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An effort was made during the last session of the New York Legislature to procure the passage of a long series of amendments to the present Building Law of that State, but although passed by one of the houses, they failed of enactment. A few changes were, however, made, all of them relating to the mode of procedure in enforcing the statute except one, which provides that nothing in the Act "shall be so construed as to prohibit the building of frame buildings with shingle roofs and eight-inch brick foundation-walls under the same in the Twelfth, Twenty-third and Twenty-fourth Wards of the city of New York, north of One Hundred and Fortieth Street;" and permits also the construction in the same district of "buildings not exceeding two stories in height above the basement, having basement walls twelve inches in thickness, and walls above the basement eight inches in thickness, constructed of hard brick and good mortar." Ward Twelve comprises the narrow upper end of Manhattan Island, from the Park to Spuyten Duyvil, Wards Twenty-three and Twenty-four are on the main-land, and include the villages of Morrisania and West Farms. That in the latter district, particularly, there is good reason for relaxing the law so as to permit the erection of two-story cottages is plain enough. For the first time, the elevated railroads have made it possible for the average working-man in New York to exchange the stifling tenement for a modest house of his own, without the serious inconveniences to which a residence beyond the rivers would subject him, and it is certainly wise to promote by legislative permissions the rapid construction in the territory served by the elevated roads of such houses as the working-men can afford to build and live in; but it is doubtful whether in extending its sanction to the erection of frame structures within the building limits, at least upon Manhattan Island, the Legislature has not gone much too far. The "frame building with eight-inch brick foundations" to which the new law refers would represent a structure little removed from a squatter's shanty, and the lining of the beautiful streets above One Hundred and Fortieth Street with such buildings would be an irremediable injury to the city. Building is now going on in New York at the rate of about fifteen hundred houses per annum. An average block contains less than sixty buildings, and a very brief inspection of the map will show that, deducting the villages of Manhattanville, Carmansville, and Fort Washington, with the precipitous banks of the Hudson and Harlem Rivers, all the available building-lots on Manhattan Island would, at the present rate, be occupied with four-story structures of brick and brownstone in something like fifteen years; and it is much to be regretted that license should have been given to improvident owners or lessees to jeopardize, by frail and inflammable erections, the vast amount of property which will soon be collected in the upper wards.

An assertion is made by the Chicago *Real Estate and Building Journal* which should attract the attention of the proper authorities at once. According to the *Journal*, an examination of the walls of the new Custom-House, made in its interest, shows the existence of eleven fissures, accompanied with dislocations so serious as to force the bricks partly out of the masonry, and bend the iron window-frames. In its opinion the cracks extend to the foundations, and are the result of settlement of the ground under them. The examination does not seem to have been very complete, and probably no good opportunity offered for making it so; but no time should be lost, unless the story is a pure fabrication, which is not likely, in making a thorough investigation. This is the more important in view of the fact that the first expert commission which inspected the structure at the time when its security was called in question decided, after careful testing of the ground and computation of the loads upon it, that the structure could not be completed with safety; and advised its demolition. The members of the second commission looked at the circumstances a little more favorably than the first, and agreed that the building might be finished without danger, but only on condition that its weight should be diminished by important changes in the construction of the upper portions, which were made in accordance with their recommendation.

Cincinnati has encountered a difficulty such as will be met more and more frequently by those inland cities which are situated on important rivers. The suburb of Walnut Hills has increased so much in population of late years, owing, as some say, to the smoke nuisance which is rendering the city itself uninhabitable, that the imperfect drainage of the place has become a matter of serious importance. At present there are no public sewers, and the multiplicity of private vaults and cesspools has already been, as is supposed, the cause of a malarial epidemic, and bids fair to produce still worse evils. In this extremity, some of the inhabitants have bethought themselves of a large sewer, opening into the Ohio River, which was constructed some years ago expressly to form an outlet for the future drainage of the district, and have asked permission to construct at their own expense a branch drain leading into it. Unfortunately the outfall of the main sewer is situated above the point at which the supply for the city water-works is taken from the stream, and no proposition for making it a conduit for sewage can possibly be entertained. The only alternative seems to be the construction of a longer drain, which shall take the waste of Walnut Hills by a circuitous route to an outfall below the water-works, but this will be a costly undertaking, the expense being estimated at not less than a million and a half. It seems as if here might be a favorable opportunity for an experiment in sewage irrigation. The circumstances are unusually favorable: the river is so near that there will be no need of providing for surface-water, — that great obstacle to successful irrigation; and small pipes, conveying only concentrated house-wastes, will be quite sufficient; while the elevated situation of the village, and the ample tracts of neighboring land available for cultivation, will render the problem a comparatively simple one, and the tax-payers of Cincinnati, by contributing toward the enterprise even half of the annual sum which the long sewer would cost them in interest, might insure its success.

A certain revival of interest in the World's Fair project is to be observed in several quarters. The committee appointed in Boston to consider the expediency of holding it in that city has done its work with such preternatural secrecy as to suggest the idea that it had abandoned its functions altogether; but occasional rumors in regard to its deliberations have served to keep alive a small remnant of expectation, and within a few days have appeared symptoms of some impending development; whose character can, however, not yet be divined. In other cities the Boston enterprise is looked upon as entirely dead, and some of the original subscribers to the Fair in New York have undertaken a second time to call the attention of wealthy individuals and corporations to the scheme. Three million dollars have already been pledged, but the promoters intend to wait before taking any definite action until the great railroad corporations indicate their willingness to make subscriptions adequate to their means and to the profits which they would derive from the actual carrying of the plan into execution.

The epidemics of intermittent fever which have appeared in Western Massachusetts seem in a fair way to be thoroughly investigated, and it may be hoped that an important addition to our knowledge of the subject will be the result. The most energetic action has been taken in Lenox, where the disease attacked the inhabitants of the lower portions of the town with great violence, finally inducing them to call upon their richer fellow-citizens, who, living on higher ground, were not affected, for assistance in procuring relief. Their appeal was promptly answered, and a committee, consisting of Messrs. Thomas Post, Richard T. Auchmuty, Samuel Belden, Chauncey Sears, and William D. Curtiss, with Dr. Richard C. Greenleaf, was appointed to collect evidence in regard to the causes of the fever, with a view to remedying them. The most noticeable circumstance in connection with the epidemic was that nearly all the patients lived in the vicinity of a large mill-pond, owned by the Smith Paper Manufacturing Company, and covering eight hundred acres of land, much of which was barely overflowed, and presented the aspect of a stagnant marsh, green with aquatic weeds and conferva scum. According to our ordinary notions, the vicinity of such a pool would be quite sufficient to account for the appearance of ague in the New Lenox district, but the Smith Manufacturing Company, with the other mill-owners of the neighborhood, who have made common cause with them, maintain that there is no necessary connection between the two; and so distinguished an authority as President Chadbourne of Williams College agrees with them. On the other side there is, however, evidence of great weight, and in accordance with it an indictment has been found against the owners of the mill-pond for maintaining a nuisance, which, after one or two postponements, will come to trial next January, when a discussion of the greatest interest may be looked for.

Col. Geo. E. Waring, Jr., has addressed a letter to the Chairman of the Highway Committee of Newport, R. I., in regard to the adoption of the Chesbrough-Cotton plan for the sewerage of that city, which is said to be strongly advocated before the City Government, in which he argues against it with a force and frankness which show that the strength of his convictions is not entirely due to his personal connection with the opposing system. In his opinion the construction of a network of large sewers, receiving surface-water and house-wastes together, would be "a serious and disastrous mistake;" and he considers that in the present state of sanitary science a repetition of the kind of drainage work which was thought most suitable for London, Paris and Chicago a quarter of a century ago is an anachronism which will daily grow more and more glaring. That the great end to be accomplished in sanitary drainage is the speedy removal to the ultimate outfall of every particle of foul matter, not only from dwellings, but from the sewers themselves, so as to avoid all decomposition and generation of gas within the limits of the inhabited district, must be acknowledged to be true. That this end is secured by the use of large, porous brick sewers, no one will pretend; while it is certain that the employment of small, glazed pipe-drains, in what is known as the "Memphis system," does in a great measure attain it. The real questions to be asked in deciding upon the expediency in a given case of adopting one system or the other are, whether the small pipes are liable to be so frequently choked as to involve great expense in maintaining them; and, whether the additional cost of works for conveying away surface-water, which must be excluded from a small-pipe system, would be so great as to bring the total expense of drainage to an impracticable point. As to the first question, the experience of Memphis has proved, notwithstanding unfavorable predictions and false reports, that the stoppage of such sewers, when properly built, will be of rare occurrence; while the cost of satisfactory surface-water disposal, though varying with each locality, will seldom be more than a fraction of the outlay necessary for the kind of drainage work hitherto commonly adopted.

After the lapse of ten years, it has been decided to rebuild the palace of the Tuileries, whose melancholy ruins have so long contrasted with the beauty of one of the most imposing scenes in Europe, the vista from the Place de la Concorde to the Arc de Triomphe. The necessity for removing the walls, which were left in a dangerous condition by the fire, had been made evident some years ago, but a certain sentiment was aroused by the discussion which took place at that time upon the question whether the memory of Catherine de Medicis should be perpetuated by the restoration of her palace, or the entire structure obliterated and the site made into a garden, and the matter was wisely suffered to rest. Now, the need of further accommodation for the public offices and collections has become manifest, while political passion has perhaps somewhat died away; the Pavillons de Flore and de Marsan, which formed the wings of the palace, have already been repaired and converted to the use of various administrative bureaux, and no objection has been or is likely to be made to the project of rebuilding the central portion, to be occupied as a museum of modern art. Following the wise example set in the reconstruction of the Hôtel de Ville, the style of the new building will accord as far as possible with that of Philibert de l'Orme's design; but whether the skill, even of the Parisian workmen, will enable them to emulate the exquisite delicacy of detail which characterized the earlier building may well be doubted. The most noted of French architects, Charles Garnier, has been commissioned to carry out the work, and we may congratulate ourselves that the loss which art suffers by the destruction of the original building will be partly made up in the interest of the new one.

It appears from later advices that the reports of the "injunction" and "seizure" of the Maxim electric lights at the Paris Electrical Exhibition were pure inventions, no interference whatever with the exhibit having been attempted; so that the Maxim lights continue to burn as brightly as ever. According to a reporter of the *World*, who has talked with the counsel of the United States Company on the subject, the French patent laws would not under any circumstances authorize such precipitate action in a suit between two foreign parties. In fact, there are no such patent regulations there as we are accustomed to. The office of Brevets d'Inventions does not examine into priority, patentability, originality, or the other circumstances of an application made to it, but simply records the application, expressly disavowing any expression of opinion as to the right of the parties to a monopoly of manufacture. Hence the mysterious initials, S. G. D. G. (*Sans Garantie du Gouvernement*), which are to be found stamped on all French patented articles. If any one disputes the claim of the registered applicant, he must seek satisfaction in the civil courts. If a suit of the kind is brought there, the court will send an officer to take an inventory of the offending goods, in order that they may be identified during the progress, or at the end of the suit. Any such proceeding as the summary locking-up of the articles on a simple *ex-parte* statement of one of the parties is as much out of the question there as it would be here.

The rapid substitution of steel for iron in constructive work has led to a great number of new and interesting observations on the proper modes of treating the material, so different in its properties from the purer metal. As architects are likely to be often called upon to deal with steel plates and bars in roofs, floors, and other constructions, it is important to know something of the more recent processes of manipulation. Every one has heard that steel is liable in forging and hammering to become hard and brittle, so that it must be annealed to bring it back to a suitable flexibility. As this is a long and costly operation, great efforts have been made, particularly in the construction of steel ships, to discover modes of treatment which should avoid changing the density of the metal. It has been found that while the concussion of an iron hammer upon a steel plate gives rise to a spot of altered texture at the point of contact of every blow, forgings made with a wooden mallet, faced with iron, are free from these defects, and after the men become accustomed to them, ordinary work can be done as rapidly with the light wooden hammers as with the heavy iron ones. In the same way it has been proved that the punching of rivet holes in steel with a sudden blow, such as is customary in punching iron plates, changes the texture of the metal around the holes, making it brittle and weak; so that punches with a spiral cutting edge, moved by the gentle, though irresistible force of the hydraulic press, are now generally substituted, with great advantage. Even for heavy forgings the steam hammer is, for similar reasons, replaced by the hydraulic press wherever possible, and the cutting of plates is in the best establishments accomplished by the movement of a sharp blade, instead of by the old method of punching a line of rivet holes, tangent to each other. In general, all manipulation of steel, whether cold or hot, should be carried on with sharp, light tools, managed gently, although forcibly, and heavy blows may be expected to injure its strength, reducing it in many cases much below that of ordinary wrought-iron. It is not unusual in building operations to cut and bend plates or bars upon the ground, and these properties of steel should be kept in mind by the superintendent or other person in authority.

## BUILDING SUPERINTENDENCE. — IX.

SUCH precautions should, however, be insisted upon if there is occasion for them, since a house with a wet cellar is, to speak briefly, unfit for habitation. **Ground Water.** The main principle to be borne in mind in ordinary soils is that the ground-water stands nearly at a level (Fig. 82), varying, like the tides, with the season; and that the smaller elevations usually form, so to speak, islands in the

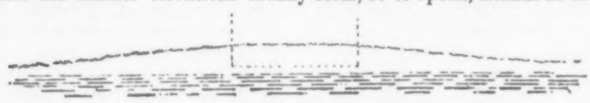

Fig. 82.

subterranean lake, upon which a house may be built with perfect safety, while another, a few rods distant, would have its basement perpetually steeped in moisture. The existence of ground-water a foot or two below the cellar bottom is of comparatively little consequence, provided that this is well concreted, and that the water never rises any higher.

More important elevations generally contain a substructure of rock, above which the rain collects, and flows downward, **Cellar on Hill.** coming to the surface at intervals in the form of springs. As the soil is always thinner near the top of the hill, such springs are more common there, and are the more annoying because their existence often cannot be detected until the progress of the excavation brings them to light. These streams can, however, in ordinary soils be intercepted without much difficulty, and their current turned harmlessly toward one side; but it is otherwise **Rocky Soil.** with cellars cut in rock. These are almost invariably infested with small veins of water, which run along the seams of the ledge and collect in the basin formed by the excavation, soaking through the house walls, and saturating the concrete floors; and the extra cost of intercepting such veins, and of cutting a channel to convey the water to a proper outfall, is usually very serious, so that locations of this kind should be avoided; or if that is impossible, the level of the cellar bottom should be set so high that little or no excavation in the rock will be needed, and the downward course of the water will not be interrupted. This may always be done, without detriment to the appearance of the building, by means of suitable grading or terracing.

Clayey soils are also unfavorable. Being impervious, they retain the water which may settle into the new excavation just outside the cellar walls until it finds an escape for itself, very **Clay.** probably into the building. Moreover, they expand greatly in wet seasons, or in frosty weather, to contract again in summer; while the tenacity with which frozen clay clings to stone or brick work often causes the dislocation or derangement of cellar walls and piers.

Most house-lots in the country or suburban towns offer at least some choice of location, and as a few inches difference in the level of the cellar bottom, or a few feet difference in the distance of the building from a ledge, may be quite sufficient, without special precautions, to determine the wetness or dryness of the cellar, and therefore the healthfulness or unhealthfulness of the house, a judicious study of the site is of great importance.

Where the limits or the character of the plot admit of no choice, it will in very many cases be necessary to incur extra and unforeseen expense in draining the excavation thoroughly. Some of the expedients to be adopted have been described in the first part, and others will be mentioned below; so that with the help of these hints the architect or private owner will be able to deal with any difficulties which he is likely to meet.

The house whose construction we have to follow is situated on the side of a rather steep hill, sloping toward the north. The lot on **Description of House.** which the house stands comprises about six acres, and the avenue leading to the building passes for some distance through a cutting, seven or eight feet deep. Rocks appear above the surface in various portions of the lot, and several springs ooze through the sides of the cutting made for the driveway, indicating that the ledge is not far beneath. The house is to be of modest dimensions, comprising a parlor, dining-room, hall, kitchen, staircase-hall and back staircase on the ground floor, and four chambers, dressing-room and bath-room on the second story, with four finished attics above. The cellar contains a laundry, furnace-room, vegetable-cellar, and open place for storage, and a servants' water-closet. The hall is finished in oak, with oak floor; the principal staircase is of cherry, with mahogany posts and rail; the parlor is finished in maple, with pine floor, bordered with maple and cherry parquetry work; and the dining-room is in ash. The kitchen and laundry are finished in hard pine, with floors of the same.

All the rooms in the second story are in whitewood, except the bath-room, which, in order to give a pleasant liveliness of effect, is finished with alternate black walnut and maple.

The attics are in pine throughout. The hall and one large attic room are to be finished so as to show the natural color of the wood; the other rooms will be painted.

The plans and specifications having been carefully drawn, the owner, if unacquainted with building matters, should take pains to **The Owner and the Plans.** understand them fully. While still in the architect's hands, he should with his help consider the various points in regard to which he has any particular theory or preference, and by measuring for himself in the houses of his friends the dimensions of doors, windows, stairs, closets, sinks, baths and other details, and comparing them with those shown on his plans, he can form a clear notion of what is intended by them, and satisfy himself that they indicate just what he wishes his house to be. The specifications, also, he should study carefully at home with his family, and may take advantage of the suggestions which they furnish to modify certain points, if he wishes, in a way to please the fancy of the persons who will occupy the various rooms. Such study as this is of much value to the owner, who is thereby often saved from expense in altering work already done in the ordinary way in order to gain some object desirable to himself, but about which he had forgotten to inform the architect; while the architect is always glad to furnish all the assistance in his power, knowing that a little time spent in promoting the thorough comprehension by all parties of the structure indicated by the drawings will enable him to do his work with much more satisfaction to himself as well as to his employer.

In regard to the contracts, the question always arises, whether the whole work shall be entrusted to one man, or two or more separate contracts made; and it is not always easy to answer it. **Contractors.** The practice of various localities has much to do with the matter. In some places it is rare for mechanics to make sub-contracts, and therefore each trade must be dealt with separately, while in others the best contractors prefer to have the sole control of their buildings, and endeavor to keep the work entirely in their hands.

Where a building must be speedily completed, it is generally easier to attain that object by putting the whole contract into the hands of one man. Two contractors, responsible only to the owner, and jealous or indifferent in regard to each other's interests, always charge each other with the responsibility for the delays which usually occur under such circumstances, and the owner finds it difficult, if not impossible, either to enforce his contract as to time of completion, or to collect indemnity for the delay without doing injustice. Where, however, the time is not restricted to the shortest possible space, most architects will agree that the best results are obtained by making at least four separate agreements; the cellar-work and grading forming the subject of one; the carpenter-work, including painting and glazing, of a second; the brickwork and plastering of a third; and the plumbing of the fourth. It is often desirable to make a fifth agreement for the painting and glazing, but if the carpenter is trustworthy, there is generally some advantage in allowing these to be included in his contract.

By the system of separate contracts better work is usually to be obtained in each branch, and, considering its quality, at a cheaper rate; although speculative builders have ways of making sub-contracts at prices which seem incredibly low to those who are not familiar with the difference between the good and the "jerry" style of work. The best mechanics always prefer to treat directly with the owner; they are in this way sure of their pay, and can therefore afford to work at a lower rate; while the owner saves the percentage of profit which the principal contractor feels himself entitled to charge upon the tenders made to him by his sub-contractors. Whatever mode is adopted, too much care cannot be taken to have the plans and specifications as full and explicit as possible. If these are what they should be, a building so simple as a dwelling-house can be, and generally is, where the owner knows his own mind in regard to the kind of house he wishes, and takes the trouble to see that the plans express it, carried out to completion without any "extras" whatever; generally to the great surprise of the proprietor, who is sure to be informed by volunteer counsellors before he begins operations that his extra bill will inevitably be "at least as large as the contract price;" that he "ought to restrict the architect to half the sum that he intends to spend," and so on. As an example of what is desirable in such documents, forms of specifications and contracts are subjoined, such as have been used, with the necessary variations, for a considerable number of houses, all of which have been finished complete at the contract price, without a dollar of extra charge, except in case of unexpected difficulties of ground, or unless the owner has desired to make alterations as the work went on, or to add to the contract the execution of some parts of the furniture, as mantels, fixed book-shelves, seats, and so on.

Armed with such instruments as these, we enter upon the execution of the work. We have made separate contracts for the cellar-work, the carpentry, the brickwork and plastering, and the plumbing, and have also selected a good furnace, and arranged with the makers to put in the requisite pipes and registers in the best manner when the proper time comes, under a guaranty that the apparatus shall heat a given number of rooms to a temperature of 70° when the thermometer outside stands at 0°, without taking air from the cellar or any other part of the house, and without regard to the direction of the wind.

Occasionally, the heating apparatus is included in the principal contract, but this is most unwise. As with plumbing, the work to be done is so difficult for any one but an expert to understand or criticise, and the difference between good and inferior work is so great, in value, even more than in cost, that it should never be made the interest of any man to get it done as cheaply as possible. Explanations of these points will be given further on. Meanwhile, we hasten to get the cellar under way.

Although no rock appears in the immediate vicinity of the site selected for the house, it is not improbable that it will be found somewhere in the excavation, and the contract with the cellar mason provides a certain price which shall be paid for whatever blasting may be necessary, stipulating at the same time that the rock taken out shall be used in the cellar walls, and an allowance made for it. If there is other stone to be had near at hand, the cost of taking out rock from the cellar is fairly offset by its value for walling material. The occurrence of ledge in the excavation will usually be accompanied by small springs, but it would be inexpedient to burden the contract with an allowance for draining them away properly, so, if they occur, the operations which they may render necessary will be best treated as extra work.

**Staking out.**

The contractor and the superintendent stake out the ground together, the latter checking the rectangularity of the lines by measuring the diagonals, and batter-boards are set up; and a bench-mark, showing the level of the top of the cellar wall, is made on one of the batter-boards. The house should always be set high enough to give good cellar windows, with a sufficient fall to the surface of the ground away from the building on all sides. Three feet distance from the highest point of the natural surface in the perimeter of the building to the top of the cellar wall is none too much. This will give two and a half feet of underpinning all around, and insure a light, well-ventilated cellar.

**Cellar-Building.**

The excavation is required to be eight inches wider on all sides than the outer line of the walls, in order that the latter may be carried up smooth and strong, outside as well as inside. The whole is laid in mortar containing equal parts of lime and cement, and both the outer and inner faces are to be pointed neatly. The trenches are to be dug two feet below the proposed cellar bottom, and eighteen inches of dry stone chips are first put in, before starting the cement wall. All this is expensive, and the cellar will cost in this way at least twice as much as if constructed in the usual country fashion; but it will be more than ten times as good, and nothing short of this fulfils the conditions which modern ideas regard as essential to dwelling-houses.

The clear height of the cellar should be eight feet in the smallest house intended for winter occupancy, and more than this in larger mansions, in order to give sufficient height above the furnace to allow of a proper ascent in the tin hot-air pipes, without which the heat cannot be successfully distributed to the various rooms. This, with the two feet additional below the cellar bottom, will make ten feet of stone-work, one and one-half feet of which will be laid dry, and the remainder in cement. Whether the material of the cellar wall shall be brick or stone may depend upon the local custom. Hard stone makes the best wall. It is non-absorbent, and as the frozen earth adheres but slightly to its surface, a wall built of it is not subject, as brickwork is, to gradual loosening and decay at the surface of the ground. Where brick must be used, they should be of the hardest quality.

The first operation is the stripping of the surface loam from the whole area covered by the building, and about eight feet additional on all sides, and the stacking of this in some convenient place for use in the subsequent grading. The excavation of the cellar then proceeds in conformity with the lines given by the batter-boards. As the top of the wall is fixed by the bench-mark at 3 feet above the highest point of the ground, and the clear height of the cellar is 8 feet, the main part of the excavation, exclusive of the trenches for the walls, will be nowhere more than $5\frac{1}{4}$ feet below the ground; the extra 3 inches being allowed for the thickness of the concrete.

**Draining the Soil.**

We have chosen our site well, and are fortunate enough to find no rock in the excavation, and no wet places in the cellar itself, but in the trenches two feet or so below, the water stands in several places. This is an indication of a moisture in the subsoil, which will increase after spring rains so as to fill the trenches, and these will overflow into the cellar unless some other outlet is provided for the water. The slope of the ground, and still more the comparative shallowness of the cellar, make this a simple matter: all that is necessary is to continue the trench beyond the line of the house, giving it a slight fall to some point where the descending ground will allow it to reach the surface. The trench may be filled nearly to the top with loose stones or broken brick, and then covered with straw and loam, or a pipe-drain may be laid through it (Fig. 83). All the water that collects under the walls will then be immediately drained away, and no matter what may be the level of the ground-water outside the house, the trench with its outlet forms a barrier which will prevent the moisture from ever making its appearance above the cellar floor (Fig. 84). It is true that in some clayey grounds, especially if traversed by veins of sand, water may rise through the cellar bottom in some places, but such soils are rare, and moisture so introduced can easily be carried off by small "French drains" of broken stone, or lines of agricultural tiles, leading from the wet spot to the main drain under the walls, or, still better, extending from wall to wall across the place to be drained.

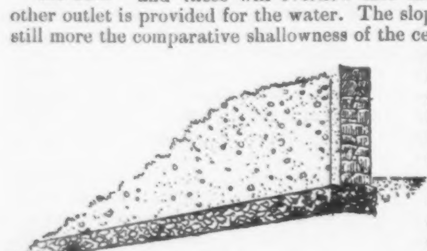

Fig. 83.

Where the ground is very soft or sandy, the outlet drain should be laid at a gentle pitch, in order that the current toward it may not be swift enough to scour out the soil beneath the foundations and cause settlement. Some architects, for fear of this, prefer to make stone or tile drains entirely outside the walls (Fig. 85 or Fig. 86), but this is somewhat more expensive, as the excavation must be made proportionally larger, while the former method is more effectual in keeping the cellar walls and floor dry, and if carefully carried out should be no more liable to cause settlements than the other. If small stones are used under the walls, they should be compacted with a rammer, and thus form an incompressible mass.

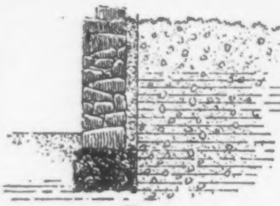

Fig. 84.

The building of the masonry upon this foundation is a simple matter, but must be sharply watched, for in no detail of construction is the common practice so vicious as in the laying of cellar walls. In stone districts, the majority of houses stand upon basements built with blocks of the most irregular shapes, laid "dry," that is, without mortar, and depending partly for support upon the earth outside of them. The smoothest face of the stones is inside, while the outside presents a ragged, bristling mass of projections, and to improve the visible face, the crevices between the stones are "chinked" with small chips, and the joints are "pointed" by rubbing mortar over them with the point of a trowel. A coat of whitewash completes a work which, while it is new, presents on the inside precisely the same aspect as the best sort of wall. But a brief period only is needed to make its defects manifest. Streams of water, after heavy rains, pour through the loose structure, followed by rats, which burrow down next the outside of the walls until they find a wide joint from which they can easily push out the pointing mortar and obtain access to the interior; and little by little the earth washes into the crevices between the bank and the stone-work, until the latter yields and bends inward, presenting the characteristic inward convexity of country cellar walls.

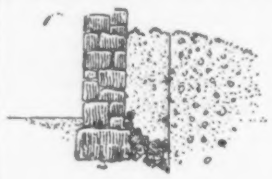

Fig. 85.

Fig. 86.

Every feature of these constructions must be avoided. In place of a dry wall, furnished only with a miserable pointing of mortar on the inside, the whole thickness must be solidly filled with cement; in place of a rough outside surface, the exterior must be the smoothest face, that water may not collect upon projections and be conducted into the wall; instead of leaning against the bank, the masonry must stand at least eight inches away from it, and the intervening space must be filled with porous gravel or sand, in order that the subterranean water-courses may be intercepted and conducted away harmlessly into the drain beneath; while all the details of bonding and proper jointing of the masonry should be as carefully attended to as in the case of a wall above ground. Further details on these points have been given in Part I., and need not be repeated here.

Without assiduous watching, most country masons lapse continually into the wretched workmanship which has become habitual to them: long stones, which they will not take the trouble to break, are set in the wall with a fair inner face, but with long "tails" projecting from the exterior into the bank, whereas the reverse would be the preferable way; and short stones are similarly set, leaving a cavity on the outside to gather water and conduct it into the wall. As the earth is usually filled in behind the stone-work as fast as it is laid, such faults are not generally detected until heavy rains reveal them, too late to apply a remedy; but something may be ascertained by using the steel rod spoken of in Part I., while the mortar and the filling outside are yet soft.

**Gravel outside of Wall.**

It is essential that the material next the wall should be permanently porous. If sand or gravel cannot be had, unsifted coal-ashes form a good substitute, and broken bricks, stone or slate chips may be used.

**Underpinning.**

The underpinning, or portion of the wall above ground, is very commonly made different from the rest, in order to obtain a smoother face. Long slabs of split granite or freestone are often used, and for cheaper work an eight-inch brick wall is sometimes built on top of the stone-work, from the grade line upward. Of these, the granite underpinning is much the best: sandstone and brick absorb moisture from the ground, as well as from snow lying against them in winter, and communicate it to the interior, besides being themselves subject to exfoliation and decay at the ground line.

Independent of appearance, the best construction is to carry the cellar wall of the full thickness to the very top, trusting to careful "drawing" of the joints for giving the exposed portions a satisfactory finish. Care should be taken that the wall is not thinned at the top (Fig. 87), as is very commonly done in country work, to give opportunity for the vicious form of floor framing by which the joists are set flush with the upper surface of the sill, their lower portion hanging down inside. Whatever the thickness, — twelve inches for brick, sixteen, eighteen, or twenty for stone, according to the character of the material, — it should continue to the under side of the sill, leaving only the necessary places for inserting the girders, and levelling off the top carefully. Frames of basement windows should, if possible, be built into the wall. The method of spiking them to the under side of the sill, leaving large, irregular holes in the stone-work for their reception, is objectionable, as the subsequent filling up is apt to be less solid than the surrounding masonry.

Fig. 87.

**Framing.**

While the wall is in process of construction, the framing of the timber, that is, the cutting into lengths, fitting and mortising, will have been going on. Usually this is done upon the ground, from material selected in some neighboring yard, as near the required dimensions as may be; but it is not uncommon for contractors to procure an "ordered frame," by sending framing plans and elevations, with a proper specification, to some saw-mill in the timber region, where the pieces are cut from the logs of the exact sizes required. One or two establishments do more than this, and ship the frame ready mortised and fitted for putting together, including when desired the boarding, shingles, clapboards, doors, windows, and other simple wood-work. There is an economy in the use of such frames, as waste is avoided, and more perfect timber is obtained, but the yard timber is usually better seasoned, and some contractors think that the time spent in overhauling after delivery the innumerable pieces of an ordered frame, except of the simplest kind, in order to select the sticks that are needed, quite offsets the waste and extra expense of framing from yard timber in the usual way.

**Inspection of Timber.**

The inspection of the rough lumber is not difficult. White pine, spruce, and hemlock are the woods most commonly used. In the far West, cottonwood is sometimes employed, and redwood is the ordinary framing timber of the Pacific coast. Of these, redwood is much the best, being strong, straight-grained, obtainable in any dimensions, and less subject to shrinkage or movement than any other. White pine is next in value, for similar reasons. Cottonwood is soft, and shrinks very much. Spruce resembles pine, but shrinks more, and is apt to warp and twist with great force during the drying process, and to "check," or crack open near the middle of the stick. The dimensions run rather small, compared with white pine or the enormous sizes of redwood lumber, but pieces up to 12″ x 12″, and 25 or 30 feet long are always to be had, and wooden dwelling-houses rarely require anything more. Hemlock is a harder wood than either spruce or pine, and can be had in large sizes, but its strength is injured by the want of adhesion between its annual rings, which disposes the timber to crack very badly in drying. The hemlock trees are very tall, and their swaying in the forest often "shakes" or separates the rings of the heart-wood, so that when sawn into scantlings or boards the interior is little better than a mass of splinters. Hard pine, or, as it is sometimes called, Georgia pine, is much used in city buildings, where its great stiffness is of advantage in enabling floors of wide span to be covered without employing timbers of inconvenient size, but it is rarely necessary in country houses to incur the additional expense of using it for this purpose, although it is employed in other ways. It is a very good timber, though shrinking considerably in drying. The principal point in examining the lumber will be to ascertain whether the sizes are according to the specifications, for which a few measurements will suffice. It should be borne in mind that only green lumber will show the full dimensions; and seasoning reduces them somewhat. A white-pine plank originally cut 12 inches wide will when dry measure about 11⅝ inches; spruce, hemlock, and hard pine somewhat less; cottonwood will shrink a whole inch in the same width, while redwood scarcely shows any change; so that suitable allowances should be made for every case. Crooked and "waney" pieces (see page 268, Vol. IX.) should be condemned, as well as those affected with serious shakes. Longitudinal cracks in the middle of a *thick* piece of spruce need not condemn it: they are almost inevitable if the timber is dry, and do not detract much from its strength; but if they occur in a thin piece, as a floor joist, and extend entirely through it, they constitute serious defects. Sticks of which portions, especially at the ends, appear livid and friable should be totally condemned. They are infected with dry-rot, and will communicate the infection to others. Amputation of the diseased part is not sufficient, for the threads of the fungus may extend a long distance into the sound part of the wood.

**Bedding Sill in Mortar.**

The first timber set in place is the sill, and this should have a thick bed of soft cement mortar prepared for it by the mason, and be hammered firmly down into it. This closes up the crevice between the top of the stone-work and the timber, through which, in poorly built houses, much cold air finds its way into the hollow floors. For additional protection, after the adjustment which is generally necessary to get the sill into position is over, it is best to point up with similar mortar along its outer edge (Fig. 88). The inside might be similarly treated, but this would interfere with the still more effectual process of lining with bricks and mortar, as described below. It is now usual to make the sill of pine or spruce, like the other portions of the frame. Our forefathers, who had no furnaces, set their dwellings very low, and banked them up with earth in winter so as to cover the lower portions of the wood-work, in order to keep the cold air from the cellar and the floors; and they found chestnut or cedar to be the only material which would resist dry-rot under such circumstances. We, however, prefer high, light cellars, with cement walls, kept dry by furnaces, and little dampness reaches the sills, but there is, as in all cases where wood comes in contact with masonry, a possibility of its being affected by moisture in the pores of the stone and mortar, so that it is best to provide a repellent coating by painting the sill on the under side. The other sides should be left untouched, so as not to impede the drying action of the air. The ends of girders also, where they enter the wall, should be similarly painted.

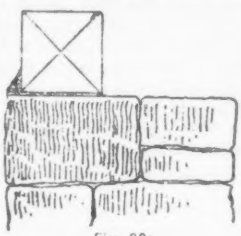

Fig. 88.

In most cases, the sill is the subject of more notching, mortising, and cutting than any other timber in the building, and must be of sufficient dimensions to allow for this. Six by six inches is a common size, or six by eight, where the basement openings are large, or there is danger of decay affecting the under side. The angles are halved together (Fig. 89), and pinned or strongly spiked. Many builders secure the sill to the foundation-walls by means of vertical bolts, about two feet long, built for the greater part of their length into the walls, at intervals of eight or ten feet. Corresponding holes are bored in the sill, and this is slipped over the bolts, and secured by nuts and washers. With light structures in exposed situations this forms a valuable safeguard against storms.

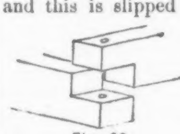

Fig. 89.

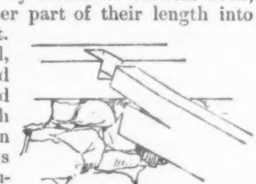

Fig. 90.

Into the sill the floor beams are framed in various ways. A very common and bad mode is to notch it some three inches deep, cutting a corresponding tenon on the upper corner of the beam, so that the upper surface of this, when in place, is flush with the top of the sill, the lower part projecting below. This necessitates the thinning off of the upper part of the wall, which would otherwise come in the way of the beams, while the tenon, from which hangs the whole weight of the beam and its load, often splits off (Fig. 90). The beams should, instead of this, be cut so as to bring their lower edges flush with the bottom of the sill (Fig. 91), with a notch, perhaps two inches deep, to hold them in place. Then the tenon will be deep enough to hold safely, and the wall can be made of the full thickness to the very top.

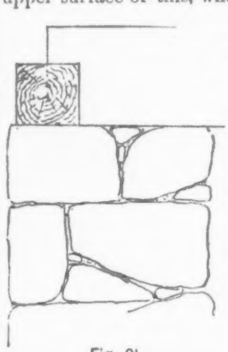

Fig. 91.

Mortises must also be made for the corner posts, and for those to be set at the intersection of interior partitions with the outside walls. Usually, each of the "filling-in" studs (Fig. 92) has also its appropriate mortise, even in "balloon" framing, but occasionally a cheap builder contents himself with simply setting the end of the stud down on the sill, and securing it by nails driven diagonally through the foot. Of course, the position of all the mortises is taken from the framing plans and elevations; which cannot be too carefully made, or the execution of them too closely watched, as a window, a chimney-opening, or a stairway, once framed in the wrong place, cannot be altered subsequently without injury to the solidity of the building. Workmen are very careless about such matters; we have known a foreman to use a framing plan traced on transparent cloth wrong side up, and regardless of the careful lettering and figures on the right side, to cut the mortises for the whole side of a house by scaling with a foot-rule the dimensions as seen inverted through the waxed linen; and it is rare, even with the most carefully drawn plans before them, for framers to complete the mortising of a sill without gross mistakes. The young architect or superintendent should therefore, as soon as the sills are set in place, verify every measurement. The figures on the plans for a wooden building should

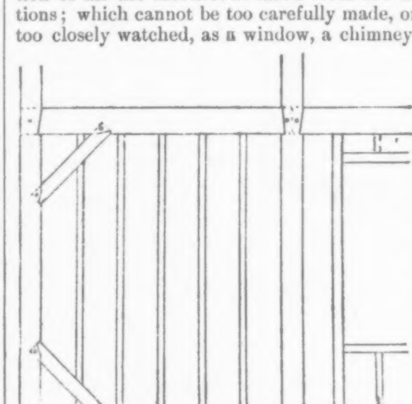

Fig. 92.

always give the distances of the *centres* of openings from the corners of the building and from each other; then the middle point between the mortises made in the sill for the studs which form the jambs of the opening can be readily found, and compared directly with the figure. If the plans are figured, as is sometimes done, in the way appropriate to stone or brick buildings, by giving the distances to the *jambs* of the openings, the verification is much more difficult, since the rough studs are always set two inches or more wider on each side than the finished opening is intended to be, to allow for the weights and lines in the case of windows, and in doors to admit of a little play in setting the frames.

After all the mortises for the studs have been examined, and such corrections as are found necessary made on the spot under the superintendent's eye, those intended for the floor timbers should undergo an equally rigid inspection. The openings for staircases and chimneys will almost always be found misplaced, or made either too large or too small. The latter is much the worse fault: it is possible to fill up an excess of space, but too small an opening, which can only be made available by cutting away and weakening the trimmer-beams, or by constricting the flues, is a serious misfortune. When these tests have been thoroughly applied, the beams may be set in place. In most cases the floor rests partly on girders, which are larger sticks, generally from 6″ x 10″ to 8″ x 12″ for the light strains of country houses, running through the cellar under the "fore-and-aft" partitions, or those which carry the floors above, and supported by brick piers in the cellar.

Occasionally, brick walls, eight inches thick, and pierced with arches for communication, take the place of the girders, but without any material advantage, unless they are carried up to the under side of the floor boards, in which case they serve to keep the floor warm and diminish the danger from fire, by intercepting the spaces between the beams.

If girders are used, special attention should be given to contriving the framing of the beams into girders and sills so that the shrinkage shall be the same at each end. This point is almost always neglected, to the detriment of the work, which begins, a year or two after the completion of the building, to undergo settlements and deformations, which instead of being inevitable, as is usually supposed, might easily have been avoided by a little care at the commencement. If, for example (Fig. 93), a ten-inch beam is framed at one end by a three-inch tenon into a six-inch sill, all flush on top, and at the other end is "sized" down one inch, without mortising, upon a 6 x 10 girder, the total height of shrinkable timber between the floor boards and the unyielding masonry will be, at the sill end, 6 inches, and at the other end 10 + 9 = 19 inches. Now a six-inch timber will shrink perhaps $\frac{1}{8}$ of an inch in drying, while at the same rate, 19 inches will shrink some $\frac{5}{8}$ of an inch, and after a year's seasoning the inner ends of the beams will thus be half an inch lower than the outer, and the floor to the same extent out of level, cracking the plastering of the walls above, distorting the door-frames, so that the doors no longer fit their places, and causing ugly dislocations in base-boards and wainscotings.

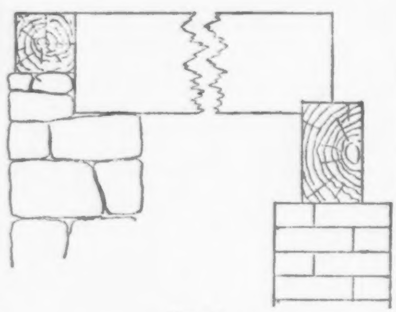

Fig. 93.

To avoid these ills, an equal height of timber should be left at each end between the flooring boards and the masonry. If the proper mode of framing into the sill is adopted (see Fig. 91), a ten-inch beam will have a six-inch tenon resting upon the bottom of the notch, with four inches of the wood of the sill between it and the cellar wall; in all, ten inches of wood. We need, therefore, ten inches of wood, and no more, between the brick piers and the floor boards at the other end. But if the girder is ten inches high, this will furnish the whole, with none to spare for projection of the beam above it, so the latter must be framed into the girder flush with its top. This is for various reasons the best way of framing into girders. Not only is it advantageous to get rid of their projection below the cellar ceiling, but the circulation between the beams is effectually cut off. If the girder is of ample strength, it may be notched, say five inches deep, to receive a

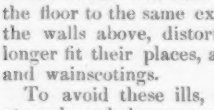

Fig. 94.

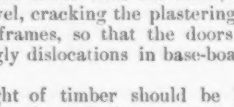

Fig. 95.

five-inch tenon on the beam (Fig. 94), but the best mode, preserving most effectually the strength both of girder and beam, is the joint with "tenon and tusk" (Fig. 95) by which the cutting is brought nearer the neutral axis of the girder, while the tusk tenon allows the joint to be bored and pinned from above.

## AUDSLEY'S DICTIONARY OF ARCHITECTURE.[1]

As nobody is supposed to read a book of this kind "through," and as each reader's estimation of it is determined by the satisfactoriness of the answers it gives to the questions which he has occasion to ask of it from time to time, it cannot be reviewed off-hand. The scope of Messrs. Audsley's work is indicated in the title-page, and more fully set forth in the preface, which explains that "it is not intended to rival, nor in any way to equal, the great essays which have been made in a similar direction; we do not pretend to the comprehensiveness of that important undertaking, the Dictionary of the Architectural Publication Society, or the learned exhaustiveness of M. Viollet-le-Duc's 'Dictionnaire Raisonné de l'Architecture Française,' but we do aim at producing what the architectural and general art student has not at present got: namely, a useful and handy book for every-day reference, on matters relating to architecture and those arts which have ever been allied with it." This seems to be sufficiently explicit, and yet there are of course opportunities for a wide variety of interpretations of what such a scheme demands. The architect who buys it for "ideas," that is to say, for forms capable of being used in his practice, will very likely be disappointed that it adds so little to the repertory supplied him by M. Viollet-le-Duc. But it may be questioned whether this is not a merit rather than a defect. The illustrations are of course a very important part of such a book, but their usefulness depends mainly upon their being illustrations. It is scarcely possible that two such masters of what may be called graphic exposition as Viollet-le-Duc can be looked for in one generation. At any rate, there is no rivalry with him attempted in the illustrations of this dictionary. The illustrations are, however, drawn or selected with clear knowledge of the points which it is desirable to bring out, and are intelligible and workmanlike in execution. As a glossary simply of architectural terms, explained with clearness and sufficiently in detail to give the reader an accurate notion of all important forms and features of past architecture, no work generally accessible in English can be compared with Messrs. Audsley's work, and it is almost, if not altogether, indispensable to practitioners and students of architecture in this country. The execution of the volumes is everywhere intelligent and consistent, and the slips which may be noted by a careful reader are upon the whole trifling, considering the extent and purpose of the work. The mechanical execution of the volumes is very good, and, in connection with the limited circulation which can be expected for a work of this character, justifies the high price (five dollars) charged for a volume of only three hundred pages. Criticism of the work must be confined mainly to its scheme.

But a glossary of architecture is a very different thing from a dictionary "*raisonné*," and it is in the ratiocination that many readers will feel the book to be deficient. A collection of completed architectural forms, telling of each where and when it was used, is a very valuable work when it is done as intelligently and industriously as it has been done in this case; but when one is in possession of this information, he cannot yet be said to understand the form, unless it has been explained to him how the form came to be. This, of course, cannot be explained without an explanation of the relation of the form to the needs and customs of the time and place in which it occurs, and to the constructive methods and the building material then and there available. The article "Apse," for example, is the most important and elaborate in these two volumes. It covers fifty pages, and is abundantly illustrated with ground plans which show the gradual development of the apse from Trajan's basilica to Amiens and Cologne. A glance over these illustrations is enough to assure us that between the first and the last the religious service for the performance of which the apse was built was so modified and elaborated as to be transformed, and that the art of construction had so advanced as to be revolutionized. To understand, properly speaking, the thirteenth-century apse, the progress in both these directions must be traced. No attempt at tracing it is made in the article under consideration, nor, indeed, is a similar attempt made in any article in this work. We are told, doubtless accurately, that as a matter of fact such and such forms were used in such and such times and places; but that statement does not help the student of architecture to understand the forms — does not even make a beginning of helping him. In fact, there is scarcely any attempt at analysis of this kind. It seems, therefore, that when the authors describe their work as "strictly a dictionary *raisonné*," they attach a different meaning to the participle from that which M. Viollet-le-Duc attached to it, or from that which most readers will attach to it. They disclaim any idea of conveying technical information, and explain that the titles they have chosen "have reference to the artistic rather than to the mechanical aspect." This would no doubt be proper if architecture could be explained without constant reference to construction, or treated apart from it. But in fact it is only Roman and Renaissance work in which the "artistic aspect" of architectural features can be considered apart from the "mechanical aspect," or in which form and function can be separately treated. It is not very long ago since a newspaper critic declared that it was not now known of what use a flying buttress was, or whether it ever

[1] *Popular Dictionary of Architecture and the Allied Arts:* A work of reference for the architect, builder, sculptor, decorative artist, and general student, with illustrations of all styles of architecture, from the Egyptian to the Renaissance. By William James Audsley, F.R.I.B.A., and George Ashdown Ashley, F.R.I.B.A., member of the Asiatic Society of Japan, etc. New York: G. P. Putnam's Sons 1881. Vol. I., A to Aqueduct; Vol. II., Aquila to Baptisterium.

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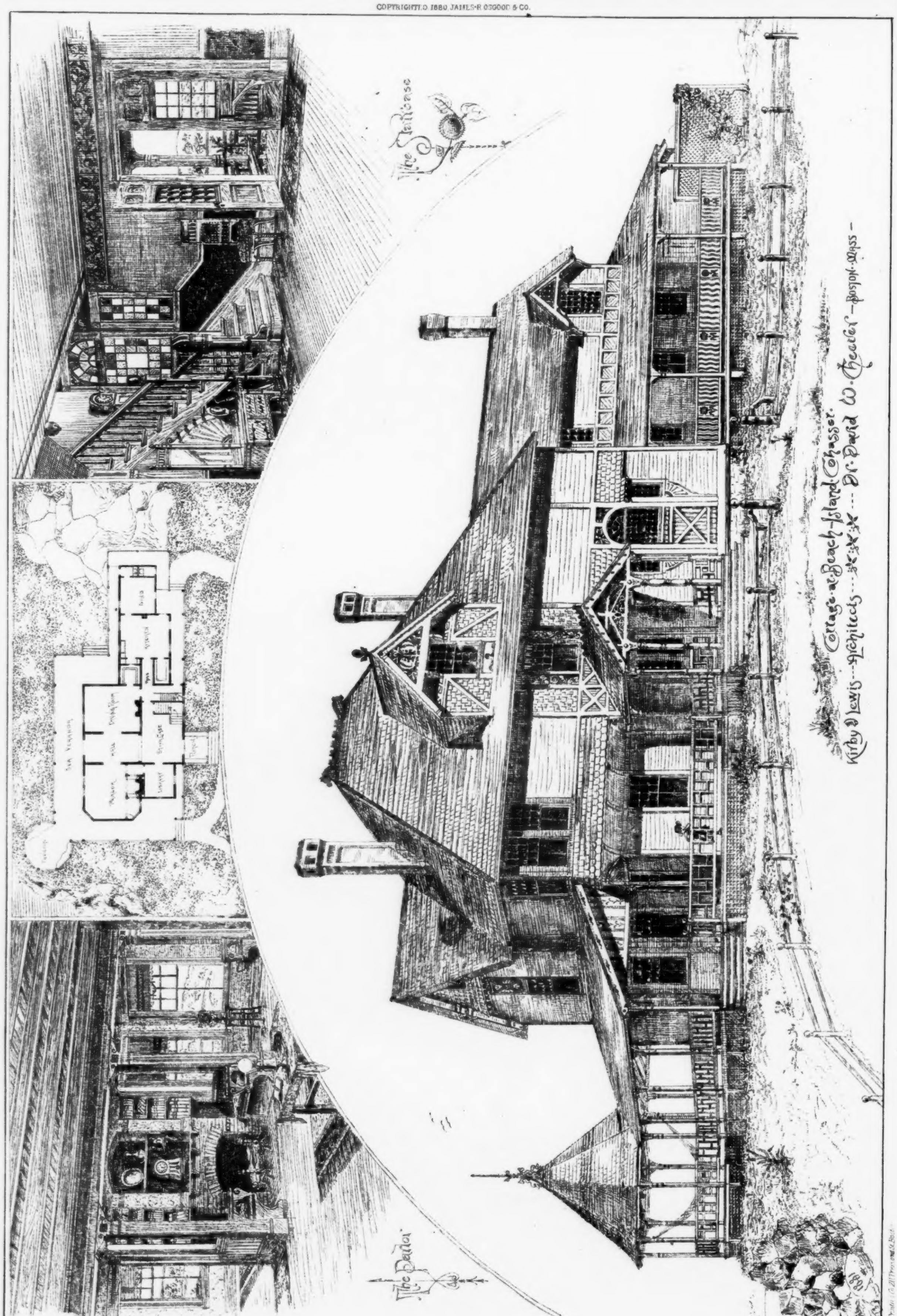

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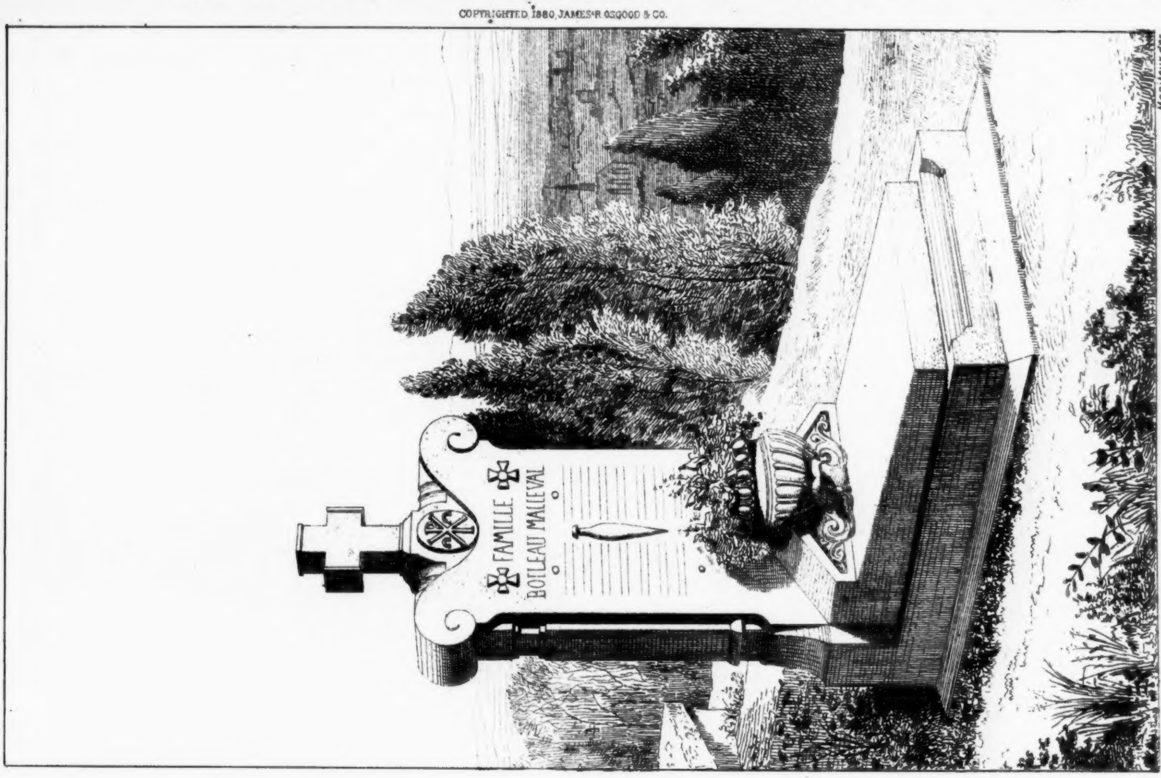


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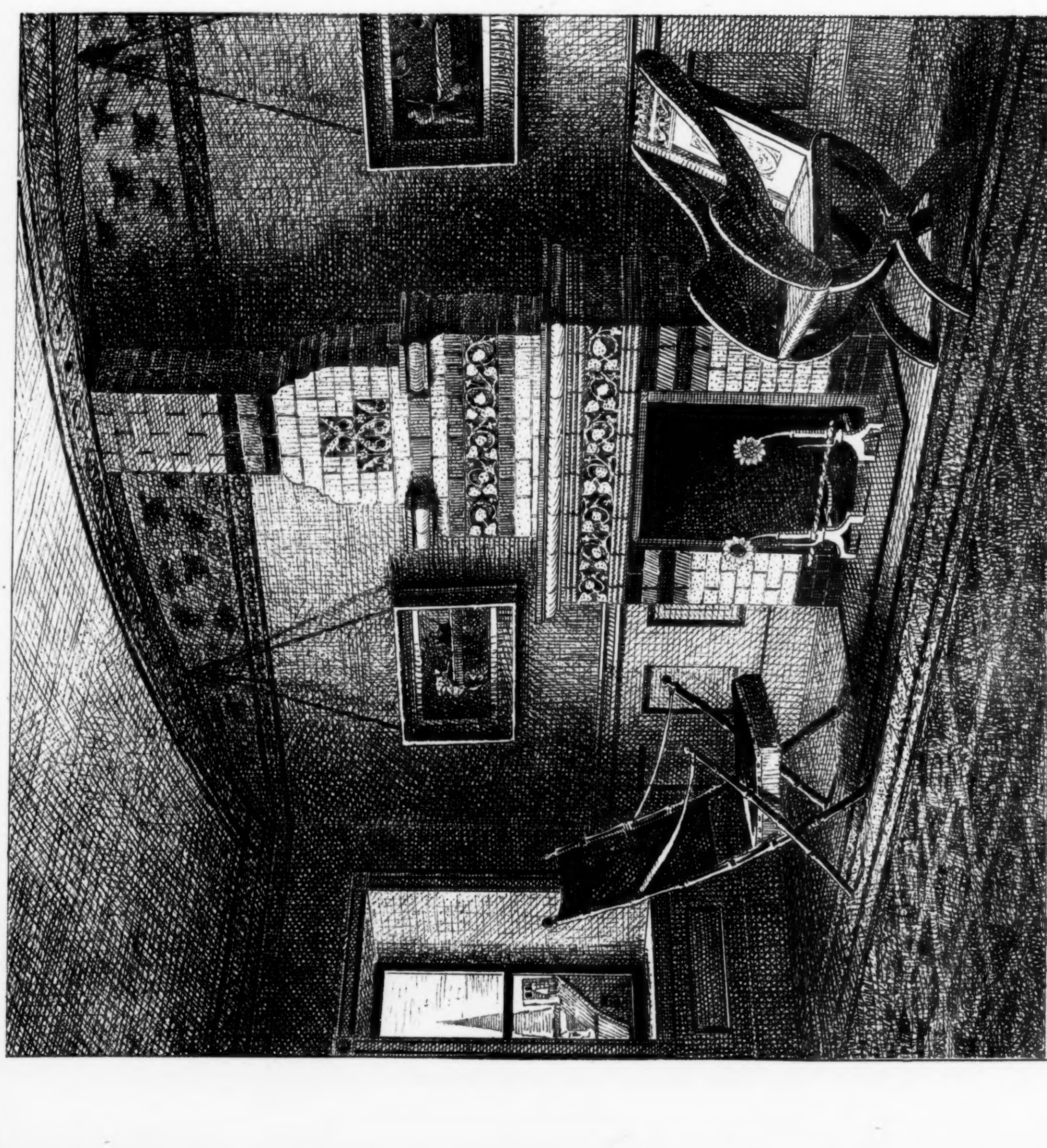
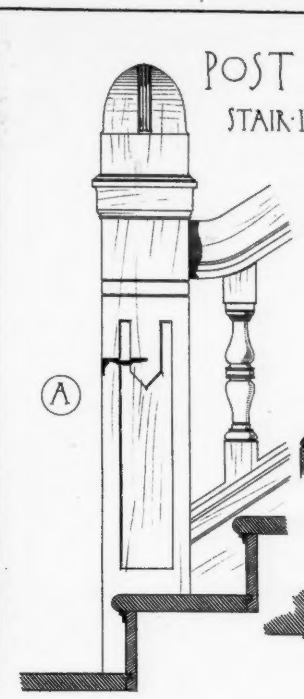
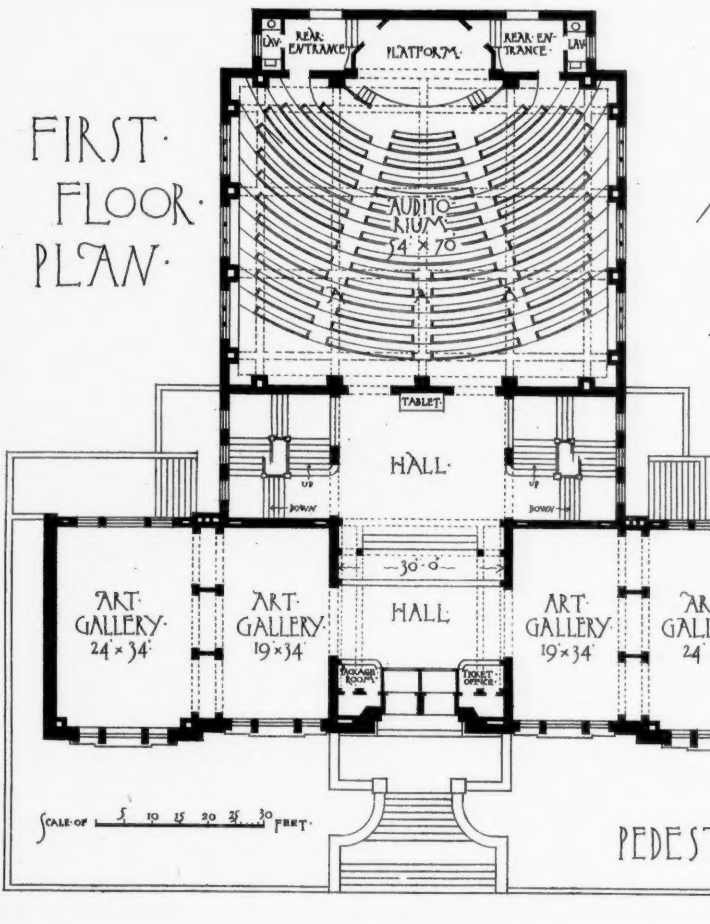


Fireplace · for John · Clayton · Esq. Philadelphia · Pa.
Charles · M. Burns · Jr. Archt.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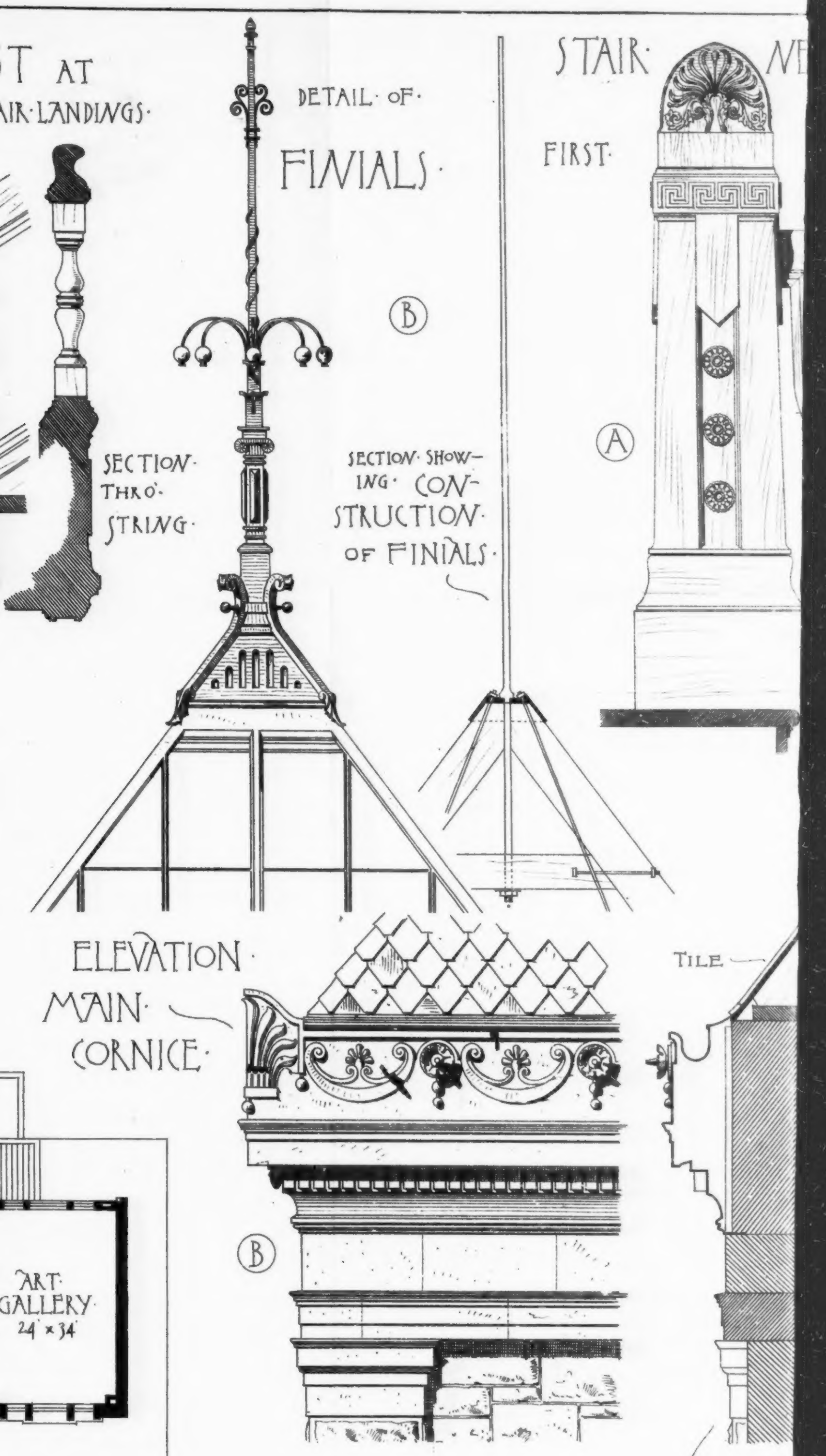
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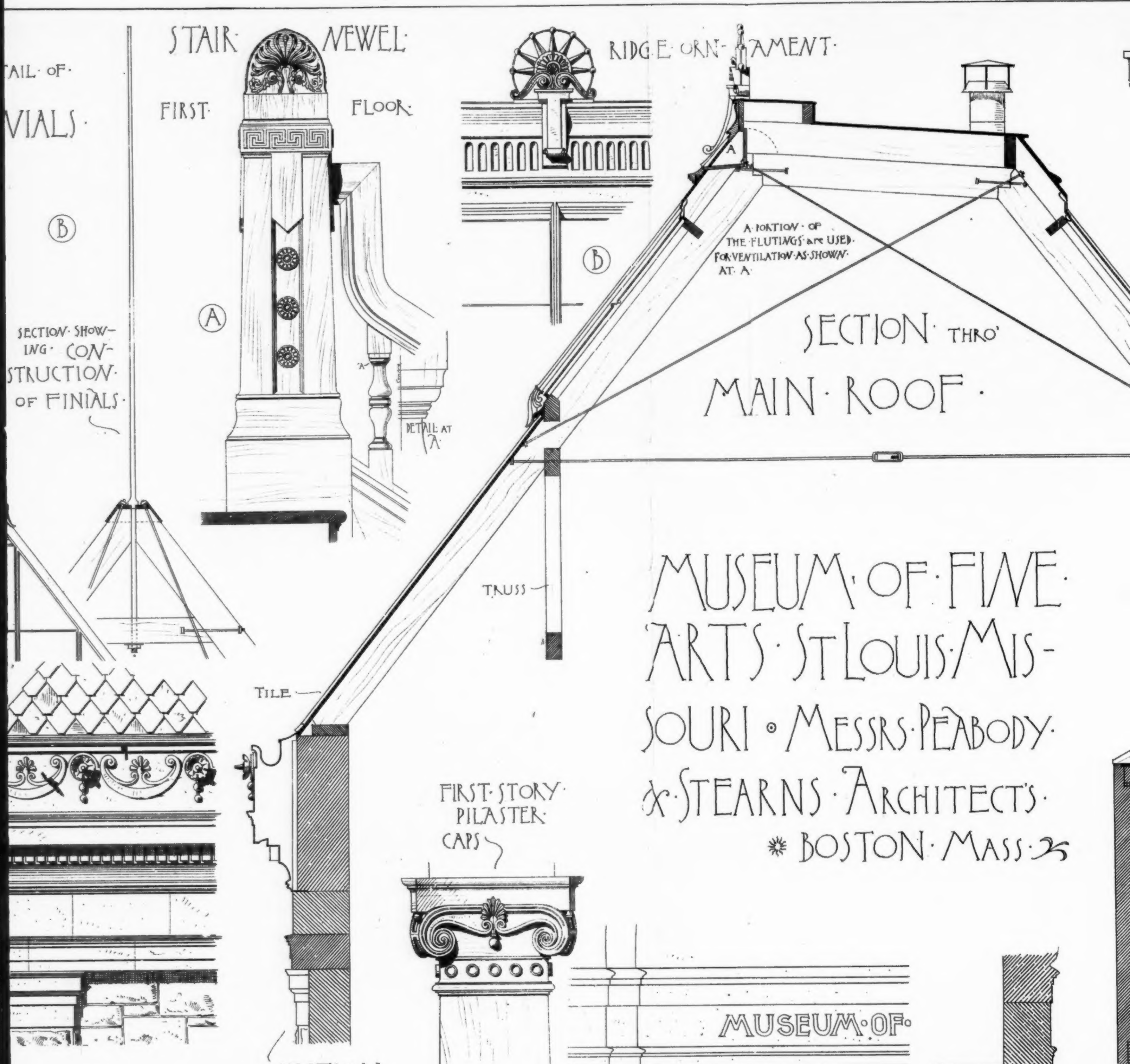

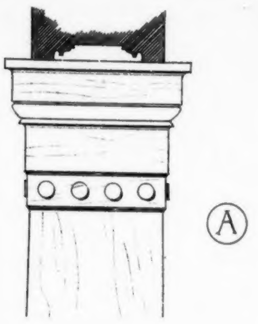


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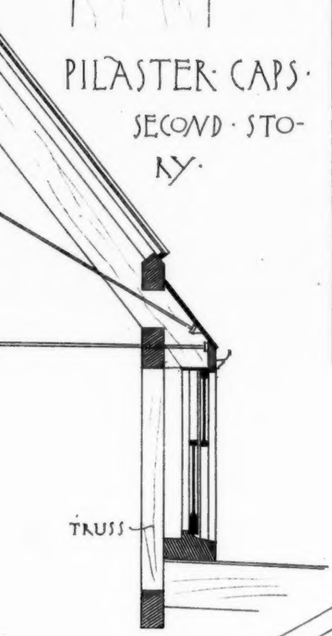
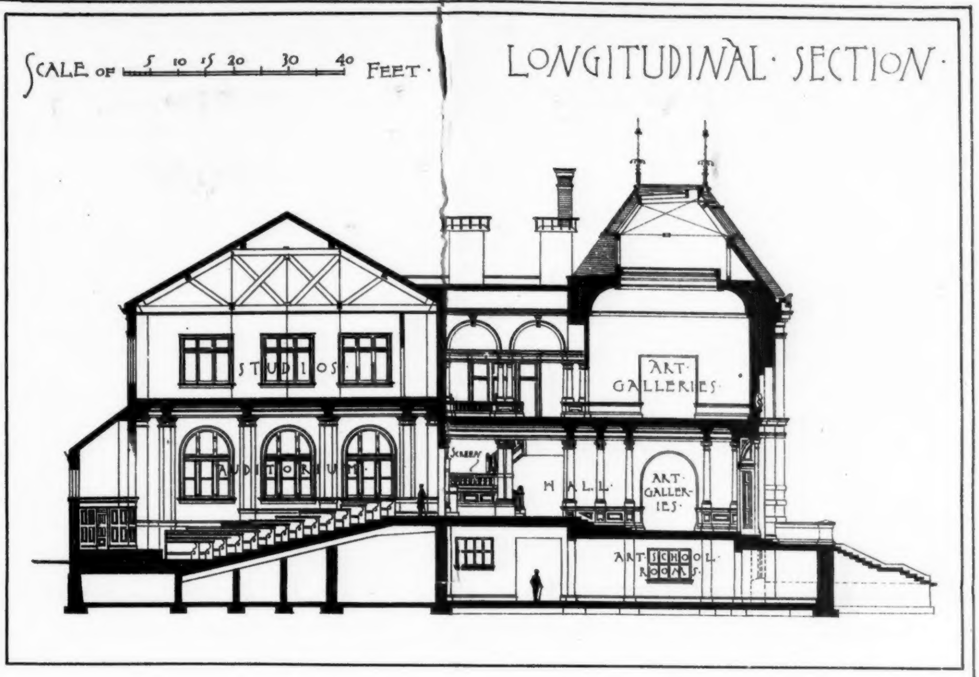
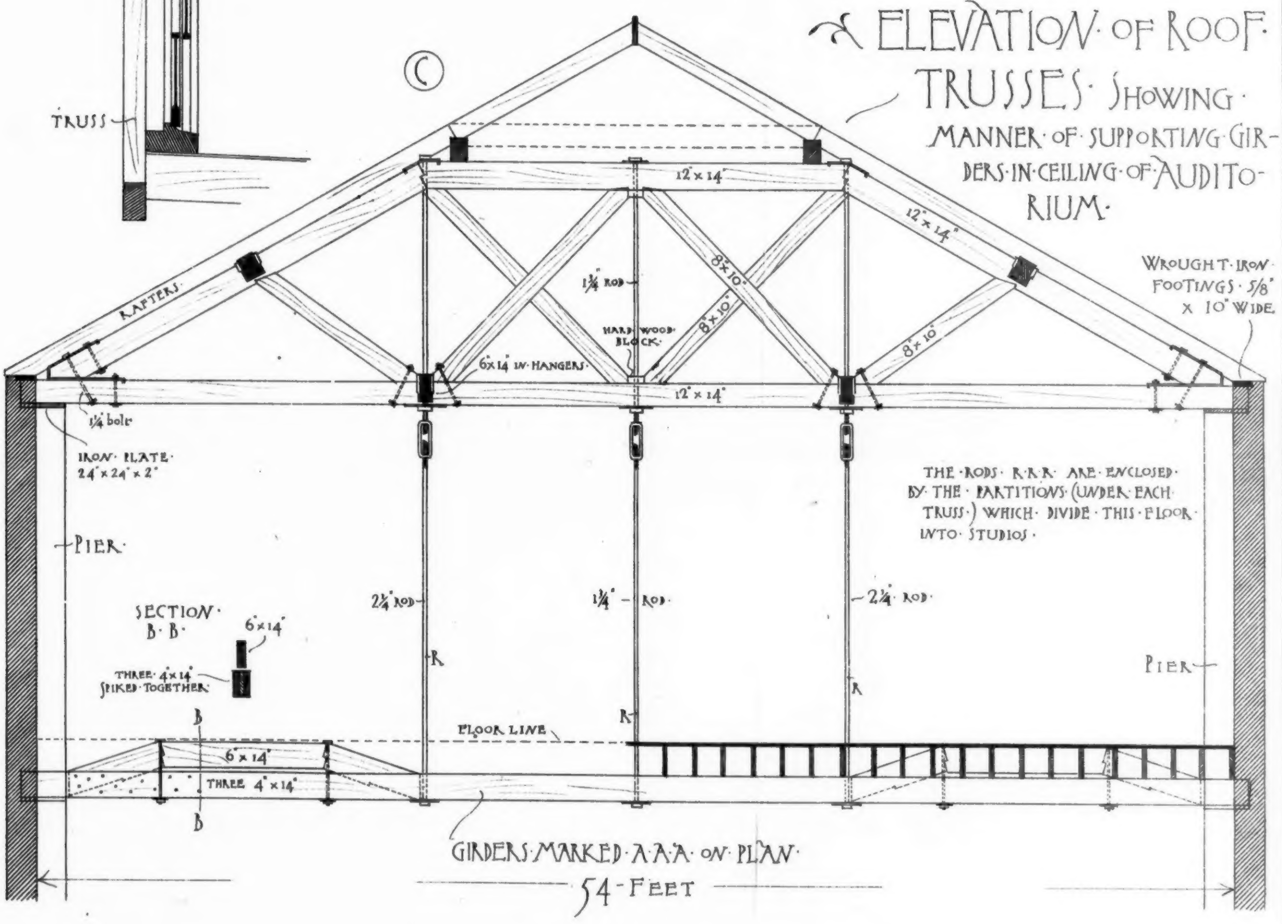
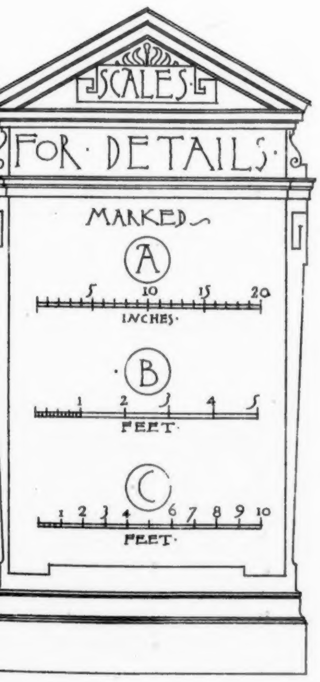
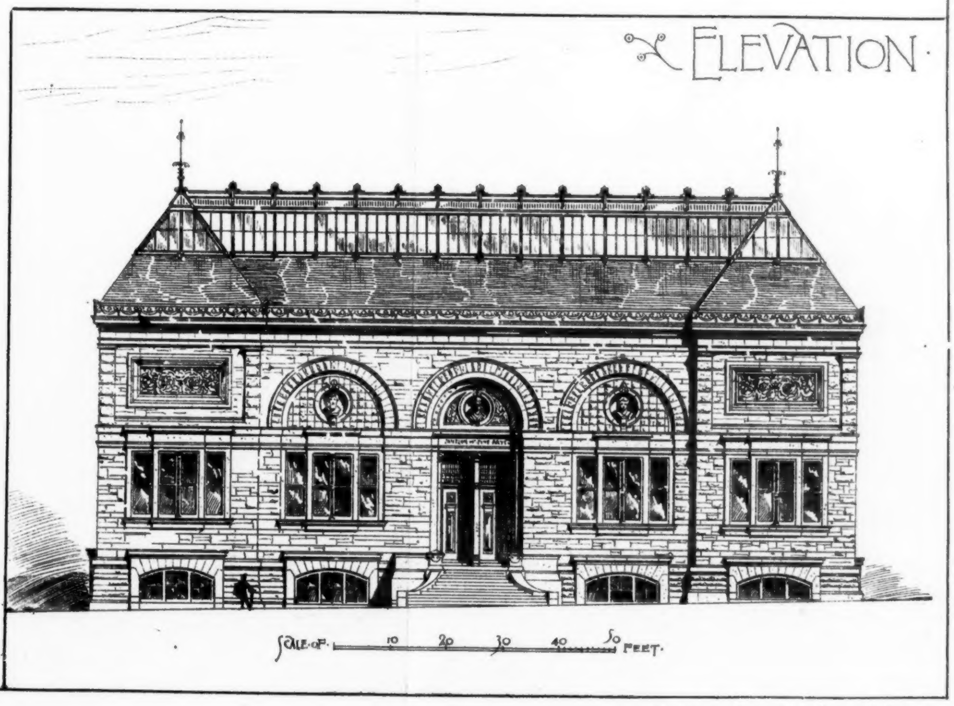



THE HELIOTYPE PRINTING CO. 211 TREMONT ST. BOSTON

had any. That benighted man will scarcely be illuminated by a perusal of Messrs. Audsley's volumes. Of course the authors know the use of a flying buttress, and of course they know that it is equally impossible to design and to criticise a flying buttress without a clear conception of the nature of the thrust which it is to resist, which ultimately determines its form, although a well-designed flying buttress will itself convey the knowledge by which it is to be judged. But, knowing this, it seems strange that a writer should forget that the artistic and mechanical aspects of an architectural work of Greek or of Gothic art cannot be separated, and that to understand either one must understand both.

It should of course be understood that this complaint is not of the Messrs. Audsley's work in particular. It is only the statement of a defect of nearly all contemporary exposition of the subject, which is shared by the new work. Another peculiarity which will probably strike most American architects as a defect is the tendency to treat architecture and architectural history as matters mainly dependent upon archæology and ecclesiology; in the one case becoming a tendency to accept examples of past practice, without analysis, as the sources rather than the illustrations of abiding principles; and in the other to assume that a particular order of rites is necessary to the production of the best architecture. This is a national peculiarity, and nobody who has followed the English architectural writing of the past generation will be at a loss to understand what we mean by it. The excess of this tendency goes far to spoil Mr. Freeman's "History of Architecture," which, indeed, he himself has in one of his later writings described as "colored by a view of things of which I have long since taken leave." Mr. Ruskin has been equally affected by a different phase of the same complaint, which, indeed, has left its mark upon the technical as well as the literary labors of the Gothic revival in England, and weakens not only the scholarship and accomplishment of the works of Sir Gilbert Scott, but the vigorous and original talents of Mr. Burges.

These conventional or national limitations, which we have thought it right to point out in the work of Messrs. Audsley, and which more or less pervade every English work on architecture, only show that there is still room for an English work more comprehensive than this. Greater fidelity and care in execution, as we have said, can scarcely be looked for; and the work is practical, instructive and useful, both to practitioners and to students.

## THE ILLUSTRATIONS.

THE MUSEUM OF FINE ARTS, ST. LOUIS, MO. MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

COTTAGE FOR DR. D. W. CHEEVER, COHASSET, MASS. MESSRS. KIRBY & LEWIS, ARCHITECTS, BOSTON, MASS.

TOMBSTONE IN THE CEMETERY PERE LA CHAISE, PARIS, FRANCE. M. BOUSSARD, ARCHITECT.

THIS plate is copied from the *Moniteur des Architectes.*

FIREPLACE FOR J. CLAYTON, ESQ., PHILADELPHIA, PA. MR. C. M. BURNS, JR., ARCHITECT, PHILADELPHIA, PA.

## LEGAL NOTES AND CASES.

*Tree reserved on the Sale of Real Property. — Revocable License.*

IN a sale of real estate a tree was reserved verbally, and the right was granted to the vendor, verbally, to enter upon the land and remove the tree. This right was granted after the deed had been made and delivered. It was decided that this consent was a license which could be revoked at any time. *Armstrong vs. Lawson*, Supreme Court of Indiana, May 23, 1881. H. E.

*Contracts with Public Officers. — Personal Liability.*

When a public officer makes a contract in his official character, he cannot be held responsible thereon personally, and if he had no authority to make the contract, he is not bound as an agent who makes a contract in the name of his principal, without authority, is bound. The person contracting with him must be held to know the extent of his legal authority, and if he enters into an agreement which he knows is not binding on the community the official represents, then he cannot hold the officer personally liable. "It has frequently been decided in this State (Indiana) and other States, that when a public officer makes a contract beyond his authority, the party contracting with him cannot hold the officer responsible as an agent acting without authority." *Huthsing vs. Bousquet*, United States Circuit Court, D. of Iowa, May, 1881. H. E.

*Chattel Mortgage. — Permission to sell Goods in Course of Trade.*

The power given in a chattel mortgage to the mortgagor to sell the goods mortgaged in the regular course of trade does not, in Massachusetts, make the mortgage void; it is, at the most, only evidence of a fraudulent purpose to be submitted to the jury. *Fletcher vs. Powers*, Supreme Court of Massachusetts, June, 1881. H. E.

*Attorney and Client. — Charges for Legal Services.*

The value of the services of a lawyer are to be determined by the learning and ability of the counsel, the means of the client, the magnitude of the interest involved, the hazards of the litigation, and the final result, and a reasonable sum must be allowed therefor. *Halaska vs. Cotzhausen*, Supreme Court of Wisconsin, June 4, 1881. H. E.

*Appropriation of Payments. — Existing Controversy.*

A creditor cannot, at his discretion, appropriate payments made by his debtor after a controversy has arisen concerning such payments. Payments made during the controversy will be applied according to the recognized rules of law governing the application of unappropriated payments. *Applegate vs. Koons*, Supreme Court of Indiana, June 23, 1881. H. E.

*Master and Servant. — Liability for Trespass of Servant. — Purpose of Employment.*

An employee was engaged in hauling supplies for his employer and broke the wagon, and to enable him to go on, he took the part he needed from the wagon of another person, and did not return it. An action was brought against the employer for the value of the whole wagon, and the court decided (1) that where a servant, in doing his master's business, commits a trespass upon the property of another without express authority from the master, if the act of the servant was intended to accomplish the purpose of his employment, and was intended for that purpose, however ill-advised or improper, then it was implied in the employment, and the master is liable. (2) If taking a part wholly destroyed the value of the wagon, so that the part not taken was of no value whatever for any purpose, the taking was equivalent to a conversion of the whole; and, in that case, the value of the whole, with interest from the time of the conversion, would ordinarily be the proper measure of damages. But if the part not taken was of any value after the severance, though of no value for the use for which it was intended, to wit, as a wagon, the owner was not deprived of the entire value. His damages should be to the extent only of the actual injury; that is, to the value so far as he was deprived of it. This could be shown by proof of what it would cost to replace the part taken, or by proof of value of the wagon entire, and of the remainder in the place and situation in which it was left. *Walker vs. Johnson*, Supreme Court of Minnesota, July 18, 1881. H. E.

## THE TIMBER RESOURCES OF TENNESSEE.

MR. JAMES R. GILMORE ("Edmund Kirke") has addressed the following letter to the Cincinnati *Commercial:* —

KNOXVILLE, TENN.

The attention of business men at the North and West is now strongly directed towards the South-West as a field for extending their operations in the various branches of manufacturing industry, and hence we may be, in some sort, doing a public service by putting in print the information we have been able to gather in regard to the timber resources of Tennessee. Our remarks will refer principally to the eastern counties, that being the section which has come most closely under our personal observation, but they will apply, generally, to the other timbered regions of the State, and, indeed, to all parts of the South-West that are favored with the fertile soil and genial climate of East Tennessee.

The total area of Tennessee is 26,880,000 acres, of which, it is stated by the United States Commissioner of Agriculture, 10,771,396 acres are still covered by the original forest. If this statement be correct, — and it is, no doubt, approximately true, — it will be seen that the forest acreage of Tennessee equals the combined timber acreage of Maine, Minnesota, Wisconsin and Michigan, and is more than double that of West Virginia. The larger portion of this immense body of timber is to be found in East Tennessee, where in some counties eighty per cent of the surface is still covered by the original growths, and if it is added that the larger part of this timber is of the more valuable kinds, — oak, ash, poplar, cherry, hickory and black walnut, — of immense size and superior quality, it will be seen what a rich field of unploughed wealth this section presents to those gloomy prophets who are predicting that in eight, or at most ten, years, there will not be enough wood left in all Michigan, Minnesota and Wisconsin to kindle a small bonfire.

Nearly every variety of timber grown in the United States is found in Tennessee. This is owing to its great diversity of surface, which gives the State as great a diversity of climate. The difference of temperature at different altitudes is fully fifteen degrees, and the soil is of an equally diversified character. Hence, at different elevations in the same locality are found the white pine (*pinus strobus*) of Michigan, the black walnut (*juglans nigra*) of Indiana, and the white oak (*quercus alba*) of tide-water Virginia. The magnificence of these forests in some parts of East Tennessee is unsurpassed anywhere in the United States. They revel, as it were, in the exuberant fertility of the soil, and attain a size that is exceeded only by the giant trees of California. Oaks are reported in some sections 7 and 8 feet in diameter, and poplar (tulip or whitewood) as large as 10 feet, and we have ourselves felled (by proxy) one of the larger trees, that was 120 feet high, and 23 feet and 7 inches in circumference at the butt. From it were cut 6 twelve-foot saw-logs that measured an aggregate of 11,120 feet, by Doyle's rule. Before, however, indulging in any further general remarks, we may as well glance somewhat in detail at the various kinds of wood which are most common in East Tennessee.

### WHITE ASH

Is one of the most abundant growths. This tree here matures rapidly, and in favorable situations — the coves on the north sides of mountains, and the rich loams of the river-bottoms — attains a height of 70 to 80 feet, and a diameter at the butt of from 3 to 4 feet. It is generally destitute of limbs for about half its height, and three, and sometimes four, saw-logs are taken from the trunk. The great value of this tree is generally known. It is stated that a Mr. Budd, of Iowa, planted on 10 acres a grove of young ash, containing 12,000 trees standing 6 feet apart. At twelve years of age they had grown to a diameter of 8 inches and a height of 35 feet. The previous thinnings had paid all the expenses of planting and cultivating, and he then cut and sold the trees for a total of $6,000. Ten feet of the bodies brought, for bent stuff, agricultural implements, etc., forty cents each, and the remainder of the tree an equal amount; so that he realized from his 10 acres during twelve years a yearly profit of $50 per acre. If he had operated in East Tennessee, Mr. Budd might have bought 10 acres of these trees of every size, from the young sapling to the mature tree, and tended by nature itself, for $50, and not had to wait twelve years to realize his profit.

WHITE OAK.

Of the hundred and more species of oak that grow in the United States, at least fifteen are found in East Tennessee. Of these the white oak is by far the most abundant and valuable. It forms fully one-third, some say one-half, of all the forests of this region, and often attains a height of 100 feet, and a diameter of 4 and 5 feet. On the French Broad, and in Campbell and Anderson Counties, it is found in great numbers and magnificent proportions. The timber is strong, compact, durable, elastic, free from worms, and generally of a better quality than that growing farther north. There is no assignable limit to the amount of business that might here be done in this timber. If every saw-mill in Michigan were moved into Tennessee, and set to sawing a thousand million feet a year, it would be at least fifty years before the present growth of this one species of timber would be exhausted; and by that time there would be another crop of these kingly trees to keep the saws a-whirling for another half-century.

We have space to merely mention the other varieties of oak that, mixed with the white oak, grow here in great profusion and to extraordinary dimensions. These are the post, burr, chestnut-oak, swamp, white, willow-oak, shingle, black-jack, Spanish, scarlet, black, and pin, besides some varieties of smaller size and less importance.

THE SUGAR-MAPLE.

In favorable situations this tree grows here to a height of 60 and 70 feet, with a girth at the trunk of from 6 to 12 feet. The bird's-eye variety is very common, and exquisitely beautiful. Highly polished, it takes a silky lustre, and its dark spots and curly undulations produce somewhat the effect of light and shade in a landscape. In the mountain counties it forms a large proportion of the timber, and there the "native" vandals cut it into fire-wood; but sawed into veneers, or exported as saw-logs, it would soon pay the entire debt of Tennessee. Nothing has yet been done here towards getting the finer varieties to market.

THE WILD CHERRY.

This wood, which in the Eastern States is of stunted growth, here attains a height of 40 and 50 feet before dividing into limbs, and well-nigh rivals the oak in leafy magnificence. It is, however, not very abundant, except in certain localities, and is generally, so far as we have seen, not equal in quality to the Michigan wood. It is paler and more liable to sap-streaks, but answers very well for ebonizing.

CEDAR (*Juniperus Virginiana*).

This tree, which is scarcely more than a sapling at the North, grows in Middle Tennessee to a height of from 60 to 90 feet, and a diameter of from 2 to 4 feet, and the wood is of a superior quality. It is light, fine-grained, compact, and used in posts and shingles has been known to outlast a century. The heart has a rich red color, and a peculiarly strong odor, which renders it obnoxious to moths. Chests made from it are proof against their ravages.

THE POPLAR (*Lirodendron tulipiera*).

This tree, called at the North the tulip and whitewood, is by far the finest and most stately of any that is found in the Tennessee forests. It often attains a height of 120 and 140 feet, with a diameter of 6, 7, and 8 feet, and a straight shaft of 80 feet before it breaks into branches. Ten thousand feet of good lumber are frequently cut from a single tree. It has a fine, compact grain, polishes well, and is wrought easily. While the West Virginia wood is largely "white" and "bastard," that which grows south of the mountains dividing that State from East Tennessee is almost altogether "yellow," or more properly, a canary color.

"Stranger," said one of the natives to us, as he watched a gang of our workmen fell one of these giant trees, "I know what yer a-goin' to do with this yere timber. Yer a-goin' to ship it up North, and send it back to us green 'uns in canary-birds; and I'm durned if it won't pass for them on sight; but we'll diskiver the trick when they try to sing. I'll be dogoned if you can make 'em sing, if ye *is* a Yankee; and I reckon a Yankee kin do about anything — that is, anything that aint agin reason."

In most sections this wood is used as a substitute for pine. It is made into joists, studding, rafters, weather-boarding and shingles, and in fact is applied to about every use that white pine is put to at the North. But while more durable than that wood, it is liable to swell and shrink with the alternations of the weather, and hence is better adapted for out-door service in a climate like this, where the summer heat seldom exceeds 85° Fahrenheit, or the winter cold 15° above zero, than to one where the temperature ranges from that of a boiling pot down to 20° below freezing to death. It is this wood which will come into universal in-door use when the Michigan forests are exhausted, and if Northern builders were wise, they would not wait that much-croaked-about event. They would begin its use to-day; for, besides being better for in-door purposes, it is cheaper than pine. First quality Michigan uppers sells now in Northern markets for from $55 to $60 per thousand, while No. 1 poplar, absolutely clear, and almost as handsome as satin-wood, can be bought for $32. Moreover, a Michigan pine will, at the utmost, yield not more than 15 per cent of uppers, while a Tennessee poplar will produce 60, and often 80, per cent of wood that is totally free from sap, knots, or other defects, and from 20 to 30 inches in width. And yet millions of acres of this magnificent timber, standing from 10,000 to 20,000 feet upon an acre, and located directly on the line of railroads that carry lumber to New York as low as is carried from Chicago, can now be bought for from $5 to $6 per acre. In fact, we know of a tract of 50,000 acres — of which 2,000, taken at random, have been measured by a Michigan expert, and found to contain 13,000,000 feet of pine and an equal quantity of poplar, besides large quantities of ash and oak — that is offered for sale now at $2 per acre. It lies along the two sides of a through railroad, which takes freight at twenty-two cents per hundred to Norfolk, Va., and thirty cents (Chicago rates) to New York. In it is a fortune to some enterprising lumberman who knows how to develop it. We have not a dollar of interest in the property, but mention it to answer some of the many inquiries that have recently come to us.

BLACK WALNUT.

There is probably twice as much of this timber still standing in this State as can now be found in Ohio and Indiana, but it is fast disappearing before the active demand which stimulates the axe of the wood-cutter. It does not grow in large bodies, like the oak and poplar, but is diffused pretty generally over all the rich soils of the State, and seldom yields more than one or two trees to an acre. Sometimes, however, small groves of it are found in fertile coves, or on the upper benches of the mountains, but in such localities it is generally difficult of access, and costs about as much to get out as it will bring when hewn for market and loaded on a railway. Though it commands a high price, it is a mistake to suppose there is a fortune in this timber. The cutting of oak, and ash, and poplar, which grow in dense forests and within easy reach of localities where a passable Christian may safely make his habitation, is, in the long run, far more profitable.

We might fill our space with a bare catalogue of the trees of Tennessee, for to it has been given "every green herb bearing seed that grows upon the face of the earth," consumed in firewood or built in rail fences. Many of its choicest woods are now going to waste, nor will this waste end till the Michigan missionary comes among its "native" vandals with an axe in his hands and a portable saw-mill slung over his shoulder. But, before we close, it seems necessary to allude to the white and yellow pine of this section.

THE WHITE PINE (*Pinus strobus*).

It is the universal impression that no white pine grows in this State, but that only shows the almost universal ignorance prevailing in regard to this region. At altitudes 2,000 feet or more above the sea it grows here in great abundance, often attaining a height of 120 feet, and standing from 12,000 to 18,000 feet upon an acre. The wood is not so light nor fine grained as the cork pines of Michigan, but it is fully equal in size and quality to the white pine of the Susquehanna region of Pennsylvania. It is, in fact, the same tree as this last, for, though growing farther south, it has its home upon a similar soil, and, owing to a higher altitude, in a similar northern climate. It is not generally diffused, but confined to the colder parts of the State — the Cumberland plateau and the high ridges of the Unaka and Allegheny Mountains. Here, intermixed with the ash, oak, and poplar, it grows of sufficient height to produce four and often sixteen foot logs to a tree. The knots are smaller than those of the Michigan timber, the sap generally thin, and, as far as has been tested by sawing, it has yielded from ten to fifteen per cent uppers. The quantity of this timber that is standing here, it is difficult to estimate, for the professional "land-looker" is, as yet, a *rara avis* in Tennessee. However, a native once assured us that a Tennesseean could *guess* about as near as a Michigan Yankee could *measure*, and hence we may venture the opinion that there is about as much of this timber now standing in this section as is left in all Michigan.

THE YELLOW PINE

Of Tennessee is an inferior wood to the yellow pine of the States farther south. It grows almost exclusively on the ridges and mountains, and on poor sandstone soils that will produce scarcely any other vegetation. Generally, it attains a height of 60 or 70 feet, and a diameter of 2 to 4 feet. It is the pauper of the forest, and the man whose wealth is invested in it might as well speak at once for apartments in some well-conducted poor-house.

PRICES OF LAND.

Land well located and bearing an acreage of 10,000 to 15,000 feet of such timber as we have described can now be bought in Tennessee for $4 to $6 per acre, and accessible standing timber for a stumpage of from $1.50 to $2 per thousand feet. This is for lands with good titles. Lands with an uncertain pedigree, the lumberman had better avoid, unless he is anxious to wade knee deep in litigation. And to steer clear of imperfect titles he must consult some good Tennessee lawyer. County-clerk abstracts, though weighed down with sealed certificates, are often not worth the paper they are written on; in fact they are often gotten up solely to deceive the unwary.

In the brief space allotted us we have been able to merely glance at this subject. In a future paper we may have something to say about the localities in which to look for timber, and the best course for a Northern man to pursue in undertaking logging or sawing in this mostly new and unexplored region. Lumbering at the South-West, the Northern man generally learns in that school which is said to be the only one in which fools will learn — experience. It was thus we got our timber education, and having a fellow-feeling for every Northern man who is tempted to sharpen his axe upon the magnificent south-western forests, we will cheerfully give him any "aid and comfort" in our power, by answering all questions that may be put to us, when we can answer them, and when we cannot, by referring him to reliable persons who will give him trustworthy information.

## A NEW FORM OF CAST-IRON GIRDER.

SOME interesting experiments, reported in the *Mining and Scientific Press*, were conducted the other day at the Pacific Rolling Mills, San Francisco, with a new form of cast-iron girder, the invention of P. H. Jackson, late Chief of the Bureau of Iron Construction, Department of Buildings, in New York. The experiment was really one on a mode of using cast-iron when subject to transverse strain, borne by these girders, the end opposite to the train is prevented from rising by the abutting parts on the bottom of the arch. There is no part of the arch in which tensile strength is employed. . . .

The inventor has endeavored to make a continuous arch embodying the principle of the voussoir arch. Mr. Jackson's is a sectional, continuous arch employed compressively over its entire cross section.

A voussoir arch is composed of many blocks to make up its length, and without the use of cement or mortar between the blocks. With the exception of friction of the blocks as they slide downward, taking a more compressed position as the load upon them is increased or the abutments yield, there is no tensile strain whatever upon them, and the calculation has only to be made as to the strength of the material in its compressive resistance. With a continuous segmental arch, made in one piece, there is, at every point, a bending moment and a thrust force; therefore, a continuous arch brings into play both compression and extension like a straight girder, but with more of compression than extension. (See page 9 of W. Airy's book on iron arches.) . . .

Fig. A is an elevation of the girder experimented on: length, 25 feet; distance between supports, 23 feet 2 inches; height, from bottom of tie to under side of arch, 2 feet 3 inches. The cross section of arch (Fig. B) was 16 inches wide by $1\frac{1}{8}$ inches thick at bottom, and the greatest height 10 inches. Two wrought-iron tie-rods, of $2\frac{1}{2}$ inches diameter, sustained the tensile strain. Fig. C shows the knuckle-joint, the round cast on the centre piece, and the socket cast on the end pieces, and with the strut cast on the same piece, the strut resting on the tie-rods. Fig. D shows end of girder. At the top of the arch will be seen a space of $1\frac{1}{4}$ inches. Whatever may be the deflection, no parts of the arch, excepting the knuckle-joint, touch, so that compression is only exerted on the line of the bottom flange. The cross section of the arch (Fig. B) is of the Hodgkinson form for straight girders, and made to sustain a 16-inch brick wall; consequently, from its broad bearing for the wall, it is largely in excess, in compressive resistance, of the tensile capacity of the rods. The following is the cost of this girder in San Francisco, where materials and labor are higher than in the Eastern cities and in Europe: —

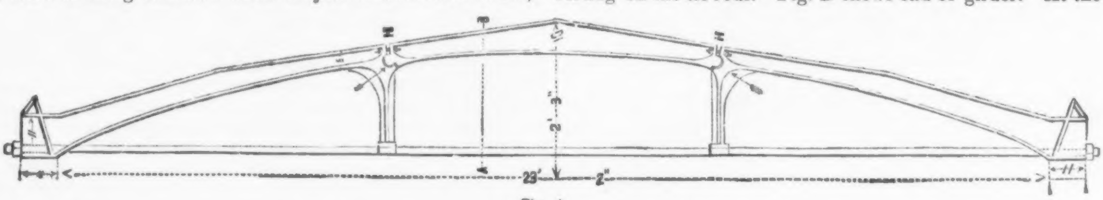


Fig. A.

by which its whole cross section is compressively employed without taxing its comparatively feeble tensile resistance. . . .

When employed the tie-rod is in tension, and the arch is in compression in every part, with no tensile strain whatever; the latter an object not before attained. The antagonistic force of compression to resist the tensile strain of the tie-rod is exerted at the bottom or intrados of the arch, and this force is increased in the ratio of the increment of the load on the arch. The remaining part of the arch above the bottom is naturally in compression due to the load.

It is in effect a device for employing cast-iron compressively, neutralizing the tensile strain due to transverse strain. The tensile strain on the tie-rods is reciprocally utilized in compressive resistance at the intrados of the arch, thus destroying tensile strain in every part of its cross section. Another advantage in construction of a metallic girder made in sections of its length is, that should the tensile strain at the intrados of the arch exceed that of compression by the action of the tie-rods, the deflection of the arch is limited to the length of a single bay. For instance, in a girder 150 feet in length, made in 10 bays, each 15 feet long, the deflection that would injure the strength of the material of the arch is limited to the length of a bay of 15 feet, instead of, as in other constructions, its weakness by deflection extending over its whole length.

The neutral axis of this girder exists between the tie-rod and the bottom or intrados of the arch, or midway between the antagonistic forces. With the segmental arch in one piece and its tie-rod the neutral axis is near the bottom of the arch, and travels upward as the load is increased, as the neutral axis will exist wherever the two opposite forces cease to exist, being indifferent to either force. True economy in the use of cast-iron for long spans when subject to cross strain is in the employment by which its tensile strength is not called into play. A grave objection to the use of cast-iron is created by an unequal distribution of the metal which takes place in a casting while forming from the molten to the solid state, and from that condition until cold. The heavy parts in contracting control the thin or weaker parts, or if the formation of the mould is such that the ends of a long casting set deep in it and offer a resistance to the contraction of the metal when forming from a liquid to a solid state, both of these inherent weaknesses continue and increase until the casting is cold. These weaknesses are due to taxing its comparatively feeble tensile strength, and not in the least injuring it in its compressive resistance; and as long as cast-iron is used compressively, it makes no difference how many pieces it may be in, provided its abutting parts squarely meet and are kept in line. Take, for instance, the area of the abutting parts of the 25-foot girder shown in the engraving, or the cross section of the bottom flange in the centre of a bay, which is 16 inches wide by $1\frac{1}{8}$ inches thick, which equals 18 inches.

Eighteen inches multiplied by 93,000 pounds to the inch equals 1,674,000 pounds, or 746 tons; taking it at one-fourth when employed, we have 186 tons as a safe load. The area of the tie-rods to resist this compression at 8 tons working strain per inch, providing the arch has suitable rise, would be $23\frac{1}{4}$ inches, or more than 3 rods of 3 inches diameter. When a railroad train enters on a bridge

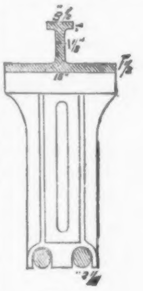


Fig. B.

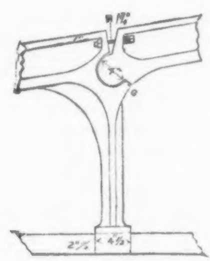


Fig. C.

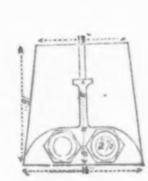


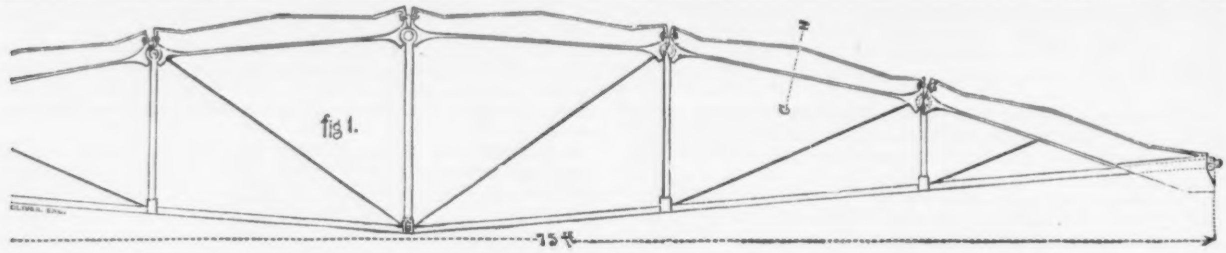
Fig. D.

| | |
|---|---|
| Weight of arch casting, 3,080 pounds, $3\frac{1}{4}$ cents | \$100.10 |
| Weight of tie-rods and nuts, 602 pounds, $4\frac{1}{2}$ cents | 40.59 |
| Fitting 4 bolts and lead | 5.50 |
| Drayage and painting | 3.00 |
| | \$149.19 |

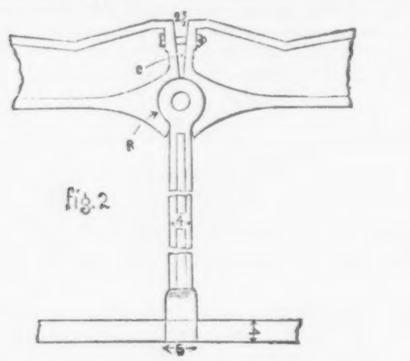
Had this been made to sustain 186 tons as a safe load, the breaking load, three times greater, — the same casting to be used, but to have 3 rods of 3-inch diameter, — it would have cost: —

| | |
|---|---|
| 3,080 pounds casting, as before | \$100.10 |
| 3 three-inch rods, 1,848 pounds, $4\frac{3}{4}$ cents | 87.78 |
| Other expenses | 9.50 |
| | \$197.38 |
| Difference | \$48.19 |

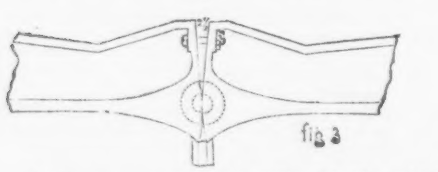
In the experiment at the Pacific Rolling Mills, this girder was loaded with 117 tons and 1,741 pounds of railroad iron, uniformly distributed over the length between the supports. Under this weight it deflected at the joints a quarter of an inch below the true arc. The foundation on which the girder rested settled seven inches, so that loading had to be stopped. It would probably have carried 225 tons, or until the rods broke. At each of the abutting ends a lamina of lead was used to fill in between the castings, which were not nicely fitted, as the strength at this place was so much in excess of requirements. This was to make up for the irregular surfaces, the draught of the pattern making it fuller in the middle in each piece. To make up for the closing-up part of the lead when the compressive force was exerted, as well as to straighten the tie-rods when loaded, the arch was cambered three-quarters of an inch at the joints above

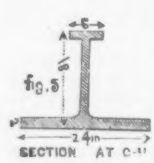



the true arc. The same rule applies to each one of these three sections as to a continuous arch in one piece of its length; that is, they are subject to a bending moment and a thrust force, and both compression and tension are brought into play, as in a straight girder, but less of tension than compression, being in the form of an arch. But it must be borne in mind that the compressive force exerted on each of these three short arches or sections of the long arch, equivalent to three small girders, each 7 feet 9 inches long, is equal to the compressive force of the whole length, 23 feet 3 inches; while the compressive and tensile force transversely exerted is only due to the load on a length of 7 feet 9 inches.








Figs. 1, 2, 3, 4 and 5 are a railroad bridge which may be made 500 feet in length, and of a suitable number of bays. It will be seen that the top of the strut is round and the ends of the arch are socketed to meet the round end of the strut. Provision is made to prevent the girder rising when loaded only on one end with a tendency to rise at the other, as when a railroad train reaches the one end. This is effected by the bottom edges of the casting pressing together. It will be seen that the ends of the arch on outside enclose the strut. Provision against lateral deflection is made for long spans by widening the ends where they abut and enclose the strut.

## PLASTERING.

ST. LOUIS, August 18, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

*Dear Sirs,* — In article VIII. of the series of papers on Building Superintendence published in the *American Architect,* the quantity of materials necessary for one hundred yards of plastering three-coat work is given thus: three casks of lime, three one-horse loads of sand, one and a half bushels of hair and about two thousand laths. The size or weight of the cask of lime is not stated, nor the cubic contents of a regulation "one-horse load." Thus a rule which is doubtless intelligible enough in the locality for which these papers are written becomes ambiguous for places where other measures are in use.

In this city and vicinity, lime is sold by the bushel of ninety pounds, and sand by the two-horse load, which averages one and a quarter cubic yards. A bushel of hair weighs about eight pounds. It comes packed in paper bags of a bushel each. The usual allowance for one hundred square yards of three-coat plastering is ten bushels of lime, two cubic yards of sand, three bushels of hair, fifteen hundred laths, ninety-four pounds of No. 3 nails, and from one-fifth to one-fourth of a barrel of plaster of Paris. The lime now costs thirty cents a bushel, the sand two dollars a load, and the plaster of Paris two dollars and a quarter a barrel.

In a California paper I find a statement of material necessary for one hundred yards of plastering (supposed to be three-coat work) as follows: eight bushels good lime, sixteen bushels clean sand, one bushel of hair.

The St. Louis lime is obtained by calcining the local limestone. The best lime slakes perfectly in a day or two. As a precaution against unslaked lumps, a sieve is sometimes used through which the liquid putty is run to cool. If carefully employed it is an absolute protection. Our sand comes from the sand-bars in the Mississippi River. It is dug by hand from parts exposed during low water, and is also obtained from under water by steam elevating machinery located on barges or steamboats. It is clean and sharp, but sometimes it contains minute black specks, apparently charcoal, which swell in the wall and burst the plaster the same as unslaked bits of lime. For white coating, a very fine white sand is used, a decomposed sandstone quarried on the Pacific Railroad some thirty miles west of the city, and easily pulverized on exposure to the air.

The ordinary wide lath are generally employed and the spaces vary from three-eighths of an inch to one-half inch. With such wide spaces and with a very free, easy-working lime, it appears to be practically impossible to get the scratch coat on the wall or ceiling without a good key behind it. I do not see how a superintendent could look behind the lath and inspect the character of the key as suggested in this paper except in the case of partitions plastered on one side only and open on the other side.

In some of our school-buildings and in some houses of the better class, three coats of plaster are applied on the brick walls as well as on stud partitions, the argument being that the brown coat, which is necessarily almost all sand, has not lime enough for a thoroughly reliable adhesion to the brick walls, especially when the bricklayers in their desire to make clean work have struck all the joints inside the wall as well as outside. Hence the same rich hair mortar which is put on the laths is applied to the brickwork, and scratched in the same way. The practice of furring brick walls, breasts, etc., which obtains in Eastern cities is not in favor in St. Louis.

Some plasterers put hair in the second or brown coat, especially on ceilings, using about one-half the amount of hair required for the scratch coat. The first and second coats are also "gauged," sometimes, by adding a small amount of plaster of Paris.

In very hot weather some experienced plasterers recommend "laid-off" work as better than three-coat work. The "laying off" consists in adding the brown coat as soon as possible after the scratch coat is on, without waiting for the latter to dry. Perhaps this may be explained by the theory that a too rapid drying of the scratch coat produces a shell on the surface which hinders the hardening of the mortar behind it, and that the shell itself lacks tenacity because the mortar has been dried out before the lime could become carbonated to any extent. When the two coats are put on together, the great thickness of mortar on the scratch coat protects it from too rapid drying, while the excess of sand in the brown coat cannot be injured in this way, and the little lime it contains is protected by the sand from drying before it is carbonated.

Very respectfully, C. E. ILLSLEY.

## COLD-AIR SUPPLY.

PITTSBURGH, PA., August 24, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

*Dear Sirs,* — In answer to the inquiry of A. S. in your issue of August 20, would say that I have had no difficulty in getting cold-air supply in the manner he specifies. It is now five years since I tried it, and it has never failed as yet. Of course if A. S. wishes to make a success of his experiment, he must have a definite idea of the end he wishes to accomplish, understand thoroughly the conditions to be met, and build accordingly.

I will not take up your time with further explanation, if A. S. wishes more, he can have my address.

Yours, etc., D. KNOX MILLER.

## MENSURATION.

SEDALIA, MO., August 22, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

*Gentlemen,* — I have been taking your paper through Brown Bros., booksellers at this place, for some two years, and I would like you to do me the favor of telling me which is the best American work on measuring the work of the different building trades.

Yours respectfully, H. W. KERR, *City Engineer.*

[VOGDES'S Architects' and Builders' Pocket Companion and Price-Book is as good as anything we know. — EDS. AMERICAN ARCHITECT.]

## BLACK LETTERING ON PLATE-GLASS A CAUSE OF FRACTURE.

DENVER, COL., June 23, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

*Dear Sirs,* — Allow me through your columns to inquire if paint upon plate-glass is liable to cause breakage. I have several times seen large plates broken across the glass where signs are painted upon a black ground; one such break occurred with me but a few days since. I find no evidence of settlement in the building, can see no reason why this particular plate should break more than others in the same front. I can point to a half dozen cases of the same kind in our city recently. Is it probable that a stripe of black paint across the glass would cause the heat of the sun to break the glass? I can think of no other reason for so many cases of breakage following the line of the paint. Respectfully, EMMET ANTHONY.

We have referred the foregoing letter to the general agent for New England of the Metropolitan Plate-Glass Insurance Co., of New York, who sends us the following reply made to his inquiries: —

NEW YORK CITY, August 23, 1881.

JACOB BEAN, ESQ., 70 Devonshire St., Boston, Mass.: —

*Dear Sir,* — Yours, enclosing letters of Emmet Anthony, of Denver, Col., to the editor *American Architect*, also editor's letter to you, are all before me. After a careful perusal of same, would say that we do not find that ordinary gilt lettering on plate-glass affects it in the least, except with some preparations it eats the enamel off the glass. Glass painted with black paint and exposed to the sun's rays at all is almost certain to crack. It has cost us nearly three hundred dollars in experimenting on this subject, but we do not regret having paid it, as it has taught us to leave risks of this nature severely alone.

There seems to be some chemical in the black paint which draws the sun directly upon the spot painted, thus creating an uneven temperature of the glass, and it is only a question of time how long a plate-glass painted as described will stand without cracking. I herewith return letters sent us, and hope the above will satisfactorily answer the queries therein.

Let me here say to you that you must not write risks of the kind just spoken of. Yours very truly, J. H. TAYLOR, *for Company.*

## NOTES AND CLIPPINGS.

BURIED RUSSIAN MEN-OF-WAR. — The St. Petersburg correspondent of the London *Standard* reports that some interesting discoveries have been made at Revel, where in excavating ground for the new harbor, the hulls of several ships long buried in the earth have been laid bare. Four Russian men-of-war, of considerable dimensions, — 120 to 180 feet long, — have, it is said, been identified. From the inscription, "*Olonets, 1711*," on one of the cannons found, it seems that the ships were wrecked after that date, and the fact is curious, as showing how rapidly the water has receded. In old times the sea evidently came up to the walls of the town, which must then have presented a singularly picturesque appearance, with its quaint, red-tiled houses, perched high on the rock above. At present there is half a mile of dry land between the walls and the harbor, and where great ships rode not very long ago, the locomotive now runs between rows of wharves and merchants' offices.

STEEL IN COILS. — The *Textile Record* says: Some four or five years ago a clerk in the Treasury Department took it into his head to decide that steel imported in the form of coils or coiled rods of the sizes preparatory to wire-drawing was not the "steel in coils" named in the tariff; that such steel in coils meant only the small coils used as clock and watch springs; and therefore that the immense quantity of steel imported in that form, viz., steel in coils, should pay an *ad valorem* duty, equal to about one half cent per pound, instead of two and one-fourth to three cents as prescribed by law. The first effect of this "decision" was to refund a large sum of money to such importers or brokers as had an inkling that steel in coils might at some time be decided to be "steel in any other form," about $40 to $45 per ton being so refunded. The next important effect was to stop the rolling of such steel here, not a ton having so been rolled in the United States for two years. It can be imported, at the trivial duty now charged, about $14 per ton less than it can be made here. And the latest information is "that there are forty wire-mills in operation in Germany, producing monthly 20,000 tons of wire, most of which comes here."

MORE TANAGRA FIGURINES. — The latest excavations made by order of the Athens Archæological Society at Tanagra, the well-known place in Bœotia whence come the charming terra-cotta figures, have yielded important results. On the northern side of the town, in front of the principal gate, fifteen tombs were discovered which were completely untouched. They contained some sixty clay figures, most of them perfect, and measuring between ten and thirty-five centimetres in height. They represent satyrs and women standing and sitting, and one is a group of two figures. Besides these, many vessels were found, amongst which some twenty lekythoi (paint and oil phials) with antique painted ornaments. Unfortunately most of these were broken. One vase which was found in a stone case shows an artistic inscription which designates it as a work of Teisias. It is also stated that fourteen scraping-irons were found, and that in two of the tombs some fifty small terra-cotta ornaments were discovered, most of which were brightly colored, and some covered with thin gold. The excavations became even more important after April 1. The published report mentions twenty vessels, some broken, ten of which are ornamented with paintings. Two of these are said to be particularly fine. Of the numerous clay figures only eight could be got out in a tolerably perfect condition. Of these, two are reported to be the most perfect figures ever found at Tanagra. One represents a winged youth who is about to raise himself into the air; before him is a maiden on her knees, her dress forming an arc above her; the youth holds her by the arms as if he wished to take her along with him in his flight. The other masterpiece is an Aphrodite rising from the sea, diving up out of a shell as it were. — *New York Tribune.*

A CAUTION TO PICTURE-BUYERS. — Americans who buy paintings in Paris will always do well to remember that there is a regular society of merchants there who deal in what are called "crusts" in the trade, — that is, worthless daubs which are artfully made up to resemble the masterpieces of some dead and gone celebrity, and which are mercilessly palmed off on the unwary as occasion offers. The sneaking meanness of one of these lying merchants has just been shown up in the French capital in a somewhat peculiar manner before the Court of Appeals. Some time ago a picture-dealer named Chazaud found out that a certain lady named Gigault was in a position to "place" valuable paintings in good society; so he confided to her care, with many injunctions as to secrecy, three pictures said to be from the master-hand of Watteau. One of them was called Le Camp Volant, a second a Retour de Campagne, and a third a portrait of Monsieur de la Jullienne. These were supposed to be worth untold sums of money, but in the goodness of his heart M. Chazaud was willing to let the portrait go at 500,000 francs, and the two others for 200,000 francs. It happened that about the same time M. Chazaud had sold to a French nobleman some other paintings, the price of which amounted to 200,000 francs, and that a compassionate friend told the nobleman that he had been gulled, and that what he had purchased would be dear at 2,000. This naturally made the gentleman of noble family excessively angry, and he sued M. Chazaud for the restoration of the sum which he had paid on account, and to make him take his "crusts" back. He also found out that Madame Gigault had the so-called Watteaus in her possession, and in order to bother M. Chazaud he obtained a ministerial order forbidding her to allow them to go out of her hands. Upon this M. Chazaud prosecuted Madame Gigault for not yielding up his pictures, and much to her astonishment she one day found herself sentenced to six months' imprisonment and 10,000 francs damages for abuse of confidence. Of course she appealed, and when the matter came before the Court of Appeals the friends of the French nobleman came forward with expert testimony to prove that the pictures which Chazaud sold were worth next to nothing at all. The Watteaus, which Madame Gigault had been requested to place for the trifling sum of 500,000 francs, amounted to a value of less than 3,000. This brought matters to a crisis. Chazaud was thoroughly shown up; the woman Gigault was acquitted by the Court of Appeals, and the nobleman got back his money. But nothing is said about the punishment of Chazaud, who is presumably at large to gull fresh victims, and who doubtless carefully reads the lists of American arrivals in Paris. — *Boston Journal.*

UNDERGROUND TELEGRAPH-WIRES. — The United States Underground-Telegraph Company has just finished laying a line of six wires one-third of a mile in length, from the building of the Fire Department, in Mercer Street, to the Police Headquarters in Mulberry Street. A. T. Woodward is the inventor and patentee of the system used. It is done by placing a box, six and a half inches wide and three and a quarter inches deep, two feet below the service of the street. In the bottom of this box an insulating compound is poured. This is made of silica, resin, paraffine and linseed oil. These substances are chosen because of their cheapness, durability and flexibility. The wires are then placed in position and the mixture poured over them. In Mercer Street there are seventy-two wires in the box, but at various corners several are taken out and attached to the regular telegraph-wires above ground. Six wires run between the two buildings, and will be thoroughly tested. The advantages of this underground system, as stated by Mr. Woodward are: positive communications at all times; reducing the cost of maintenance, repair and reconstruction to less than one per cent a year. The existing telegraph system costs eight dollars a mile each year for repairs, while the new system has been in operation in Brooklyn a year and has not cost anything. The expense of operating wires encased in this compound is reduced seventy-five per cent, as there is no loss of power from escape through leaks, to which wires above ground are subjected. There will be entire freedom from loss of power in foggy or rainy weather. It will also be valuable on railways where the clock signal is used. As it is underground and not subjected to the severe winds, it will always be in working order, whatever the condition of the weather may be. This system is adapted to the following uses: telegraph, telephone, fire and burglar alarms, electric light, and for the transmission of electric power. A solid rod from a quarter of an inch to an inch in diameter can be easily and perfectly insulated. A bill recently passed at Albany compels all owners of telegraph lines to place them under ground before January 1, 1883. — *The Fireman's Journal.*

THE AIX-LA-CHAPELLE CATHEDRAL. — Since the completion of Cologne Cathedral the band of German architects who accomplished that great work have naturally been looking out for some other undertaking of similar character. German ardor likewise seems more willing to expend itself in great works of restoration and completion than original achievement. The restoration of Strasburg Minster was long considered, but finally it has been decided that Aix-la-Chapelle shall be the next great national undertaking. This beautiful basilica dates back to the time of Charlemagne, and is far richer than Cologne in archæological interest and historical associations. Indeed, no other building in Germany can claim such a momentous past as that which contains the tomb of the first German emperor. It is, of course, a national duty that such a building should be preserved as far as possible, but it is doubtful whether posterity will thank the present age for its completions and reconstructions. One of the main proposals at Aix-la-Chapelle is to rebuild the tower of the eastern façade, which was burned down two centuries ago. This is to be rebuilt according to the original design; but it is not stated how, in the nineteenth century, the faith and aspirations are to be reconstructed out of which such buildings grew, as it were, spontaneously, in mediæval times. Now, at best, all that can be attained is a forced imitative construction, not a free growth; and, this being the case, it might be wiser for the present age to express its own thoughts and science, rather than attempt to turn back to the designs of an age of faith, when the faith necessary for carrying them out has long been dead. — *The Academy.*

## BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

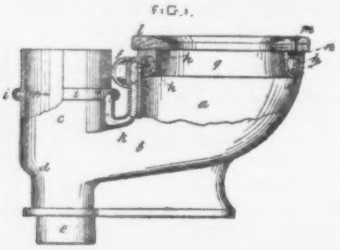
[*Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.*]

## BUILDING PATENTS.

[*Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.*]

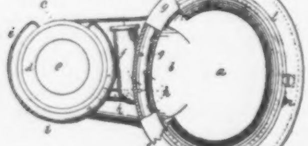
243,719. WATER-CLOSET. — Andrew G. Myers, New York, N. Y. This improvement aims to produce a more effective scouring-wash from the flushing-rim, and also to provide the upright limb which contains the valve that controls the discharge from the basin to the underlying trap with a similar scouring-wash, whenever the closet is operated. It also partly consists in the construction of the seat relatively to the basin. In the figures only the basin and valve-chamber are represented, the trap onto which these are set not being shown. The basin *a* has a wide inclined neck, *b*, at its base, which opens into the upright limb or valve-chamber *c*, above a contraction or shoulder, *d*, therein, while the contracted neck *e* at the base of the valve-chamber connects with the trap in the usual manner. The discharge valve or plunger, which is inclosed in the limb *c*, but is not shown, seats on the shoulder *d*, and thus closes communication with the trap, so as to retain the body of water which enters the closet to the regular depth, and when the valve is raised this water is allowed to suddenly descend into

FIG. 1.



the trap, and thus cleanse the closet in the usual way. The water-pipe connects to the nozzle *f*, which opens into the hollow flushing-rim *g*, in about the usual manner. When the discharge-valve is raised the water-valve is simultaneously opened and a stream of water enters the flushing-rim and escapes in an annular sheet down the sides of the basin. It is desirable, however, that this stream should issue from the rim against the sides of the basin with the greatest possible energy, so as to effectually remove all adhering deposits and render the bas'n thoroughly clean at each action. Heretofore this has not been effected to a desirable extent, for the flushing-rims have been constructed with a uniform or smooth interior, which allows the water to escape into the basin in a too smooth and uninterrupted manner. According to this improvement, the interior of the flushing-rim is made so as to present a number of projections, *h h*, to the passage of the cen-

FIG. 2.



trifugal stream which sweeps around the rim, so that this stream becomes partly intercepted or broken up at several points, and strong jets are directed or deflected downward at various points around the basin, so that the stream issuing from the rim becomes interrupted at various points around the basin, and variable in force and volume, in such a way as to produce a very energetic stream down and around the sides of the basin, which produces an effective scouring action. These projections *h h* extend in two opposing series, as shown, one series from the side of the basin directed inward, and the other series from the flushing-rim directed outward, as seen in Fig. 1; and as shown in Fig. 2 the projections in the two series preferably alternate with each other around the rim. Another feature of the invention consists in means for causing a scouring-wash down the sides of the upright valve-chamber and against the inclosed valve simultaneously with the wash in the basin. This is effected by forming the limb *c* with an encircling or partly-encircling water-channel *i* around its upper part, which opens through the walls of the limb by a number of perforations as seen in Figs. 1 and 2, and a water-duct, *k*, connects it with the water inlet *f* of the basin, so that when the water is discharged into the basin, a simultaneous discharge occurs in the valve-chamber *c*, partly in the form of an annular scouring stream down the sides of the chamber, and partly in jets across the chamber, which strike the inclosed valve, thus effectively washing those parts and preventing the lodgment of offensive deposits. The entire closet, with its water-ducts and flushing-rims on basin and valve-chamber, is made in one continuous structure of earthenware, whereby all joints and breaks are obviated. The remaining feature of the invention relates to the seat. In many cases it is desirable to have the seat fixed directly to


# AN EXHIBITION

— OF —

# Architectural Drawings

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**IN BOSTON,**

**During September and October, 1881.**

## ARCHITECTS IN EVERY PART OF THE COUNTRY

**Are invited to contribute Designs to this Exhibition, and to forward their Contributions as soon as possible.**

Drawings may be sent by mail, by express, prepaid, or by freight at reduced rates arranged by the officers of the association, to T. M. CLARK, 178 Devonshire Street; HENRY A. TURNER, 31 West Street; JOHN S. DAMRELL, City-Hall, or to the *American Architect*, 211 Tremont Street, Boston, Mass.




the basin and of a size just sufficient to encircle the same, and thus dispense with a riser and inclosing-case, ordinarily used to support the seat and inclose the closet. This is desirable for hospitals and public places where it is preferable to have the closet exposed, so that the attendant may always know its condition, and also afford as little chance as possible for the accumulation or concealment of infectious or offensive matter. For hospital purposes such seats are usually made of earthenware or glazed iron, in the form of a narrow oval rim to just fit over the rim of the basin, and to lift on or off, as required; but these are unpleasant to the body, on account of their coldness, and are injurious to some patients. Besides, if in case of infection their destruction should become necessary, their expense would be appreciable. Now, in this case, the seat is of wood, as shown at *l* in Figs. 1 and 2, which rests directly upon the rim of the basin, and is secured to it by screws *m*, screwed into leaden plugs, *n*, which are run into dovetailed cavities in the rim.

245,943. LATHE-DOG. — John Doyle, Hoboken, N. J.

245,944. CURTAIN-FIXTURE. — Lars Erikson, Chicago, Ill.

245,946. DAMPER-PLATE AND REFLECTOR. — Adam Good, San Francisco, Cal.

245,969. KNOB-ROSE. — John B. Montague and James T. Booker, Franklin, Ky.

245,983. STONE-PICK. — Thomas L. Thomas, Beaver Falls, Pa.

245,988. WOOD-BORING MACHINE. — Alfred Williams, Moline, Ill.

245,989. PUMP. — William H. Young, Kenton, O.

245,992. FASTENING WIRE LATHING TO IRON FRAMES OF BUILDINGS. — Robert T. Brown, Boston, Mass.

246,009. AUTOMATIC FIRE-EXTINGUISHER. — Ozro C. Heath, Providence, R. I.

246,013. AIR-COOLING APPARATUS. — Ralph S. Jennings, Baltimore, Md.

246,045. DRAUGHTSMAN'S TRIANGLE AND PROTRACTOR. — Levi W. Stockwell, Cleveland, O.

246,048. APPARATUS FOR WITHDRAWING OR FORCING AIR FOR VENTILATING AND OTHER PURPOSES. — William Verity and Benjamin Verity, Stanhope Street, Euston Road, County of Middlesex, England.

246,073. AIR-COOLING MACHINE. — John P. and Oliver G. Burnham, Chicago, Ill.

246,092. BELL-JOINT FOR COUPLING PIPES. — Henry G. Dennis, New Bedford, Mass.

246,093. — OIL-CAN TIP. — Nicholas B. Dennys, Singapore, Straits Settlements, British India.

246,116. TILE-MACHINE. — Frank Frary, Fort Wayne, Ind.

246,129. CLOSET-SEAT. — John P. Hannan, Pittsburgh, Pa.

246,145. LOCK AND LATCH. — Francis Keil, New York, N. Y.

246,149. — VENTILATOR. — August Kind, Berlin, Germany.

246,152. HANGING SLIDING DOORS. — Benjamin Knopp, Bloomville, O.

246,153. WINDOW-SCREEN. — John Koch, Brookline, Mass.

246,186. SHUTTER-WORKER. — Fred H. Moore, Holbrook, Mass.

246,193. SEWER-TRAP. — James F. O'Grady, Chicago, Ill.

246,199. BLASTING ROCK, ETC. — Jesse W. Reid, Holland's Store, S. C.

246,231. APPARATUS FOR THAWING FROZEN PIPES. — Edward Spencer, St. Louis, Mo.

246,232. SHEET-METAL TUBE. — William G. Spencer, Boston, Mass.

246,233. RATCHET BIT-BRACE. — Nelson Spofford, Haverhill, Mass.

246,266. WINDOW-SASH. — Herman Wocher, Philadelphia, Pa.

BUILDING INTELLIGENCE.

246,269. SASH-FASTENER. — Jacob B. Yeagley, Indianapolis, Ind.

9,844. (*Reissue*). SASH-CORD FASTENER. — Frederick Egge, Bridgeport, Conn.

## SUMMARY OF THE WEEK.

### Baltimore.

BUILDING PERMITS. — Since the last report eighteen permits have been granted, of which the more prominent are as follows: —

J. R. Nice, three-st'y dwell., Harlem Ave., w of Garden St.

J. S. Tucker, 2 three-st'y dwells., Harlem Ave., w of Stricker St.

Baltimore & Ohio Railroad Co., four-st'y brick warehouse, Thames St., near cor. of Philpot St.

C. F. Rechter, 5 three-st'y brick buildings, n e cor. Schroeder and George Sts.

C. F. Rechter, six dwells., Calhoun St., commencing at the s w cor. of Tennant St.

Reinhardt Schneek, brick building, 63 Leadenhall St.

Dr. Thee Cook, five brick dwells., on the north side of Randall St.

Dr. Thee Cook, eight brick dwells., commencing at the n w cor. of Randall and Patapsco Sts.

CHURCH. — Mr. Frank E. Davis is preparing drawings for a church building, M. E. (colored) denomination, to be erected on Orchard St.

HOSPITAL. — Mr. Jackson C. Gott is preparing drawings for quarantine buildings, consisting of a hospital, 64' x 113', and the necessary out-buildings, to be located on the Baltimore Marine Hospital Grounds, at Curtis Creek.

### Boston.

BUILDING PERMITS. — *Wood.* — *Boston St.*, near Pond St., for Sidney Chase, stable, 36' x 46', two-st'y and mansard.

*Enfield St.*, near Hazel St., for Warren P. Stokes, stable, 20' x 16'; Warren P. Stokes, builder.

*Howard St.*, near Hartford St., for Wm. S. Ewell, greenhouse, 20' x 86'; Wm. S. Ewell, builder.

*Lamartine St.*, near Boylston St., for Francis J. Morse, dwell. and store, 23' x 32', two-st'y; Joseph Hammerle, builder.

HOUSES. — Mr. Carl Fehmer is the architect of two houses for Geo. B. Upton, measuring 24' x 64' and 27' x 64'. They are brick and stone fronts, four stories high; B. F. Dewing, mason; Morton & Chesley, carpenters.

### Brooklyn.

BUILDING PERMITS. — *Albany Ave.*, from Dean St. to Pacific St., 11 two and three st'y stone dwells.; owner, E. Conlon, 936 Pacific St.

*Bremen St.*, e s, 241' s Prospect St., three-st'y brick dwell.; cost, $3,500; owner, C. Ritchie, No. 205 East Seventy-sixth St., New York; architect, E. T. Hatch.

*Lynch St.*, s s, about 350' e Marcy Ave., two-st'y brick stable; cost, $12,000; owner, J. H. Shultz, Lee Ave., cor. Hewes St.; architect, W. H. Gaylor; builder, J. Rodwall.

*Hopkins St.*, n s, 300' e Throop Ave., 2 three-st'y frame tenements; cost, each $3,200; owner, George Loeffler, 82 Tompkins Ave.

*Park Pl.*, s s, 360' w Vanderbilt Ave., 2 four-st'y stone dwells.; cost, each, $7,500; owner and builder, John V. Porter, 146 Park Pl.

*Greene Ave.*, 375' e Grand Ave., one-st'y brick stable; owner, R. R. Bennett, 79 Madison St.

*Greenpoint Ave.*, *No.* 37, n e cor. West St., three-

(*Continued on next page.*)