THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. IX. Copyright, 1881, JAMES R. OSGOOD & CO. No. 262.

JANUARY 1, 1881.

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

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THE case of Phelps *vs.* Tolman, details of which were given in the *American Architect* for July 5, 1879, has been decided in the United States Circuit Court at Washington, in favor of the plaintiff. The defendant, Tolman, was an architect, successor to the business of a Mr. Plowman, deceased, who at the time of his death was engaged upon certain houses in process of erection for Mr. Phelps. Mr. Phelps agreed with the new architect to pay on account a sum of money large enough to meet the expenses of the office until Mr. Plowman's affairs could be settled; but a misunderstanding arose relative to this agreement, and Mr. Phelps resolved to dismiss the architect, and demanded from him the plans and drawings relating to his houses. Mr. Tolman refused to give them up, and removed them to a place of safe keeping, whereupon Mr. Phelps commenced the suit for their recovery which has just been decided. The suit has attracted a good deal of interest among architects all over the country, and has very generally been looked upon as a test case, which would decide the question of the absolute ownership of an architect's plans; so that it has been suggested that, in the event of an adverse award, the American Institute of Architects should lend its official countenance and support to the defendant in an appeal to the highest judicial authority. This, we hope, will not be done, for the reason, not only that the customary or legal rights of the professional man are here complicated and covered up by the special agreements with Plowman and his successor, but also, and principally, because the technical ownership of the drawings is a very secondary consideration in the suit; which was brought virtually to secure their temporary use while the buildings were in process of erection.

THIS journal has already defined its position as to the rights which architects can justly claim in their drawings (*American Architect*, June 15, 1878), and we need not repeat the arguments which have been previously set forth; but the dispute between Messrs. Phelps and Tolman furnishes an occasion for adverting to a side of the subject which must not be lost from view, if the profession would give to their established custom that character of perfect fairness which will gain for it immediate acceptance in the courts as well as in public opinion. The analogy so commonly drawn between an architect's plans and the notes of a physician, the brief of a lawyer, or the sermons of a clergyman, fails in one point: while the minister, lawyer, or doctor can be dismissed or retire, carrying with him his sermons, briefs or notes, without detriment to the interests of his late employers, the architect who, having proceeded a certain distance with his commission, has brought his client into the midst of an important work, and deserting or being deprived of his office takes away with him the plans necessary for the completion of the building, inflicts a serious injury on his employer, compelling him to begin anew with another architect the work for which the first had been perhaps already paid. This is contrary both to law and justice, and the architect, while claiming that drawings, when their service in the construction of the building is over, belong to him, and not to his clients, must remember that the latter is unquestionably entitled to the *use* of them until the structure is completed. It is the architect's part of the contract to afford him this; and even though the client may violate his part of the tacit agreement, — to pay for such use, — the architect has no right to retaliate by injuring him; he must accomplish his own duty, and then the law will help him to obtain justice from others.

A RATHER unfortunate conclusion has, we think, been arrived at in the case of the new Parliament Buildings at Toronto. According to the Toronto *Globe*, the authors of the design to which the first premium was awarded, and of which the experts themselves say, that "it is unworthy of mention from an architectural standpoint," are commissioned to make such changes in their plans as will diminish the expense, and make them otherwise more satisfactory. The design is now estimated at about fifty per cent more than the prescribed limit. Furthermore, the authors of the two plans which, though the most costly of all, possessed the most technical merit, are also invited to submit such modifications as will bring down the expense as near as may be to the stipulated sum. "The Government will then make a choice between these and the designs of the architects to whom the first premium was awarded." It is not difficult to foretell the result of this new competition. As so often happens, the candidates who have been astute enough, or reckless enough, to disregard from the beginning the condition of cost, although they may lose the chance of a comparatively insignificant premium, secure for their designs an admiration which is only increased by the sympathy evoked by their necessary exclusion from the lists. The plain surfaces of the practicable plan grow more and more repulsive in comparison with the arcades and crockets of the other, and the public casts about for some means of abandoning that which it cannot approve. At this opportune moment a whisper circulates that the beautiful but unattainable design "may perhaps be modified so as to reduce the cost, preserving all the essential features," and desire becomes converted into hope. The plan which fulfilled the requirements is forgotten; by means of thin walls, doubtful foundations, and scanty finishings, the popular design is erected; and the bills, however large they may prove to be, are paid without a murmur by the delighted public.

THE Boston *Herald* has done a good work in calling public attention to the unsafe condition in case of fire of a number of manufactories and other buildings in that city, where operatives are employed. Some of these structures are among the finest as to external appearance, but were found by the reporter to lack adequate stairways, to say nothing of fire-escapes; to be encumbered with vast quantities of inflammable goods piled up on the floor; and in certain cases to have the doors intended for the escape of the inmates secured with staples and padlocks. Many of the older buildings are even worse than this. There are several places in the very heart of the business portion of the city, where clusters of houses and shops, either of studding and clapboards, or of the lightest possible brick-work, are huddled together around tortuous alleys, accessible only through archways, and enclosed by the most costly structures, to which they are a perpetual menace. Situated as they are, these shops are always tenanted and filled with workmen, although their very existence is generally unsuspected by the passers in the handsome streets behind which they lurk. In the minds of fire engineers and insurance agents, however, they demand much attention, and an occasional effort is made for their condemnation and removal, but so far without any success. Harvard Place, Province Street, Province Court, and many other dark and filthy alleys without a name, take the place of what should be wide and well-built streets, and soon would be if peculiar circumstances did not prevent; the most serious among them being the tenure by which the land is to a great extent held. Much of it is owned by hospitals or other charitable corporations, and leased on ground rents, with the inevitable result of securing the worst possible class of buildings, dangerous in themselves and to their neighbors, but removed from all hope of improvement except under compulsion of law. The manner in which they are used is as reckless as that in which they were originally built; paint shops, plumbers' shops, glass-furnaces and cabinet-makers' varnishing rooms alternate in structures provided with but one flight of narrow wooden stairs for the escape of their inmates in case of fire; and as an illustration of the thoughtlessness of these, we have

ourselves seen a hot-air furnace under a similar structure with the smoke-pipe *wrapped in paper*, tied on with cotton strings. The intention of this was probably to save heat; and we were told that it had been in this condition all one winter.

We have received the prospectus of the Technical Schools established in New York under the auspices of the Metropolitan Museum of Art. As will be remembered, the liberality of a private gentleman has enabled the Museum to erect a special building for these schools, which were conducted last year in rooms hired for the purpose, and classes in house, sign, and decorative painting, turning and wood-carving, carriage-draughting and construction, and in general drawing and designing now meet regularly in the new structure. As the prospectus says, these schools are not primarily art-schools, but are intended to make thorough, efficient, and practical mechanics, and while attention is given to the theoretical and artistic branches of the trade, the chief aim will be to make first-class workmen who can earn a living by their trade. Explanations of the processes employed will be given by experienced workmen from the best shops, and it is believed that the value of this systematic instruction will be shown by the increased prices which will be commanded in the trades by workmen who have had these advantages. That is, we suppose, if the unions do not interfere to prevent any such aristocratic distinctions, and either pull down the schools or condemn the graduates to conform their income to that of the meanest botchers in their respective arts. The school work-rooms are open for practice the whole of each day during the term of five months, and instruction is given from eight to twelve o'clock every forenoon. Artistic as well as technical teachers are employed, and it is intended that the graduates shall be not only masters of their tools, but able to distinguish good from bad work, both mechanically and artistically. The price of instruction varies from eight to seventy-five dollars, for the full courses, but the largest sum is trifling considered either as a price for the long and thorough training given, or as an investment from which future income is to be derived.

We are glad to see the names of Mr. Frederick Baumann and Mr. James R. Willett as members of the Committee on Sewerage appointed by the Citizens' Association of Chicago to draw up a set of official recommendations on the subject of house drainage, and are not surprised at the general excellence of the rules which they and their colleagues have presented. One or two of the minor recommendations we think open to criticism, but as a whole, the document is much the best of its kind that we have seen. Under the circumstances which prevail in Chicago, the committee advise that all house drains should be extended to the sewer without a trap, and ventilated by carrying the soil-pipe above the roof. The city lies so low that the sewers have very little fall, and are nearly filled by every heavy shower, or by a sudden rise of the water in the Lake; the result being a forcible displacement of the air contained in them, which finds its way through the house-traps. The committee think that the perforation of man-hole covers, which they recommend for the purpose of furnishing an escape for the pent-up air, will not be sufficient, especially in winter, when the covers are clogged with frozen mud, and that additional vent through the house-pipes is necessary. Speaking of house-plumbing, the committee advise that no waste-pipe should be less than two inches in diameter; which seems to us questionable; and they urge the use of iron soil-pipe, with one-quarter inch thickness of metal, tested for flaws before use. Such testing is done by the best manufacturers for their highest quality of pipe, which will be furnished by the best plumbers to private individuals if a fair price is paid for it, but no test that the latter can apply is of the slightest value. Soil-pipe with a quarter-inch thickness of metal is often mentioned in books on sanitary engineering, but rarely used for dwellings. The average thickness is less than half that, and we fear it will be difficult to improve the practice of plumbers generally in this respect. Perhaps the Chicago Citizens' Association may be able to do so, and certainly we wish it success.

We notice in the accounts of the great fire at Pensacola, which took place a few days ago, that the county records were conveyed to a place of safety by the bravery of the clerk, who had saved them in a similar way not less than *four times* previously. Our admiration for the energy of this official is fully equalled by our astonishment at the unsubstantial character of the depository to which the tax-payers of the county confide the evidences of title to their real property, the records of court decisions, and other documents, the least valuable of which is worth more to the parties interested than the whole cost of constructing a fire-proof enclosure which would keep them secure, independent of the energy of their custodian. The insecurity of titles to land in some parts of the South has long been a reproach to those districts, as well as a very serious hindrance to their development; and such States and counties as can show an unbroken line of records will feel more and more, as population increases, the advantage which such a possession gives them; an advantage which would be multiplied tenfold if the treasure were made secure, so far as human skill can accomplish this, against accidents which may sweep away in a moment the money value of real estate; the probate records upon which rest the rights of widows and orphans, and the good name of trustees; the documentary proof by which justice may decide between the guilty and the innocent, the swindler and his victim; and those multiform evidences of debts incurred and paid which civilized life accepts as property.

Messrs. Hunt, Ward, and Van Brunt, the commissioners appointed by the Government to recommend a design for the Yorktown Monument, have presented their report to the Secretary of War, by whom it is transmitted to the Senate. They advocate, in general terms, the adoption of the design already familiar by the model on exhibition at the War Department, but suggest that the work remain in their hands for a time to afford opportunity for further study and improvement. The approximate estimates of cost vary from ninety thousand to one hundred and sixty thousand dollars, according to the dimensions of the executed monument. The larger sum will allow the column which forms the main feature of the design to be carried to the height of one hundred and fifty-five feet; while the smaller will only admit of ninety-seven feet for the shaft, the other details being also reduced in the same proportion. The difference in effect and dignity between the two modes of carrying out the plan would be so great that we hope there will be no hesitation in appropriating the full amount needed. In such matters a small additional expenditure often brings to a happy issue enterprises in which there is no alternative between complete success and total failure.

Another electric-light accident is reported from Manchester, England, a workman employed in handling, one of the ordinary lamps having in some way directed the current through his own body with fatal result. This is simply a repetition of the case which occurred on board the new steamer-yacht *Livadia*, just built for the Czar of Russia. On her trial trip, which took place a few weeks ago, one of the stokers was helping to swing a lamp between the decks, and while holding the lamp in one hand accidentally brought the other in contact with the return wire, thus completing the circuit; and the whole current being thus directed through his body, he fell instantly dead, decomposition, according to the *Builder's* account, beginning immediately, as in the case of persons struck by lightning. Such occurrences, in connection with the well authenticated case to which we referred some weeks ago, of a telephone instrument hanging in an office which was burnt up and destroyed by the accidental contact, remote from the instrument, of the wire which operated it with another wire used for conveying the current of an electric light, should suggest greater care than has hitherto been the rule in arranging the lines by which these tremendous forces are conveyed. The mere possibility of an accident like the one on board the *Livadia*, occurring to a person while using a telephone would very much restrict their use, while an actual fatality might almost lead to their total abandonment as a public convenience. Some means of isolating such wires will soon become necessary, and we are glad to see that a private corporation has been organized for the purpose of laying underground in the streets of cities, lines of terra-cotta blocks, perforated with numerous holes which will, when the blocks are in position, form so many continuous tubes, from one and a half to two and a half inches in diameter, which can be rented to telegraph companies and private individuals for running their wires. Such a system seems practicable, and the expense to each company using it would be small in comparison with that of separate tubes,—perhaps so small that they will be disposed to take advantage of it without legislative compulsion.

BUILDING SUPERINTENDENCE. — I.

ALL who have had any experience in the supervision of building operations know the importance of having a systematic plan in pursuing their examination of any given work, and the difficulty, without such aid, of giving adequate attention to all the innumerable points of construction which require notice at their proper time, and before they are covered up or built over, so as to make changes inconvenient or impossible, and there are few who cannot recall instances of vexatious mistakes, costly alterations, or buildings left insecure through want of attention at the right moment to defects which an hour's labor would then have remedied. To the young architect, especially, judging from the writer's own experience, a manual which may help to direct his attention to all the various details which should be noticed, and put him in mind of the defects to be looked for at each stage of a given construction, cannot fail to be of use, and such a manual, it is hoped, the following pages will supply. No doubt there will be imperfections and omissions; but the writer trusts they will not be found very numerous, and that such as may exist will be duly criticised and corrected by those competent to do so. Reference will be made to the different modes of building which prevail in various localities, so far as the writer's knowledge permits, as much for the purpose of comparison and criticism as for the sake of extending the usefulness of the work.

The general subject of superintendence will be considered under the three heads of Stone Buildings, Brick Buildings, including structures on city lots with ashlar facing, and Wooden Buildings.

In the division of Brick Buildings will be special reference to the iron-work, cast and wrought, and those details of boiler and steam work, glass and hardware, which are more commonly to be considered in connection with city structures than others; and under Wooden Buildings the questions of grading, cellar-work and drainage will be dwelt upon, which continually call for settlement in country construction.

In each class the progress of a typical building will be described, from the first breaking of ground to the completion of the work, showing the successive stages of construction and the order of delivery of material on the ground, such as they would be found by the superintendent in his periodical visits. At each imaginary visit occasion will be taken to call attention to points which need to be considered at that particular stage, although the execution of them may belong to a subsequent period, and some general directions for judging of the quality of materials will be given at the time they make their first appearance on the premises.

From a sense of its great importance, the writer, although not considering himself peculiarly qualified for the task, will endeavor, in treating of the different kinds of work, to present a standard by which each sort can be judged. Nothing is more embarrassing to the young architect than to be called upon to decide a dispute between contractors and owner on the question of what constitutes a "good, substantial, and workmanlike manner" of executing any particular piece of construction. He is not likely to commit the error of being too lenient in his requirements, but he may, if unaccustomed to practical work, be led into unreasonable exactions or untenable positions which he will subsequently have to abandon, to the detriment of his reputation and authority. It often happens that the owner has formed *a priori* an ideal of what the work should be, which does not agree with the actual execution, and he consequently refuses to accept it, or claims an allowance in the price on account of what he asserts to be defective workmanship; and the architect is called upon to decide between the parties. In such cases it is of the utmost importance to him to be able to show such thorough familiarity with common practice as will command the respect of both. Without this he is continually liable to do injustice either to the contractor or his client, as well as to incur their ill-will. Take, for instance, a question which sometimes actually occurs in the case of buildings faced with freestone ashlar. The owner, perhaps, has been reading some text-book on construction and has come across the familiar direction that "all stones used in masonry should be laid on their natural bed." On his next visit to his building he looks for the application of this rule and is surprised to find every stone in the facing set up edgeways. He sends for the contractor, who professes never to have heard of any rules about beds, and declines the owner's request either to take down the masonry and do it over again, or to make a discount from the contract price of the work. The disputants then betake themselves to the architect, who finds all his resources of tact and experience required to convince the owner that although his rule might be theoretically correct, universal custom justified the contractor in violating it. He is sure to be sharply questioned, and if his practical knowledge proves defective, all his rulings in favor of the builder expose him to suspicion and discredit.

It will be of advantage, however, in connection with the discussion of the usual practice in the different kinds of work, to point out such improved methods as are sometimes used, but with a caution to the reader, that under the common contract the builder cannot be compelled to use them at his own expense, unless they are recognized in the best ordinary practice of the locality to which he belongs, or are particularly mentioned in the specification, although most good mechanics are glad of any suggestions for the improvement of their work, even at some extra cost to themselves, and will be equally grateful for any help toward a uniform standard of practice, to which both they and the architects can refer.

For the discomfiture of bad workmen, the young architect will be warned against some of the ways in which defective materials or construction are covered up, and will be reminded to look for bad work before the building arrives at so advanced a stage that it can no longer be detected or remedied.

To save space, it is supposed that the reader is familiar with the principles of construction as given in the text-books, and with the common forms of specifications and building contracts. Any one in need of such elementary information will find Dobson's "Art of Building," in Lockwood's series, the best cheap work on the general subject, and Brooks's "Dwelling Houses," in the same series, will afford some additional details in its special branch. As a complete and authoritative text-book, however, no work within our knowledge can compare with the three volumes of "Notes on Building Construction," prepared for the use of the English Science and Art Department at South Kensington, and published by Rivingtons, Waterloo Place, London.

For those who read French, Ramée's "Architecture Pratique" will be an extremely practical and useful little book, while those who have sufficient leisure will find the time necessary for the study of Rondelet's standard work, the "Traité Théorique et Pratique de l'Art de Bâtir" well repaid.

There are many other useful works, both in French and English, which treat of various portions of the subject. Among the best are Wightwick's "Hints to Young Architects," published in Lockwood's series, with Hatfield's "American House Carpenter," published by Wiley & Son, New York.

The specifications in the English books are useless in this country, our materials, modes of construction, and technical terms differing completely from those in use across the water, but models which will serve very well as guides for the non-professional reader in the construction of brick or stone buildings will be found in the printed specifications for public structures of various kinds, copies of some of which can generally be had by inquiring of the proper officers. For wooden buildings, the best work in print is perhaps Mr. Wm. T. Hallett's "Specifications for Frame Houses," published by Bicknell & Comstock, New York. If a form of contract is desired, a very good one can be found in Mr. Hallett's book, or blank agreements for building, as well as a special form for "mechanics' work," can be obtained of any stationer. These forms are not all that could be desired, but do very well for ordinary cases.

One or two preliminary remarks may be made before describing the actual processes of inspection.

In the first place it is necessary to be as familiar as possible with the plans and other drawings of the building to be constructed. Nothing is of so much service in rendering the labors of the superintendent valuable to his employers and himself as the thorough understanding of the projected building, which will enable him to foresee the consequences of every step, to judge of the position and workmanship of each part of the edifice, while in process of construction, with reference to its final use and finish. His duty is only half fulfilled if he trusts blindly to the accuracy of the plans. He should examine, compare and correct them minutely, thoroughly, and frequently. It is impossible in the architect's office to avoid all mistakes in drawing or figuring, but such as escape the eye of the busy professional man can easily be detected by a little care in comparing them with the work on the ground, and this duty clearly belongs to the superintendent. Not only should he make sure of the accuracy of the plans, but he must also look out beforehand for other points which may affect or hinder the construction when once begun. If, for instance, the drawings show stone and brickwork bonded together in elevation, it should be his duty at once to procure bricks of the kind to be used in the facing, and lay them up with mortar joints of the usual or specified width, in order to ascertain with certainty the height which a given number of courses of brick will lay. It is common in such work to assume that five courses of brick will lay one foot in height, and the detail drawings for the stonework are often made and figured accordingly. If, then, as often happens, the particular brick used is a little thicker or thinner than the standard, the stone once cut from an incorrect assumption will fail to bond properly, and, if it cannot be recut, must either be thrown away or inserted as best it may, the wide joints and irregular lines bearing witness to the incompetency of the one who directed the work.

Even supposing the plans to be correct, the superintendent will find many opportunities for saving both contractor and owner from the annoyance and expense caused by the carelessness of workmen. It is impossible to get the ordinary mechanic to concern himself about the future matters which will depend upon his work, and a little foresight in supervision will prevent many careless deviations from the drawings or specifications, which, although the contractor would be bound to correct them, he will be glad to have detected in season to save him that expense, and will show his gratitude by special endeavor to please. Another important point in efficient supervision is, after inspecting the materials delivered, to make sure that those rejected are removed from the premises. If they are marked for rejection, as they should always be, let the mark be on the *face* of the cracked or thin stone, or on the *upper side* of a "waney" floor-board, so that it can be recognized if it should be afterwards put into the work. If this precaution is not taken, and if the marks are not made in such a manner that they cannot be rubbed or planed off, materials once discarded will be smuggled into the building in spite of the injunctions of the superintendent or contractor.

It is impossible to be too thorough in each periodical inspection of the building. It will not do to examine one portion one day and another the next; the proper way is to go all over the structure at each visit. Wherever a man is working, or has been working since the last inspection, go and see what he has done. In this way it will be possible to gain that definite knowledge of every portion of the structure which is the only security against concealed vices of workmanship.

One other precaution must be observed: let not the young architect put too much faith in what workmen say to him. The best of them dislike to pull down or change what is already done, and if inadvertence or temporary convenience has led them into palpable violations of the specifications, they will often stretch the truth considerably in their explanations and excuse. Some are much worse than this, and will deliberately avail themselves of the credulity and inexperience of the young architect under whose authority they come, to obtain from him, both before and after the execution of the work, such concessions from and interpretations of the strict letter of the specification as will be most to their profit. It is difficult for one who is not quite certain that he knows how to distinguish between fresh and damaged cement, for instance, to persist in rejecting a lot of which he has suspicions, but which the builder declares to be not only of the best quality, but the only lot of that quality which can be procured without seriously delaying the work, and if the superintendent is found to be accessible to such representations, his credulity is sure to be tested on many other points. The only way in which young architects can escape being occasionally made victims of such practices, is for them to make up their minds what is right by the best light that they can, and insist on their directions being followed. With a little thought, and assiduous study of other buildings in process of construction, it need rarely happen that their orders will be unreasonable, and a firm stand on such occasions as arise in the early stages of the work will not only make their subsequent duty much lighter and pleasanter, but will often save them ultimate discredit and regret.

These preliminary remarks are applicable to every kind of building. Others might be added, but as they may perhaps be better understood and remembered in connection with some practical illustration, it will be as well to defer their consideration until they present themselves in treating of a particular class of work.

VAULTS.[1] — VI.

SPRINGERS.

In the early examples, and in many late ones, the ribs are few, only groin, transverse, and wall; and each one starts from the spring with its full section, and is often supported by its own independent shaft, as in Figure 57. When intermediates are added such an arrangement is clumsy, and therefore the ribs are bunched together at the springing, each starting with only a part of its section, as in Figure 58. As they rise the sections increase, and become full at the point where the ribs separate and the panels begin. Up to this height the work is solid and is called the springer. It is a corbel bonded into the wall sustaining the ribs. Its joints are often horizontal, Figure 59. In ruins it is generally seen standing after the ribs have fallen. On the plan, Figure 53, it will be observed that the groin rib and the inner intermediate of the side vault separate from each other farther inward, and, therefore, at a higher point than from the other ribs, and thus attain their full section sooner on one side than on the other. This often occurs, but may be considered awkward. It is remedied by retiring these two ribs somewhat at the springing, or by advancing the others; or, more effectually, by making all of the ribs of the same curvature up to the top of the springer.

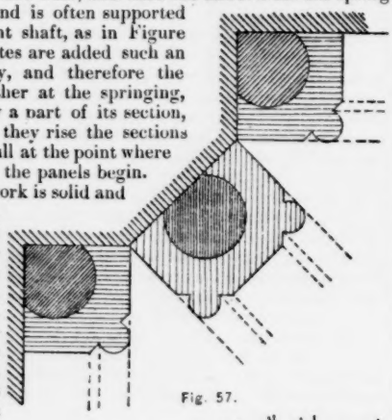


Fig. 57.

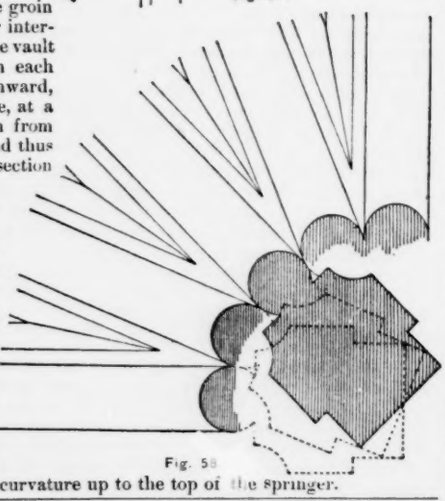


Fig. 58

[1] These papers, by Professor Charles Babcock of Cornell University, will be printed in monthly parts.

Sir Gilbert Scott states that it was not uncommon for stone springers to carry wooden ribs. He finished the nave of Chester cathedral in that manner. The vaulting of the great octagonal central space of Ely cathedral is so constructed; but this probably would not stand if the ribs were of stone.

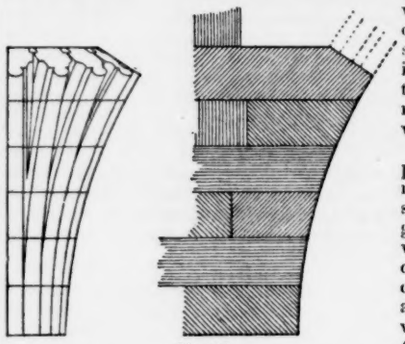


Fig. 59.

Although it is not a part of our subject, it may not be amiss to say a few words in regard to the *thrust* of vaults, and the means of resisting it. In the case of a barrel-vault, as it pushes against the wall alike at all points, (if it exerts any thrust, which some do not,) they must be thick enough to resist it; or there may be half vaults acting as flying buttresses, as in Figure 3. The great Roman groined-vaults, and many of their barrel-vaults, being built of bricks and concrete with mortar which is as hard and strong as the other materials, are not amenable to the mechanical laws of the arch, and need no abutment, but only a sufficient vertical support. A symmetrical stone groined-vault, whether solid or ribbed, exerts its thrust in the plane of the transverse section. In Romanesque work the walls are of sufficient thickness to afford a proper resistance. In the Gothic system the thrust is opposed by buttresses, and the walls may be dispensed with so far as the vault is concerned. The flying-buttress, if its function be, as many suppose, to convey the pressure of a nave-vault as directly as possible to the aisle wall and its buttress, is never, we believe, scientifically located, that is to say, it is not in the line of pressure. If it were, it would in many cases pass through the aisle-vault. It is always above the aisle vault; in early work between it and the roof; in the middle and later periods above the roof. It is sometimes a stone strut, supported between its ends by a half arch; and, more commonly, a half arch covered by a coping. In the latter case its function is to resist the thrust of the vault by its own thrust at the crown, which is exerted horizontally and distributed over a considerable vertical space of the wall or pier which carries the vault. Its outward thrust is resisted by the pier, pinnacled or not, which rises up from the aisle buttresses. In most cases it is applied to the clerestory wall at a point above that at which the line of pressure comes out; often at the top of the wall.

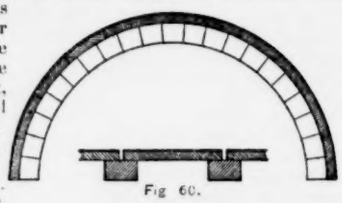


Fig. 60.

Fig. 61.

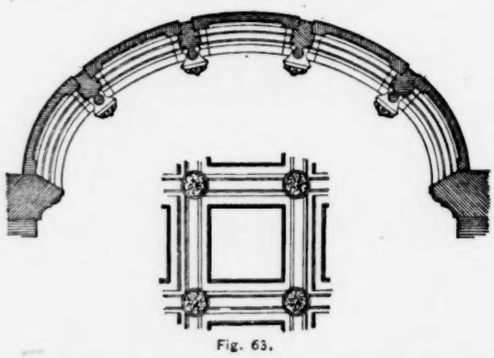


Fig. 63.

As to the method of laying vaults, those that are solid require strong centering, able to carry their weight until they are finished. Rib-vaults require heavy centering only for the ribs. The panels, if each course is in a single piece, need no centres; if they are cross-jointed, or if spheroidal, only short narrow centres for each course, or two or three together, which may be supported on the scaffold; and only one set is necessary, as they can be used over and over again for the different panels. Cylindrical panels, however, if wide at the top, as when only groin and transverse ribs are used, must be thick enough to form true arches, and then they are not mechanically complete until the last course, or key, is laid; so that they will need continuous centres. Spheroidal panels are, like a dome, mechanically complete at any point when a course, or ring, is finished.

Panels are often laid of quite thin stones and afterwards covered on the back with a layer or two of brickwork, or of concrete, so that the whole vault, when completed, is about as heavy as if it were solid.

We are now prepared to explain and illustrate the leading forms of rib-vaulting.

A. SIMPLE RIB-VAULTS.

Three examples are given.

Fig. 60, from Baths of Diana, at Nismes.

Fig. 61, from hall of Castle Campbell, Scotland.

Fig. 62, a form common in the after Gothic of France.

B. COMPOUND RIB-VAULTS.

We will classify these, as far as practicable, according to the number of cells, or parts, of which they are composed.

1. TRIPARTITE. These cover a triangular space, which usually occurs in an apsidal aisle, as in Fig. 32.

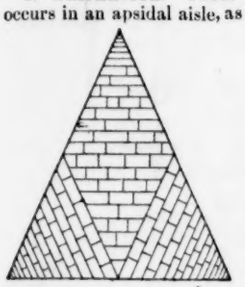


Fig. 63.

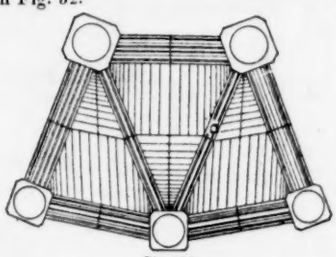


Fig. 64.

The simplest form is that shown in Fig. 63, from the transept porch of the cathedral at Erfust. It has groin and wall ribs only. There are three cells, each having two triangular panels. Fig. 64 is a plan of the vaulting of a compartment of the inner aisle of the choir of Notre Dame, Paris. The trapezoidal space, usually covered by a quadrilateral vault, is here covered by three triangular vaults.

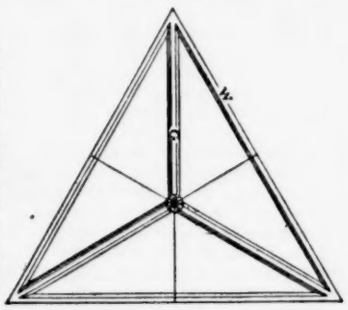


Fig. 65.

The panels of triangular vaults are sometimes arranged as in Figure 65.

THE STRENGTH AND STIFFNESS OF FLOORS.

THE necessity of having the floors in buildings of any importance whatever sufficiently strong to bear with perfect safety, and without exceeding a certain deflection, the load which is to come upon them, is too evident to need urging here. It is my object to present here such facts and rules as shall enable any architect or builder to calculate with reasonable certainty the strength of any floor which he may have to put into a building.

In calculating the strength of floor-beams, whether of iron or wood, we have first to decide upon the span of these beams, which is generally determined by the size of the opening to be covered; and second, upon the load which is to come upon the floor. Wooden floor-beams should never have a span of more than twenty-five feet, for if they are of a greater length than this, it is difficult to stiffen them sufficiently to prevent vibration under a heavy or a moving load. When the distance between the bearing-walls of a building is greater than the above limits, partition-walls should be built, or else the beams should be supported by iron or wooden girders resting upon iron or wooden columns. The building laws of the cities of New York and Boston require that the distance between the bearing-walls of all buildings, except churches, theatres, and other public buildings, shall not be more than twenty-five feet, unless girders are substituted in place of the partition-wall. When possible, floor-beams should always be made continuous, as the strength of each portion of the beam is thereby increased about one-half. The superimposed loads on floors of different classes may be taken as follows: —

Floors in dwellings, 75 pounds per square foot; in churches, theatres, ball-rooms and other public buildings, 120 pounds per square foot; and in the so-called first-class stores, 250 pounds per square foot. Warehouse floors are sometimes very heavily loaded, and for these special computation must be made in each case.

In considering the load on a floor, it should be remembered that the effect of a load suddenly applied, in producing stress and strain, is twice as great as that of the same load gradually applied, and hence the factor of safety used for the former should be twice as great as that for the latter. The load produced by a crowd of people walking on a floor, is usually considered to produce an effect which is a mean between that of the same load when gradually and when suddenly applied, and a factor of safety is adopted accordingly.

STRENGTH OF WOODEN FLOORS.

Floors may be divided into two classes: wooden floors, and iron, or fire-proof floors. We will first consider the strength of the former.

Having decided upon the span of the floor-beams, and upon the load which may come upon the floor, we must next consider the weight of the floor itself.

Wooden floors in dwellings weigh, on the average, from 17 to 20 pounds per square foot of floor, including the weight of the plastering on the under side; and for ordinary floors in dwellings, the weight may be taken at 20 pounds per square foot. For floors in public buildings, the weight per square foot seldoms exceeds 25 pounds; and it will be perfectly safe to take it at that amount. In warehouse floors, which have to sustain very heavy loads, the weight per square foot may sometimes be as great as 40 or 50 pounds, and in such cases the approximate weight of the floor per square foot should be first calculated.

In considering the load on the floor, we assume it to be equally loaded over its whole surface, as this would be the severest strain to which the timbers could be subjected. Hence in calculating the dimensions of the floor-beams, we use the formula for a distributed load. The formula for the safe load of a rectangular beam, supported at both ends and loaded with a uniformly distributed load is [1]

$$(1) \qquad W = \frac{2 \times B \times D^2 \times a}{S \times L}$$

in which B is the breadth of the beam; D, the depth of the beam, both in inches; a, the weight, which, if applied at the centre, would just break a unit beam one inch square and one foot between bearings; S, a factor of safety; and L, the clear span in feet. As each floor-beam supports the floor half way to the beam on each side of it, and over its whole length, the area of the floor supported by each beam will be represented by $C \times L$, if we let c denote the distance between centres of beams *in feet*.

If we let f denote the weight of the superimposed load per square foot of floor surface, and f' the weight of one square foot of the floor itself, then the load on each beam will be represented by

$$C \times L\,(f+f'),$$

and substituting this value in Formula 1, in the place of W, we have,

$$(2) \qquad C \times L \times (f+f') = \frac{2 \times B \times D^2 \times a}{S \times L}$$

or

$$B \times D^2 = \frac{S \times L^2 \times C \times (f+f')}{2 \times a}$$

This formula gives the breadth and depth of the beams in terms of the length, distance between centres, superimposed load and weight of the floor itself; and applies to all wooden floor-beams whatever be the weight of the superimposed load, or of the floor itself.

If the dimensions of the beams have been decided upon, and it is desired to know what distance they should be placed apart to have the proper loads, the following formula may be used:

$$(3) \qquad \left.\begin{matrix}\text{Distance between centres} \\ \text{in feet}\end{matrix}\right\} = \frac{2 \times B \times D^2 \times a}{S \times L^2 \times (f+f')}$$

The values of a, for the different kinds of timber, were given in an article on the strength of beams in the *American Architect* of April 24, 1880, and only the values for the three woods most commonly used in building construction will be repeated here, viz: — white-pine, 460 pounds, yellow-pine, 725 pounds, and spruce, 548 pounds. The value of S, depends upon the condition of the timber, and upon the character of the load.

Dry, well-seasoned timber does not require as large a factor of safety as green wood, or wood that is shaky. Also, for a perfectly dead load it is not necessary to use as large a factor of safety as for a load consisting of a crowd of people, and the factor of safety for the latter load need not be as great as that for a suddenly applied load. The factors of safety for floor-timbers adopted by the best engineers range from 6 to 10. For ordinary dwellings, public buildings and stores, I think that 6 is amply sufficient for strength; but for floors in factories and machine-shops I should use 10. To illustrate the application of Formulas 2 and 3, we will take two of the commonest cases met with.

Example I.: What should be the dimensions of the spruce floor-beams in a dwelling, the beams to have a span of 15 feet, and to be placed 16 inches on centres?

In this case, the factor of safety should be 6; f should be taken at 75 lbs, and f' at 20 lbs.; and a is 548 lbs. Then by Formula 2

$$B \times D^2 = \frac{6 \times 225 \times 1\frac{1}{3} \times 95}{2 \times 548} = 156.$$

If we take $B = 2$ ins., then $D^2 = 78$ ins., and $D = 9$ ins. nearly. Hence, to have the requisite strength, the beams should be 2 x 9 ins.

Example II. It is desired to use 2 x 10 inch yellow-pine beams in the floor of a church, the beams to have a span of 16 feet; what distance should they be spaced on centres?

Here, $S = 6$, as before; $f = 120$ lbs., $f' = 25$ lbs., and $a = 725$ lbs. Then by Formula 3 we have:

$$\left.\begin{matrix}\text{Distance between} \\ \text{centres}\end{matrix}\right\} = \frac{2 \times 2 \times 100 \times 725}{6 \times 256 \times 145} \Bigg\} = 1\tfrac{1}{3} \text{ ft. nearly, or 16 ins.}$$

Hence the floor will be sufficiently strong if the beams are placed 16 inches on centres.

Floors are generally stiffened by "bridging," inserted between the timbers at every five to eight feet in the length of the beams. The effect of this bracing is decidedly beneficial in sustaining any *concentrated* weight upon the floor; but it does not materially strengthen a floor to resist a uniformly distributed load.

From the manner in which Formula 2 was derived, it is evident

[1] Formula 4, page 179, *American Architect*, April 24, 1880.

that it would apply equally well for a girder, C being in this case the distance in feet between the centres of girders, or of girder and wall, as the case may be.

Example: What should be the dimensions of yellow-pine girders, to support the floor in a public hall, the girders to be 10 feet apart on centres, and to have a span of 12 feet?

Ans.: We should use Formula 2, S in this case being = to 6; $f = 120$, $f' = 25$, $c = 10$, and $a = 725$ lbs. Then

$$B \times D^2 = \frac{6 \times 144 \times 10 \times 145}{2 \times 725} = 864$$

Taking B = 8 ins., we have $D^2 = 108$, and D = 10½ ins., nearly. Hence the girder should be 8 × 10½ ins.

STIFFNESS OF WOODEN FLOORS.

In floors in first-class buildings we generally desire something more than mere strength to resist fracture. We desire to have the floor sufficiently stiff so that it will not bend enough under its load to crack the ceiling, or to be noticed by the eye. To obtain this desired quality in floors, it is necessary to calculate the requisite dimensions of the beams by the formulæ for stiffness, and if the dimensions obtained are larger than those obtained by the formulæ for strength, they should be adopted in place of those obtained by the formulæ for strength. It should be remembered that a beam may have sufficient strength to safely carry a given load, and yet not be stiff enough; and on the other hand, a beam calculated by the formulæ for stiffness may not be sufficiently strong to carry the load to be placed upon it. So that, to be sure that a given beam possesses the required amount of strength and stiffness, it is necessary to calculate its bearing load by the formulæ both for strength and for stiffness, and to adopt the smaller number. As a general rule, those beams in which the proportion of *depth* to *length* is very *small*, should be calculated by the formulæ for strength, and *vice versa*. The formula for the deflection of rectangular wooden beams, supported at both ends and loaded with a uniformly distributed load is:

$$(4) \qquad \left.\begin{matrix}\text{Deflection in}\\ \text{inches,}\end{matrix}\right\} = \frac{5 \times W \times L^3 \times 1728}{8 \times B \times D^3 \times E \times 4}$$

in which the same notation is employed as in Formula 1; and E denotes the modulus of elasticity of the material, determined by experiments. It appears to be the opinion of the best authorities that the beams in floors of first-class buildings should not bend or deflect at the centre more than one-fortieth of an inch for every foot of span; or the deflection should not exceed $\frac{L}{40}$ inches. Then, putting this value of the deflection in the left-hand member of Equation 4, we have:—

$$(5) \qquad \frac{L}{40} = \frac{5 \times W \times L^3 \times 1728}{8 \times B \times D^3 \times E \times 4}$$

or

$$W = \frac{8 \times B \times D^3}{5 \times L^2 \times e}$$

where $e = 17{,}280 \frac{}{E}$.

Transposing the terms of the equation, and substituting for W the value, $C \times L \times (f + f')$, we have

$$(6) \qquad B \times D^3 = \tfrac{1}{8} \times C \times L^3 \times (f + f') \times e$$

and

$$(7) \qquad C = \frac{8 \times B \times D^3}{5 \times L^3 \times (f + f') \times e}$$

The values of e may be taken as follows: yellow-pine, .0125; white-pine, .0138; and spruce, .0128. It is obvious that the values of e should be obtained from experiments on timbers of the size used in construction. The value given for yellow-pine is deduced from experiments on large timbers by Prof. R. H. Thurston; the value for white-pine from experiments by the writer, and that for spruce is taken from a table given in Trautwine's *Pocket Book for Engineers*. As an example of Formula 6, we will take Example 1 under strength of wooden beams. In this example, C = 1½, $f = 75$, $f' = 20$, L = 15; and $e = .0128$ Then we have by substitution in

$$(6), \qquad B \times D^3 = \tfrac{8}{8} \times 1\tfrac{1}{2} \times 3375 \times 95 \times .0128 = 3420.$$

Then, if we let B = 2 inches, as before, we shall have $D = \sqrt[3]{1710}$ or 12 ins. nearly; or, if we wished to keep the depth 9 ins., we should have B = 2⅔ ins., nearly. Hence we see that while a beam 2 × 9 ins. would be sufficiently strong to carry the given load, yet it would deflect beyond one-fortieth of an inch per foot of span, and would be liable to cause the ceiling underneath to crack. Therefore we should use the 2 × 12 ins., or 2½ × 9 ins. beam.

F. E. Kidder, B. C. E.

THE ILLUSTRATIONS.

THE HEMENWAY GYMNASIUM FOR HARVARD COLLEGE, CAMBRIDGE, MASS. — MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

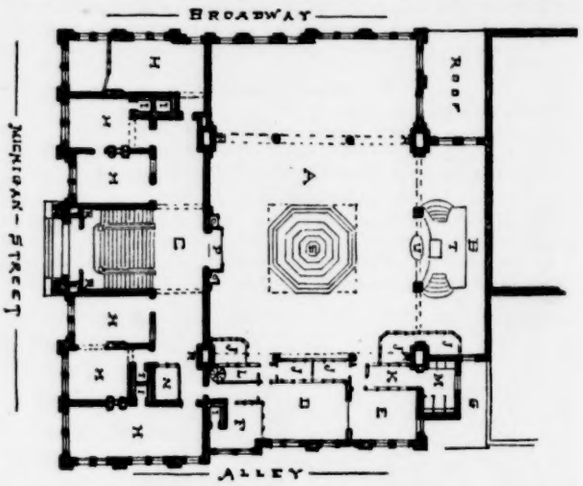
We have been disappointed in our endeavors to procure an adequate description of this building, a view of which, taken from nature, was published in our last issue.

HOUSE FOR G. HENRY WHITCOMB, WORCESTER, MASS. — MR. S. C. EARLE, ARCHITECT, BOSTON, MASS.

The outside walls are of light and dark Monson granite, mostly in rock face. The inside finish is of various hard woods. Cost, about $20,000.

COTTAGE FOR M. C. WENTWORTH, THORN MT. HOUSE, JACKSON, N. H. — MR. W. A. BATES, ARCHITECT, NEW YORK, N. Y.

CHAMBER OF COMMERCE BUILDING, MILWAUKEE.



A, Chamber of Commerce; B, Alcove; C, Hall; D, Directors' Room; E, Reading Room; F, Secretary's Room; G, Court; H, Offices; I, Vaults; J, Telegraph Offices; K, Wash-Room; L, Coat-Room; M, Water Closets; N, Elevator; O, Telephone Closets; P, Vestibule; R, Ventilators; S, Pit; T, Platform; U, Reporters' Table.

The members of the Milwaukee Chamber of Commerce took formal possession of their new building on the 18th of November.

The site occupied by the building has been known in this city for nearly twenty years as "the Chamber of Commerce corner." The capacity of the old Chamber has long been inadequate for the increasing business, but until the spring of 1879, no definite arrangements had been made to erect a building which should contain a Chamber sufficiently large to satisfy all present and near future requirements. The new building marks the growing need of increased facilities for the transactions of commercial exchanges, and also manifests the advance in architecture.

The aim of the architect, Mr. E. T. Mix, has been to avoid the expense of a fire-proof building, and to produce one of slow-burning construction. The manner in which this has been accomplished will be found particularly described in the methods of deafening between the joists, the construction of partitions, the protection of wood-work in the roof, etc. The lot, at the corner of Broadway and Michigan street, on which the building stands, is 120 feet square. The basement extends to the south line of the lot, joining another building. The main wall above the basement on this side is kept back seventeen feet from the line, the alcove, B, being about twenty feet high. On the west is an alley fifteen feet wide, increased to twenty feet, as will be seen on the plan. An ample supply of light and air is thus given to that portion of the building not fronting the streets. The building is five stories high above the basement, the Chamber occupying the first, second, and third stories, making its height forty-six feet.

The building, aside from the Chamber, including the basement, is arranged for telegraph and commission offices. Over the centre of the Chamber is a skylight twenty-four feet square. The offices and rooms at the west end are divided from the Chamber by glass partitions, and over these is the visitors' gallery. The rooms and gallery do not detract from the apparent size of the Chamber, as above these it continues to the outside wall. The eye takes in the space over the gallery, which corresponds with and balances the other end, so that the whole size and symmetry is well preserved.

The inside of the Chamber is sixty by one hundred and ten feet, with an alcove seventeen by sixty feet. On the platform T, is the President's desk.

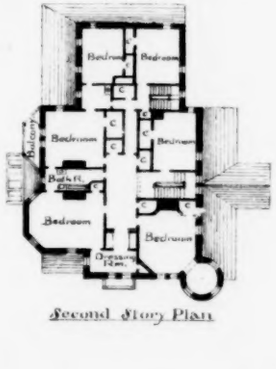
For the information of the uninitiated, it may be stated that the pit, S, is on the level of the main floor, the lines around S indicate steps, the wide space in the centre is a platform about four feet wide. The sellers stand in the pit, the buyers on the platform, each shouting what to an outsider is unmeaning jargon.

The foundations for all walls and piers are laid on piles, and those which carry heavy weights are built the height of the sub-basement with Joliet dimension-stone. The basement walls on the two street fronts are faced with Minnesota granite, backed up with brickwork; the lower course of granite, however, covers the entire thickness of the wall, and each course is well bonded with the brick.

Above the basement the two street fronts are faced with the "Halderman blue stone" — one kind of Ohio sand-stone — and backed with brick. From three to four courses of bond-stone in each story run through the wall, and every course is well anchored to the brick-work. All other main walls inside and outside are of Milwaukee brick. Brick ledges are built out from the wall at each story to receive the joists.

To obviate the usual effects of frost on outside walls, a lining of hollow brick is carried up, independent of, and one inch from the main wall. The same kind of brick is used for partitions which do not carry joists. These bricks were made specially for this build-

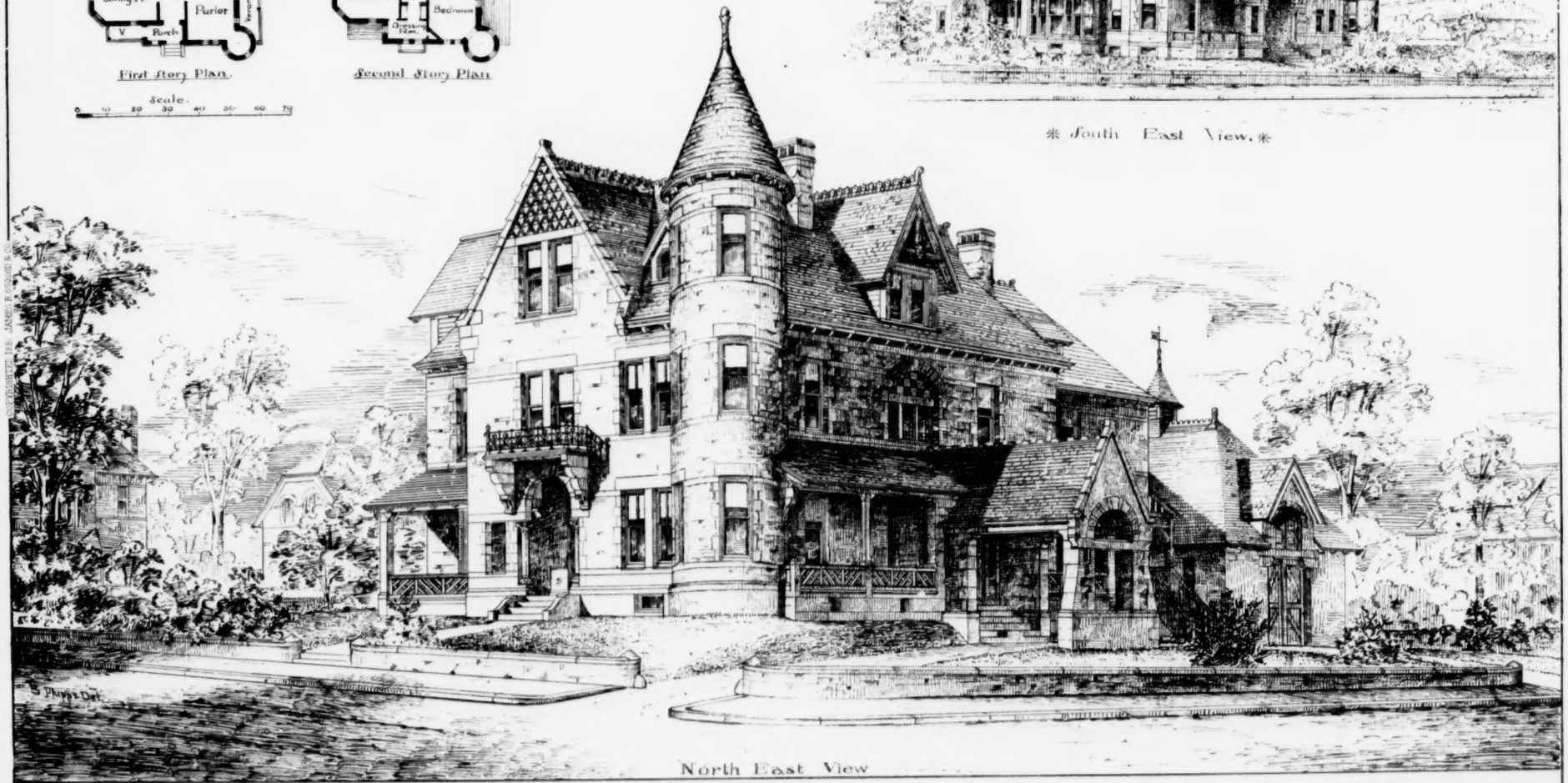
First Story Plan.



Second Story Plan

Scale.

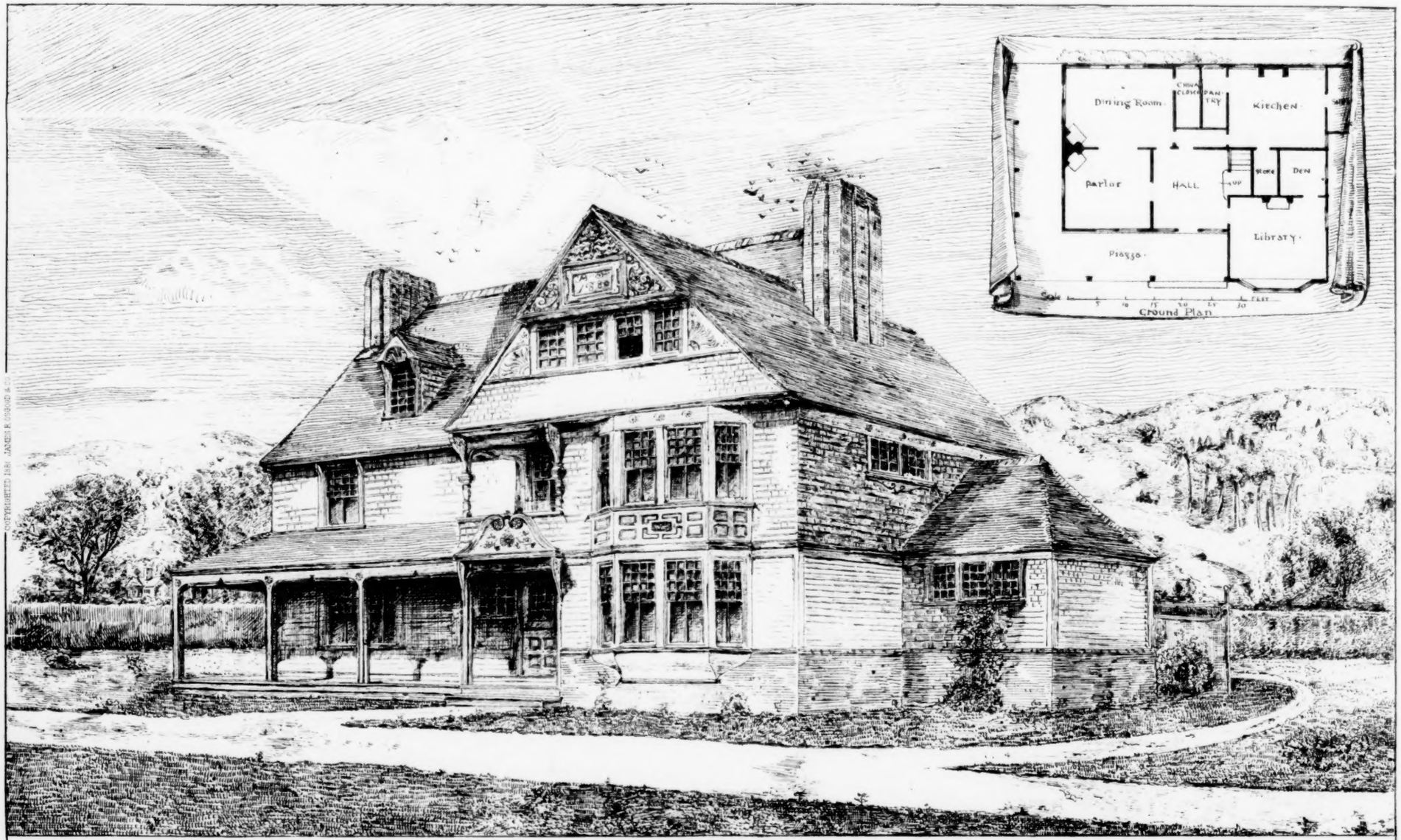
* South East View. *



North East View

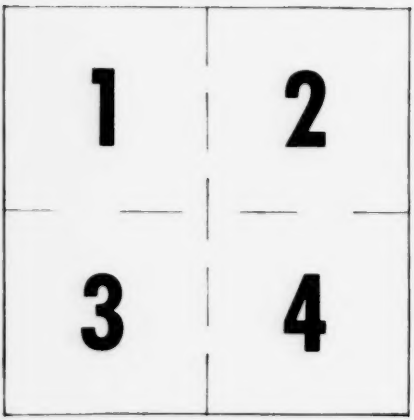
Stephen C. Earle. Architect Boston

House for G. Henry Whitcomb. Worcester Mass *



Cottage for M.C. Wentworth Esq. Thorn Mt. House. Jackson. N.H. Wm. A. Bates. Arch't. 57. B'way. New York.

Maps on this order too large to be
are filmed clockwise beginning in th
right and top to bottom as many fra
diagrams illustrate the method.



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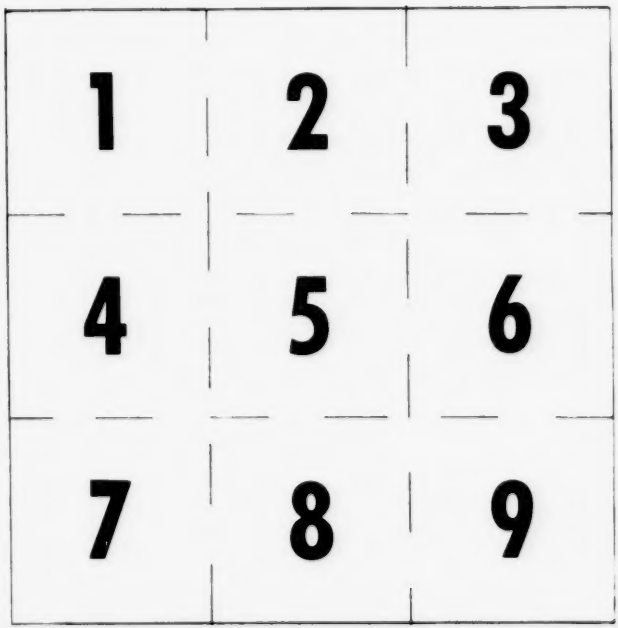
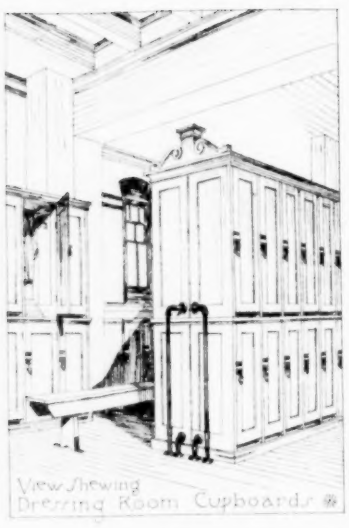
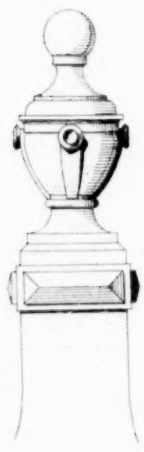
frames as required. The following




View Shewing Dressing Room Cupboards

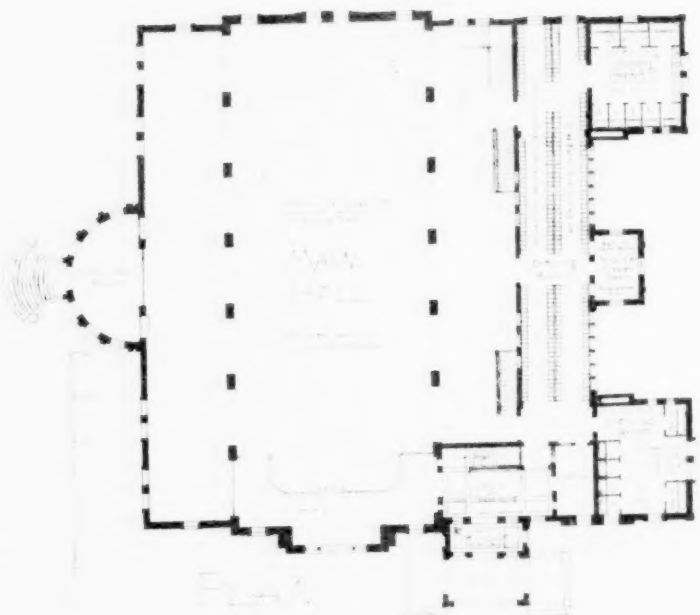


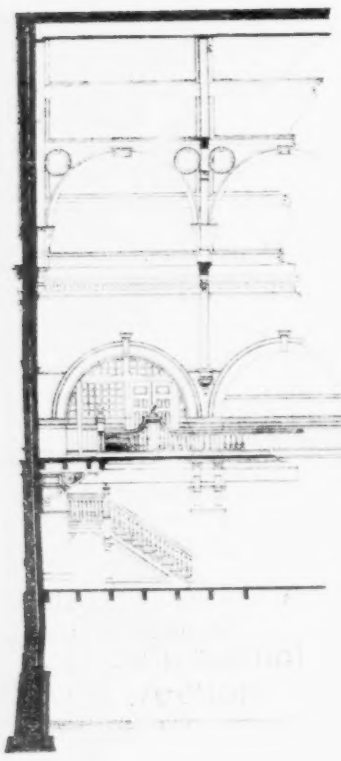
Section showing manner of Ventilating Cupboards

Notes.

The Basement Contains Eight Bowling Alleys, a Base Ball Ground and a Sparring Room, also the Boiler Room W.C's &c.

In the Balcony or Running Track level, are the two Stairway Halls leading to a Meeting Room, Directors Room and the Rowing Room. (A portion of the Track is seen over Screen, in Interior View.)



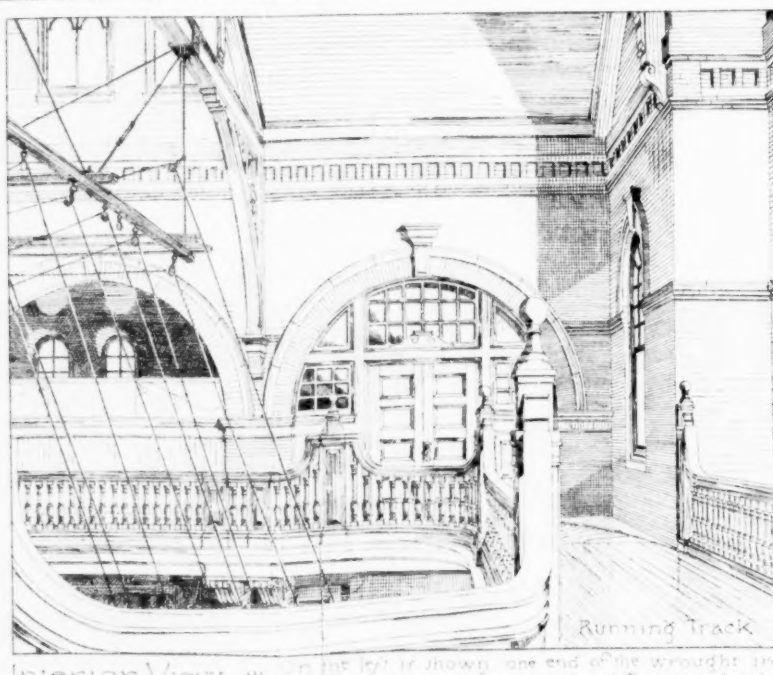


Transverse Section looking toward Principal Front

Perspective View

The HEMENWAY GYMNASIUM

For Harvard College. Messrs. Peabody & Stearns, Architects. CAMBRIDGE, Mass. Boston Mass.


Running Track

Interior View (Drawn in the building)

On the left is shown one end of the wrought iron Truss suspended from the Roof Trusses, to which is attached a Variety of Gymnasium Apparatus

D.A. Gleason Del.

Vase on Front Gable. (B)

Stone Newel at west Entrance (B)

Section and Side Elevation Running Track (B)

Detail of Roof over Meeting Room. (C)

Detail of LANTERN. (C)

Note. The whole Exterior of Lantern from Roof of Building to Finial is Covered with Copper

Half Section and Elevation

Half Plan

Section of Rail.

Head of Well Post

Drop to Well Post

Detail of Stairway From Main Floor to Balcony Floor (A)

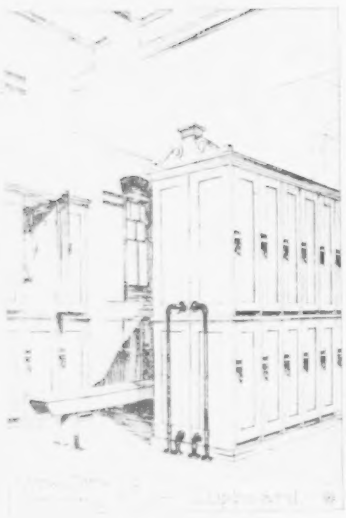
Brown Stone

Newel, Rail and Balusters to Principal Entrance (B)

SCALE For Details marked (A) Inches (B) Feet and (C) Feet.

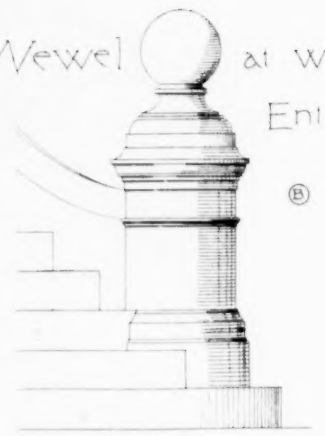
Detail of Score Board (B)

Detail of Bowling



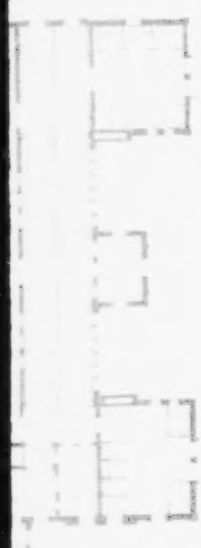
Vase on Front Gable. Ⓑ

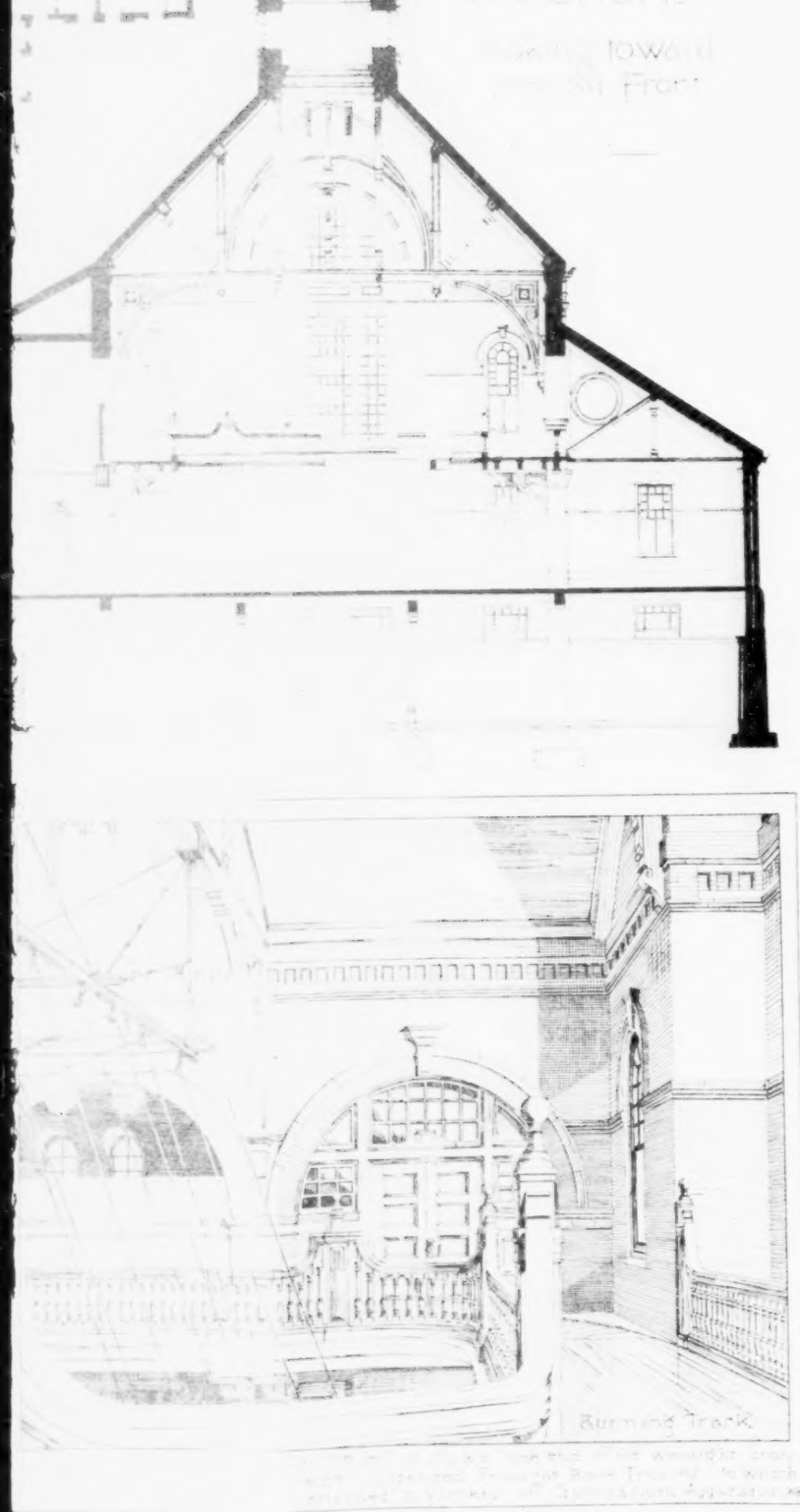
Stone Newel at W Entr Ⓑ



Detail of Roof over Meeting Room ©

Ventilating Shaft





Detail of LANTERN. ©

Note. The whole Exterior of Lantern from Roof of Building to Finial is Covered with Copper

Head of Well Post

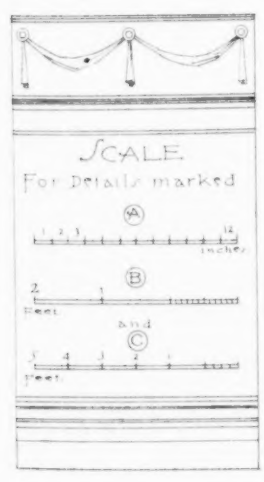
Section Rail.

Drop to Well Post

Burning Track

Half Section and Elevation

Half Plan



SCALE For Details marked Ⓐ 1 2 3 12 Inches Ⓑ 2 1 Feet and Ⓒ 5 4 3 2 1 Feet

west
Entrance
(B)

Section
and
Side Elevation
Running Track
(B)

Front
Detail of
Brackets
Supporting Balcony
(B)

(C)
Large Window in Main Gable

Detail of
Stairway
From Main Floor
to Balcony Floor
(A)

R. Red Brick
B Buff Brick

Brown Stone

Newel, Rail and Balusters to Principal Entrance
(B)

PLAN

Inside Elevation

Outside Elevation

(B)
Detail of
Score
Slate Marked in Square

Detail of One of the (Eight)
Bowling Alleys
in Basement

Section
C.
(Measured at the Building)

Section A

Section B

Elevation

Plan

ing, their size three by five by ten and a half inches. For lining the outside walls they are laid on the edge, and for the partitions flatwise.

The mortar used for laying brick and stone was first made in the usual manner of common lime and sand mortar, but immediately before using, about one-fifth, by measure, of Milwaukee cement was added and well mixed. This has proved to be a very excellent mortar.

The joists throughout the building are three by twelve inches, pine, laid twelve inches on centres on the brick ledges. The space between the joists is built up fair with the face of the ledge to the top of the joists. A strip one by two inches is nailed on each side of the joists three inches below the upper edge. Common bricks are then laid on the strips, the joints and ends slushed full with mortar, and from the top of the brick to the upper edge of the joists filled with Portland cement. The lath on ceilings is three-quarters of an inch wide, pine, put on with half-inch spaces. It was found that by using properly tempered mortar it pressed through the spaces, turned over and completely covered the upper side of the lath. This, with the brick and cement deafening makes it difficult for fire to communicate with the joists. On all walls and partitions the plastering is rendered on the brickwork itself.

The columns shown on the plan, continue through the upper stories; on these at the line of each floor above the chamber, and at the proper height to receive the roof timbers, rest wrought-iron girders. On these girders, and on four wrought-iron trusses, which span the centre of the Chamber, the whole superstructure above the Chamber rests.

The wrought-iron sectional columns cased with porous terra-cotta, as manufactured by P. B. Wight & Co., are used. The iron trusses including tie rods and all girders are cased with the same material, and the whole plastered on the terra-cotta. The columns are first plastered with Portland cement and finished with Keene's cement.

The architect has aimed to make the stairs completely fire-proof. They are inclosed on three sides by brick walls, as shown on the plan.

The stairs are built on iron carriages, with iron risers and slate treads. The carriages rest on wrought-iron girders at the landings. All the iron-work is completely protected by terra-cotta. The floors of the halls are tiled, so that in case of fire, approach to and from the stairs is secured. The same care has been taken with all work connected with the elevator. Much credit is due to the architect for his attention to these important particulars.

The roof is constructed with pine rafters and sheathed with matched boards. The inclined part is slated, the decks tinned. On each part strips one and one-half by one and one-half inches, are nailed on the sheathing at proper distances to receive the nails for slate and tin respectively. The spaces between the strips are filled with Portland cement, and the tin and slate laid solid on the cement. The inside of the rafters and deck joists are covered with porous terra-cotta tiles, screwed to their lower edges. At the meeting of the four corners of the tiles, an iron plate about two inches square, punched to receive the screw, is sunk into the corner of each tile. By this means one screw holds the corner of four tiles. The joints are pointed up, and the whole plastered direct on the tile. By this means, it is thought, the roof is well protected from fire, although the construction is of wood.

The mason-work — except cut-stone — and the carpentry — except mill-work — have been done by the day, a competent foreman superintending each branch of the work. Great care has been exercised to secure thoroughness of execution in all details, and no expense has been spared by Mr. Alex. Mitchell, the owner, to accomplish this end.

The windows in three outside walls afford good light and summer ventilation to the Chamber. Four ventilating stacks well placed for the purpose provide for winter ventilation. These stacks are warmed by steam coils. They are marked R on the plan.

A word with regard to the decoration of the chamber.

As indicated on the plan, the columns, from which spring arches, divide the ceiling into three sections, the centre being sixty feet square. The columns are thirty feet high to the top of the capital. The entablature over the capital is continued on the walls, leaving a space of twelve feet from the top of the entablature cornice to the ceiling.

The north and south walls of the central section are sub-divided by pilasters which are continued to the ceiling cornice. These divide the space above the entablature into three panels. On the south side these panels are occupied by windows. The panels on the north wall contain an allegorical painting, the work of Mr. J. S. Conway, a resident artist of Milwaukee. The painting contains ten figures, nine female and one male. The central figure, representing Commerce, is seated near a "ticker" holding the ribbon in her left hand, the right hand held to the face in thoughtful mood. Approaching her from each direction come other figures each bringing products of the soil, wheat sheaves, fruit, flowers, and ore from the mines, while at her feet sits one, holding a horn of plenty from which are rolling coins. The details of the painting are carefully worked out with points of marked excellence. Especially noticeable is the male figure, which with a backward movement is drawing a car of ore. The strength of the distended muscles in the arms, back and shoulders of this figure is well given by the artist. The coloring throughout is brilliant, but toned by the taste which is the result of studio-work. This painting is the first, outside of the studio, executed by the artist, still a very young man. His work for ten years in Milwaukee has ever given great promise, and this effort receives high commendation.

All other painting, with this exception, is done by Almini. The designs are appropriate and well executed; but I must desist from further remarks, as I fear I have exceeded the space usually allowed to notices of this nature. I offer as an excuse for so doing, the unusual thoroughness with which the entire work on this building has been done. B.

THE RIGHT TO SUPPORT FOR BUILDINGS.

IT may be safely said that no branch of the law is in a more unsatisfactory state than that which relates to the easement of support. In fact, it is at the present time a doubtful question whether any right to lateral support from land to buildings on adjoining land can exist or be created by any means except by express grant. It is to be hoped that, so far as this portion of the question is concerned, the law will soon receive a clear and authoritative exposition, in the judgment of the House of Lords in the case of Angus *v.* Dalton, which has occupied the Supreme Court of Appeal, aided by a committee of judges from other divisions of the Court, during a great portion of last week. When the judgment of their lordships in this case has been delivered, it will be clearly laid down whether a right of lateral support from land to buildings on adjoining land can be the subject-matter of an easement, properly so-called, and be acquired by prescription or user. It is, however, at present an established rule of law that, whatever might be the case with regard to the acquisition of such a right as we have just mentioned, no right of support for buildings from adjoining buildings exists at common law, in the absence of a grant to that effect.

In a case which the *Architect* has reported at length, the parties seem to have been aware of the difficulties surrounding the legal aspect of the case, and to have endeavored by private contract to avoid any possible discussion of the question. In this praiseworthy effort, however, they unfortunately failed, and the result was a four days trial in the Exchequer Division of the High Court of Justice in Dublin. The defendant desiring to rebuild his house, which adjoined the plaintiff's, and apprehending that in so doing he would interfere with certain ancient lights in the plaintiff's house, consulted with the plaintiff and eventually entered into a contract, the terms of which are contained in a letter from the plaintiff to the defendant. The letter was written by the plaintiff and assented to by the defendant without the latter referring to or in any way consulting his architect, and it is evident that to this omission the disastrous consequences which followed were principally due. The plaintiff's letter was in the following terms: —

I consulted my people about your building up against my side wall, and I find the loss of window at workshop will render it useless, as our workmen cannot work with a top or head-light. The light must be obtained from a window or side-light. However, taking your side of the question, I do think it would be a pity to destroy your front, and therefore will consent to remove the work-board to the win low at back wall. This, I think, will save the cost of sky or bell light. For this I will expect what you mention as to ground-plan and back-passage; also that you will undertake to carry off the water from my roof, and not interfere with the good working of my chimneys by your building, nor in any way injure my house. I want to be as obliging as I can without having injury. I also expect that you will protect my house during the time that you are pulling down and rebuilding with such props as may be required, and, in fact, that whatever good you may do me, you will do me no harm.

The defendant's house was then pulled down for the purpose of being rebuilt under the direction of his architect, and it is fair to assume from the evidence that the architect did not carefully examine the plaintiff's house before he proceeded with the work. He does not seem to have anticipated any interference with the support of the plaintiff's house — in fact, the houses seem to have stood without requiring mutual support, and the collapse of the plaintiff's house appears to have been mainly due to the weakening of the piers and the wall adjoining the defendant's house, which had been recklessly cut away by the plaintiff to make room for show-cases and other purposes. No doubt the fall was, in some degree and to some extent, owing to the removal of the defendant's house, and the learned Judge directed the jury that the proper construction of the contract upon which only the action would lie was that the defendant would not, by pulling down or rebuilding his own house, do any injury to the plaintiff's house, but would use due skill and care to protect the plaintiff's walls from any injury by reason of the pulling down or rebuilding of his own.

It has been stated, and it was admitted at the trial by both sides, that the plaintiff had no legal right to support for his house from the defendant's, and therefore, in the absence of express contract, the defendant would not be liable. The jury seems to have found that the defendant did not use due and reasonable skill and care in protecting the walls and house of the plaintiff by proper and necessary props and appliances from sustaining injury by reason of the pulling down and rebuilding of the defendant's house, and assessed the damages at 900*l.*

The learned Judge, in charging the jury, stated that the defendant had entered into the contract and left the conduct of the removal and rebuilding entirely to his builder and his architect, but that he did so without apprising them in any way of the additional obligation into which he had entered by the contract. This, of course, as we have already pointed out, was an omission from which, it is fair to assume, the damage resulted. The architect would appear to have taken for granted that the walls and piers of the plaintiff's house,

being evidently built as self-supporting, had been allowed to remain in a sound state and condition; and such being the case, he had no immediate apprehensions of danger. The mere fact that the architect did take some steps for the protection of the plaintiff's house, which he was not bound to do by virtue of a common law obligation, can scarcely be said to indicate a knowledge of the contract into which his client had entered, for it is not commonly known that a man is freed from any such obligations by the common law. The prudent architect or surveyor, as a rule, takes due and reasonable precautions for the protection of neighboring property, whatever might be his ideas of his legal obligations. This the architect seems to have done in the present instance, and was a fact which evidently weighed with the jury in forming the conclusion they did.

The case, however, is chiefly interesting as showing the importance of the architect being consulted by the building owner before entering into contracts of this kind, and the danger of leaving the architect and the builder uninformed as to his obligations.—*The Architect.*

THE FIRST GREAT SUB-AQUEOUS TUNNEL.

The disaster in the Hudson River Tunnel recalls the vicissitudes of the first great sub-aqueous tunnel under the Thames. Two or three attempts had been made to connect the shores of Essex and Kent by a sub-aqueous passage, but all had failed, when one day, as Brunel was passing through the dockyard at Chatham, his eye was caught by a piece of ship-timber perforated by that most destructive of worms, the *teredo navalis*. The study of its mode of operation suggested the idea of constructing a vast cast-iron shield, which should bore like an auger by means of strong screws, while as fast as the earth was cut away bricklayers should be at hand to replace it with an arch. Sir Isambord Brunel has described it as "an ambulating coffer-dam travelling horizontally." In spite of the failure of Mr. Vasie's operations in 1805, and those of Mr. Trevethick in 1807, Mr. Brunel's plans so commended themselves to the Institution of Civil Engineers and the public, that at a meeting held on the 18th of February, 1824, a company was formed and 1381 shares of stock subscribed for. Borings having been begun to test the soil, the first stone of the shaft on the Rotherhithe bank, about 50 yards from the river, was laid March 2, 1825. The shaft, 50 feet in diameter, was of brickwork, bound with iron and wood, 3 feet thick and 42 feet high. It was built on the surface of the ground, and the earth being excavated from within and underneath, it sank gradually to its final position, the space of 20 feet beneath, left for the opening of the tunnel, being constructed by underpinning. August 11, the underpinning was completed, and October 11, the reservoir at the bottom for receiving the permanent pumps was finished. On the 25th of November, 1825, the shield made its first start, it having been determined to construct the tunnel in the form of a rectangular mass of brickwork 37½ feet wide and 22 feet high, pierced by two parallel horseshoe archways, each 14 feet wide and 17 feet high.

If the non-scientific reader will imagine an edifice of three rows, each of 12 iron boxes 9 feet deep, 6 feet high and 3 feet wide, each box faced with small movable boards and occupied by a workman, he will have an idea of the Brunel shield. It was placed just beyond the completed brick arch. Each man removing one or two boards, excavated some of the clay. When a sufficient space had been cleared the shield was moved forward and the brick arch behind built up, under a shelter of iron "staves" connecting the "frames" of the shield with the completed brickwork. Work was prosecuted under some difficulty, the water often infiltrating rapidly or breaking in at the boards, while, as the men were hired by the piece, things were done rather with an eye to haste than to solidity and safety. On May 11, 1826, 100 feet had been completed, and by August 12, 205. On the 20th, Brunel records: "Found the lowest cell of No. 1 left by the workmen without a single poling against the ground. This is indeed a most unjustifiable neglect." September 8, began an alarming flow of diluted silt lasting for a week, and another occurred in October, showing that the shield was moving close under the water. The engineer, warned by "the men driving on without any consideration or fear of consequences," recorded, November 20, that for nine days he had spent more than twenty hours daily in the tunnel. December 20, through the carelessness of a miner, the whole facing of one frame fell, followed by a caving of the earth, but luckily the river did not break in. February 3, 1827, the tunnel having been driven 406 feet, Brunel complains of the "dust under the Thames."

March 29, they were again in the threatening clayey silt. April 20, some bones and china came down; on the 22d, young Brunel went down in a diving-bell, in 30 feet of water above the shield, and the noise of his driving a rod into the bed of the river could be distinctly heard in the tunnel. On the 29th, and the 8th of May, there were panics, the latter caused by a cave-in of earth, bringing down the deposits at the bottom of the river bed, lumps of clay, stones, bones, nails, etc., with water. On the 12th of May, a shovel and hammer that young Brunel had left in the river when he went down in the diving-bell, worked through the clay into the tunnel; yet on that day, and despite the known danger of the work, the polings in one frame were left off by a careless workman. Well might Brunel write: "Notwithstanding every prudence on our part a disaster may still occur; may it not be when the arch is full of visitors!" On the 18th, the river broke through. One man felt it coming at his board and cried to his mate for help; but the latter replied that his "face" was running in, too. A sheet of water wrapped both and washed them out of their cells, knocking down those who had gone to their help; the water "came in most magnificently," filling the tunnel and shaft, but not a life was lost. Brunel records that being relieved by the catastrophe of the anxiety in which he had been, he spent "a most comfortable night."

On the 20th he adds — apropos of the inevitable sermon by the curate of Rotherhithe, declaring that the accident was "a just judgment upon the presumptuous aspirations of mortal men" — "The poor man!" The ground was promptly reconnoitred from the diving-bell, and the work begun of filling the hole with gravel and clay in bags, rafts and tarpaulins being also sunk. By June 25th the men could re-enter the shield, and did so in order of precedence, the last man out of the works leading the way in. By July 26th they could walk to the frames, and in August the tunnel was pumped dry and work was progressing as usual. December 18th, 1827, found them working in clay, fissured by numerous springs. At 6, A. M., on the 12th of January, 1828, the water again broke in. Young Brunel ordered the men to retreat, and was last to leave the frames, when, with a tremendous roar, the flood came through and washed the timber staging down on him and six other men. Though his knee was badly injured, he swam toward the stairs and was washed up the shaft; all his companions were drowned. The injuries he had received kept him under medical treatment for several months, and the work was temporarily abandoned. After 4,000 tons of clay, in bags, had been lowered into the break, it was filled, the tunnel was pumped out, and the shield bricked in; but then the enterprise came to a standstill for lack of funds. In 1835, on the solicitation of the Duke of Wellington, the government advanced £246,000 to the company, and the work was again begun, some improvements being made in the shield. On the 23d of August and the 3d of November, 1837, and on the 21st of March, 1838, there were irruptions of the Thames, one man being drowned in the second of these. In October, 1840, the Wapping shaft was commenced. It was sunk the entire depth of 70 feet without underpinning, and the junction between it and the tunnel was not made without some difficulty. On the 1st of August, 1842, the work was completed; but the tunnel was not formally opened until March 25, 1843. The accounts presented at the first annual meeting showed that 2,038,477 people had passed through it during the year, producing a revenue of £8,478 2*s* 8*d*, besides which a sum of £460 was derived from the rent of stalls. It had cost £468,000, and as the tolls soon sank to about £5,000 a year, the income barely sufficed to keep the work in repair. Could it have been completed with carriage-ways, it might have paid; but the company could not raise the £180,000 necessary for this purpose. In 1865 the tunnel was bought by the East London Railway Company, for $200,000. July 19, 1869, it was closed as a foot-way, and soon after it began to be employed as a link between the Great Eastern and North London railways and those on the south of the Thames. In 1869–70 was constructed a new tunnel, the Thames Sub-way, with a shaft on Tower Hill; another was constructed from Arthur Street to St. George's Church, Borough, and another from plar to Greenwich. Another tunnel was begun at Woolwich, August 23, 1876.

None of our American sub-aqueous canals had hitherto — so far as we are acquainted — involved in their construction loss of life. Chicago has four of them; two of 5 and 7 feet diameter respectively, lined with two rings of brick, run from the shore underneath Lake Michigan to "the Crib," two miles out, and, from an iron cylinder sunk within the crib receive the water-supply for the city. They cost respectively $157,844 and $411,510. There are also two tunnels under the Chicago River for foot-passengers and vehicles; one at La Salle St., connecting the South and North Divisions, one at Washington St., connecting the South and West Divisions. Cleveland, Ohio, has also a tunnel, 6,606 feet in length, driven out under the lake, at a cost of $320,352, to obtain a water-supply. At Detroit, — or rather under the Detroit River, between Anderson and Stony Island — there is in process of construction a railroad tunnel, 4,450 feet long, without speaking of the approaches and bridges. It is to be completed by December 1, 1880, at a cost of $1.500,000. Preliminary works, it might also be added, are under way at Sangatte and St. Margaret's Bay on the gigantic channel tunnel, which will be twenty-two miles long, without including approaches of nine miles. — *The Iron Age.*

STORM-WATER IN TOWN SEWERAGE.[1] — II.

It is usual in constructing a plan for the sewerage of a town to arrange for the removal of a certain proportion of the water of storms of a certain amount, what is in excess of this amount being got rid of by storm-water overflows. If the amount of rainfall which it is arranged to remove is very small, the purpose is only incompletely attained. If the provision is for the removal of a large rain fall, then the sewers are necessarily too large to be cleansed by lighter rains, and the larger sewers of the system, unless of very steep inclination, are very sure to accumulate deposits to a considerable amount. These deposits are less favorably circumstanced as to ventilation than those in the catch-basins; and, while it is by no means universal, it is very general for the larger sewers to be, except immediately after heavy rains, very foul with accumulations of organic matter undergoing a decomposition which produces the

[1] A paper read before the American Public Health Association at New Orleans, (1880), by George E. Waring, Jr., Newport, R. I.

"sewer-gas" with which we are so familiar. There is doubtless a very considerable production of sewer-gas due to the deposits of street-wash alone; but when we add to these deposits the adhering filth derived from our house-drains, its character is very much aggravated, and the resultant gases become much more pernicious. The confined air of our large unventilated city sewers is rich in the products of this combined decomposition.

It is a favorite theory with engineers that complete ventilation will render these gases inoffensive and harmless. Theoretically this may be true; practically it is not true, for the reason that the complete ventilation of a large storm-water sewer is substantially impossible. The truth of this statement is very clearly established by the condition, especially during warm weather, of the Fourth Avenue tunnel, in New York. This is a large underground roadway less than half a mile in length, and containing two railroad tracks. It is entirely open at each end, and its course is in the direction of the prevailing winds. Its roof is pierced with a constant succession of large openings probably from eight to twenty feet in diameter, opening directly to the sky. The constant passage of cars in both directions must act as a very important source of movement in the air. The utmost care is taken to keep the road-bed clean, and the walls and roof are whitewashed with great frequency. Disinfectants are freely used, and every effort is made to secure a pure condition of the atmosphere. The result is, as nearly as possible, a total failure, and at times the whole atmosphere of the tunnel is absolutely sickening. If no better result can be secured under these most favorable circumstances, what are we to expect of a sewer four or five feet in diameter, deep in the ground, foul from end to end, and with no other means of ventilation than a dozen small holes in the covers of man-holes at intervals of 300 or 400 feet? The condition that we actually find under such circumstances is, almost without exception, unqualifiedly bad. The suggestion has been made that these sewers may be kept safe and sweet by dispensing with the traps on house-drains and furnishing ventilation through the soil-pipe which extends from every connection. So far as the sewer is concerned this would doubtless mitigate the difficulty to a certain degree; but it is certainly of very questionable propriety to establish such a source of foulness as the decomposition of the filthy deposits of a sewer, and then to attempt to alleviate the difficulty by carrying the extremely offensive gases through our soil-pipes.

The ingenuity of the engineering profession has exhausted itself in attempting to get rid of the effect of sewer-gas when once it has been produced. We have never yet reached anything better than the terse recommendation of a London authority to the effect that "we must let the stink out into the middle of the streets."

The conditions by which the world was driven to this very unsatisfactory result were, under the old systems of flushings, substantially unavoidable, and what has been done in the way of city sewerage has been in the direct line of progressive improvement. It seems to me that the time has now come when a new departure should be taken, and when the sewer-gas difficulty should be met by prevention, rather than by attempts at cure. It is clear that under the present combined storm-water and foul sewage system, prevention is simply impossible. The production of foul gases is an unavoidable attendant upon every application of that system. All that is to be said on the other side is that, to withdraw the flushing effect of storm-water, and to leave household wastes to take care of themselves in small pipes, would result simply in an aggravation of the difficulty.

Fortunately, within the past few years the conditions of the problem have been radically changed. Formerly it was restricted by limitations in the matter of flushing. Small pipes could not safely be used for sewage proper to the exclusion of storm-water, because storm-water was needed to flush them out. This statement of the case is practically true, although not strictly true. Flushing by means of man-holes at the heads of the lines, into which water was to be poured, or where a tumbling-tank might be set, or flushing by means of various manual operations, all made the use of small pipes possible, but left it very undesirable, inasmuch as it is always undesirable to rely on manual operations or on the action of moving mechanism to keep sewers in condition. It is therefore quite proper to say that the possibilities of the art of sewerage underwent a radical change on the invention of Rogers Field's annular siphon for emptying flush-tanks. This invention, which includes no moving parts and the action of which is positive, makes it possible for us to accumulate the flow of a stream yielding not more than five gallons per hour until it shall have filled a tank or reservoir of any desired size, with the certainty that the continued flow of the same stream after the tank shall have become full will cause the whole accumulation to be discharged into the head of the sewer with such rapidity and force as to give it an effective flushing. It is now entirely safe to use pipes of as small size as the quantity of the sewage will permit, and recourse to storm-water flushing is no longer necessary.

Therefore the question of what we are to do with storm-water presents itself in a new form. It seems to me very clear what we are not to do with it; that is, that, in my opinion, we certainly ought not to admit it to sewers which are in connection with the drains of houses. While the impurities of storm-water are by no means the *chief* factor in the production of sewer-gas, the admission of these impurities to large sewers is undoubtedly the most serious *cause* of its production. Fæcal matter carried completely through the sewers and discharged at its outlet within a few hours of its admission would do no especial harm; but fæcal matter added to the accumulations of mud and sand and sticks and rubbish strewn along the usual large brick sewer, in the absence of daylight and practically in the absence of ventilation, is so situated as to produce its very worst effect.

As I have already said, the question: What shall we do with storm-water? is the most pressing question in sewerage engineering at this time. Our practice has been almost universally to deliver it into deep sewers. This, I venture to say, is generally a mistake, and is almost always quite unnecessary. Proper provision being made for the drainage of the sub-soil, our only care with regard to the rainfall is to provide means by which it shall escape without material inconvenience to traffic; that in its escape it shall wash the street gutters, and that the greater storms shall not harm public and private property. There is nothing in the nature of rain-water which makes its temporary presence on the surface of the ground injurious to health. There is no reason why it may not be discharged over the surface of the streets and along the gutters, provided its volume is not so great as to interrupt or seriously to interfere with traffic. Therefore, as the roadside gutters are in full view, and may easily be kept clean and in repair, there is no reason why the water which falls from the heavens may not flow through them, for at least so far as they are able to keep it within bounds. Sooner or later, in the larger cities, the water of copious rains will get beyond its bounds, and the flow of the gutters will spread out over the street or will rise on to the sidewalk. After the discharge of a certain number of gutters has accumulated, there may be danger, during violent storms, of injury to the pavement, of the filling of cellars, or of serious interruption to travel. Then, but not until then, it will become necessary to carry the flow below the surface of the street and lead it to a safe point of outlet.

Now there is a great difference between carrying storm-water underneath the surface of the ground and only at points where there is danger of serious flooding, and the present practice of carrying the whole rainfall from the hill-tops as well as from the valleys, first into foul and costly catch-basins and then into deep and costly sewers. In my judgment, the latter course is, to use the mildest expression, unscientific and unpractical; while the other fulfils the best requirements of common sense. If the art of town drainage had never been practised, and if the proposition were made for the first time to Mr. Chesborough, or to Mr. Lane, or to Mr. Moore, or to Mr. Shedd, or to Mr. Philbrick — all skilful engineers — I am sure that it would never occur to one of them to get rid of it by channels from ten to twenty feet below the surface of the street and extending under all the streets of the city. It has been led there only by the conditions under which the work of sewerage has been developed. The occasion for its being taken there no longer exists, and an entire reformation in this part of the work is demanded.

It would be absurd for any one at this early day to prescribe any substitute for the old practice as being the best. All that it is safe now to say is that storm-water should be kept on the surface of the streets as long as possible, and that when its accumulations must necessarily be carried beneath the surface, they should be carried only to such depth as is requisite to get them out of the way and to prevent the filling of their channels with ice during slight flow in cold weather.

It will probably be a very long time before we arrive at the perfection of this method of delivery. We shall have annoyances of various sorts, and we shall doubtless encounter some serious difficulties in the matter of the crossing of streets. Until some substitute is devised for depressed gutters we shall receive a certain amount of unfavorable comment from those who enjoy a level and uninterrupted roadway. Let us remember, however, that all of these drawbacks relate solely to the personal convenience of the people, and that they involve no serious dangers. That we may not be appalled by the idea of creating such annoyance, let us consider for a moment the other side of the question. Leaving now entirely aside all consideration of sewer-gas, the cleansing of large sewers, etc., think for one moment of the effect of the rapid delivery through sewers of storm-water which, if flowing more slowly through the street gutters, would do no material harm; think of the gorging of the large sewers of Providence, and the back-flow of sewage-matter through the kitchen sinks and basement water-closets of some low parts of that city; think of the vast trouble of a similar kind that has occurred in Brooklyn, where not only have the houses themselves been invaded by sewage matter during heavy storms, but where the man-hole covers have been lifted, and the torrent has poured over the surface of the streets and of the sidewalks; think of London, the theatre of the proudest achievements of the drainage engineer, a city whose intercepting sewers are a model for the world, and all of whose ills were supposed to have been cured by Sir Joseph Bazalgette's achievements — but where, alas for the hopes of the engineer! he has been, if not hoist by his own petard, drowned in his own sewage.

Many of the lower parishes are crying aloud for relief from the stinking floods with which the new sewerage system is deluging their poor inhabitants. The storm-water has been got rid of with a vengeance. It has been robbed from the surface of the streets where it would have done good sanitary service in flushing the gutters, and has been delivered into sewers of great velocity to accumulate at the lower levels far beyond the capacity of the pumps to remove it, and has become the curse of wide, low-lying areas, where but for the sewers it would at least have arrived so gradually as to have done infinitely less harm.

In closing, permit me to formulate my opinion on the subject by saying that the present manner of disposing of storm-water in sewered towns by removing it from the surface where it is needed, to the sewer where it creates a nuisance, is a "relic of barbarism"; and — I beg that my respected friends of the engineering profession will pardon me — that its continuance indicates an over-riding of reason by tradition.

INWOOD.

To the Editor of the American Architect:—

In your issue of December 18th, you describe the site of the proposed Exhibition of 1883 as being "ten miles north of the City Hall, *in what was lately Westchester County.*" This is an error. It (the site) is part of Manhattan Island, and has always been in *New York* County. Reader.

NOTES AND CLIPPINGS.

What Becomes of our Forests. — A paper-manufacturing firm purposes converting twenty thousand acres of timber-land in Somerset County, Pennsylvania, into paper. A large gang of workmen has been sent to the tract to begin improvements. There will be erected a shanty fifty feet in length, twelve feet in width, and eight feet high. The shanty once completed, work will be begun on a large store building, thirty dwelling houses, and an enormous digester for the cooking and steaming of wood in the manufacture of pulp, and a huge building to be used in the manufacture of paper sacks and wrapping paper. All these preparations are preliminary to reducing 20,000 acres of forest to news, books, and fine writing papers.—*Chicago Tribune.*

St. Stephen's, Vienna. — The exterior of this famous cathedral, as is known, has undergone thorough restoration, and certain modifications of the interior are at present the subject of lively discussion. The proposed removal of the hideous altars, in the worst style of Renaissance, which conceal and disfigure the massive pillars of the nave, could hardly be objected to. The dimmest religious light always reigns in St. Stephen's, and doubtless hundreds of visitors depart without suspecting that the dark coloring of the stone which causes it is entirely artificial. A portion of the paint has been cleared off by way of experiment, but the innovation will probably meet with much opposition. Well may the Viennese be jealously careful of their ancient monuments. It is strange that so historically ancient a capital should have so few to show. Of old Vienna, what little remains is rapidly being demolished to make way for larger, airier, and presumably healthier places of residence. It would seem as if soon no traces of ages ago would remain, no token of vanished customs and traditions, but the famous Stock im Eisen. — *Correspondence of the Philadelphia Bulletin.*

A Museum's Lost Treasures Found. — "A sort of out-house, easily accessible to persons in the street," does not seem the most likely place in the world in which to discover a valuable treasure-trove of engraved gems, globes of crystal, pieces of carved ivory and amber, and other costly and curious objects, yet it was in such an unpromising locality that a great find was lately made in the vicinity of the Ashmolean Museum at Oxford. It appears that it has long been known, from an ancient catalogue, that many interesting objects which figured in the collection of the founder of the museum more than 200 years ago were nowhere to be found, although diligent search has been made for them. Now some of them have turned up in a shed exposed to the depredations of any feloniously minded persons existing in the academic city, and it may be supposed that the spirit of discovery once set to work will not rest until the other curiosities anciently in the possession of the worthy Lambeth merchant who founded the "Ashmolean" have been unearthed. Among the rarities already brought to light is a splendid Persian hookah, of antique shape, made of silver inlaid with turquoises. A brick, supposed to have belonged to one of the earliest Chaldean monarchs, is another antiquarian gem; but perhaps the most interesting object of all is a hawking-glove once worn on the hand of King Henry VIII. which has lain for three centuries moldering under a heap of rubbish in a forgotten corner of an Oxford shed. — *London Telegraph.*

An Elaborate Tomb in Vermont. — A correspondent of the Montpelier (Vt.) *Watchman* describes at some length a tomb now nearly completed in a small rural graveyard in that State. It is situated in the little hamlet of Cuttingsville, a few miles below Rutland. The total cost of the structure will exceed $60,000, and it is being erected at the order of Mr. Beaman, a wealthy resident of Chester, N. Y., and a native of Clarendon, Vt., in memory of his wife and daughter and an infant grand-daughter of whom he has been bereaved by sudden and repeated strokes, and for whom, in his own quiet language, he is building, in cost at least, the house he intended for them. Nearly 100 men have been busy on various departments of the labor for months past. In general exterior character it is a massive granite mausoleum vestibule sheltering the vault that contains the cherished dead. The granite blocks inclosing the sides and the roof are of immense massiveness, that of the roof weighing nine tons. The door is a granite monolith of eight tons' weight, designed to be kept closed at inclement periods of the year. At other times the entrance is kept by an open grating door of massive bronze, to cost $5,000. The whole interior is of choice white marble, not in ashlars or thin scale-work, but in massive blocks, that of the ceiling weighing five tons in a single stone, deeply wrought into domed roof-work, with emblems and tracery of the most elaborate character. The chief features within are statuary memorials of the dead on richly wrought consoles. At the four angles are placed mirrors, so set as to be protected from the elements. The only external statue is the angel of immortality kneeling at the door, with the key to the portals of the tomb in her hand.

Ancient Rome. — The slopes of the Tusculan Hills, facing Rome and the Campagna, were more densely crowded with villas in ancient times than they are now. This difference is easily understood. Aristocratic families were then more numerous and wealthy; they cherished their native land; travelling abroad in summer was more difficult than pleasant; the country around Rome was then more healthy and fit for summer residence than it is now. The lowest of modern villas at Frascati, the Pallavicini, although built at a height of 303 millimetres above the sea, is subject to malaria from June to October. In ancient times the salubrious region began at a height of 100 millimetres, thus affording an immensely wider space for summer residences. The villa of the Cæcilii, now called I Grottoni, stands at 132 millimetres; the beautiful villas called Cisternole, St. Matteo, Bevilacqua, etc., range between 100 and 200 millimetres above the sea. To this lower region, actually saturated with malarious sporules, belongs the villa of the Emperor Galba, the ruins of which ought to be better known and more frequently visited by the student or the tourist. They cover a wide space east of the railway station of Frascati. The piscina of this villa is one of the largest in Latium. It is 120 feet square, 30 feet deep, divided into six galleries by five rows of pilasters, and holds 70,000 cubic feet of water. Such capacity was not deemed sufficient for the wants of the place. Another reservoir, 135 feet long, 42 feet wide, was added close by, thus bringing the storage of winter water for summer purposes to 130,000 cubic feet. Between the piscina and the palace a lead pipe was found in 1705, inscribed, "Felix arkarius imp. Sergii Galbæ," a document which leaves no doubt as to the site of the villa, mentioned twice by Suetonius, in chapters 4 and 18 of Galba's life. The imperial palace stood where stands now the "Campitelli" farm-house — a perfect labyrinth of reticulated walls, with mosaic or marble pavements, niches for statues, fountains, etc. On the hill called Floriano are remains of other buildings, inclosed by a wall 2,000 feet long. Here some months ago a cryptoporticus was discovered, with stucco bas-reliefs on the ceiling, of the finest workmanship. They represent panoplies of Roman and Eastern weapons, crowns of laurel and oak, sea monsters, and other miscellaneous subjects. I have mentioned this "Tusculanum" of Galba because it will be explored and searched in a scientific way in the course of the winter, and because of its connection with the history of malaria, the summer plague of the Campagna. Two things are absolutely certain: first, that the site of the villa is now utterly unhealthy, and subject to the influence of pernicious fevers from June to October; secondly, that in ancient times it was healthy and fit for a summer staying. Suetonius tells plainly that Galba *æstivare consuerat* in this place, which it would have been foolish to do unless its hygienic condition were altogether different.—*R. Lanciani, in the Athenæum.*

Nature's Big Gas Tanks. — Bradford, Pa., and neighboring places are lighted and heated by natural gas. In 1875 an oil company was sinking a well on a high hill west of Bradford. At the depth of several hundred feet they struck a vein of gas. No oil was found. The force of the gas was such that when it was ignited a pillar of fire more than fifty feet high was formed. The roar of the gas could be heard for a mile and more. This burned for months. The heat was such that the grass and foliage grew in the depth of winter as luxuriantly for hundreds of feet around as it did in the summer. Strawberries ripened near this well in February. The well had been burning for a long time before the feasibility of utilizing it was thought of. A belt of dry territory, but yielding vast volumes of gas, was subsequently found to exist in the vicinity of the original gas-well. A company was formed to carry the gas into the city. It is now distributed all over the place by pipes. A gas-pipe, with jets attached, is run into parlor and kitchen stoves. The supply of gas is controlled by a stop-cock on the pipe. When a fire is wanted a lighted match is thrown into the stove and the gas turned on. The fire is started at once. The gas possesses great heating qualities, and apartments are warmed as quickly and as well by it as by coal. Gas for illuminating purposes is conducted into the houses the same as artificial gas is taken in. At first the light was not brilliant and steady, owing to impurities. Processes for refining it were invented, and now the natural illuminator is unsurpassed by the finest manufactured gas. It is so cheap that people seldom turn out their lights. It burns day and night in stores, hotels, private houses and streets. Consumers pay by the month instead of by the thousand. Gas-wells have come to be more valuable than oil-wells, and the sudden and phenomenal appearance of oil in some of the principal wells in the gas belt has created consternation among owners and consumers. For years the gas has flowed from the wells in unremitting volume. That oil was not to be found there it was thought had been conclusively settled. A few days ago one of the wells ceased in its gas supply. It was found to be half full of oil. Fifteen barrels of excellent crude oil were pumped out, and the gas flowed again. One or two of the other gas-wells exhibited the same phenomenon. It is necessary to pump the oil out daily before the gas will flow. This sudden appearance of oil in territory that was considered dry has not yet been satisfactorily explained.—*Philadelphia Telegraph.*

The Woolwich Crane. — The colossal crane at Woolwich, which has been upwards of four years in process of erection, assumed a definite shape on November 30. The immensity of the work is illustrated by the weight of the iron employed in its construction, which, in the aggregate, exceeds one thousand eight hundred tons, while the brass bearings alone amount to more than three tons. When completed the crane will be capable of lifting three or four 100-ton guns at once; but the purpose for which it has been provided is not to do work which other appliances could accomplish in detail, but rather to meet the probable necessity for dealing with specimens of ordnance so enormous as to defy all the means at present available for mounting them on their carriages. The motive power will be steam. Although calculated to raise 1,200 tons in case of need, the apparatus will also be fixed for raising small weights at accelerated speed, and it is anticipated that, even in the ordinary daily work of the Royal gun factories, to which department it belongs, it will prove a valuable auxiliary. The great machine has been designed by Mr. R. S. Fraser, Deputy Superintendent of the department, and the work carried out by General Younghusband and Colonel Eardley Maitland, the past and present superintendents.

BUILDING INTELLIGENCE.

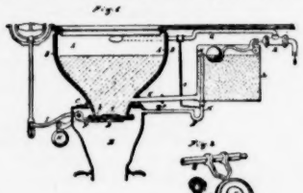
[Reported for The American Architect and Building News].

[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.]

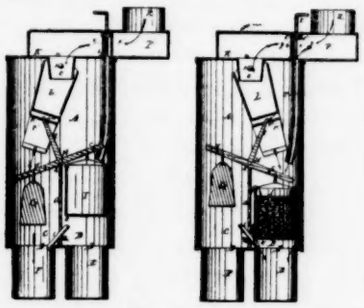
BUILDING PATENTS.

[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.]

234,934. WATER-CLOSET. — Alexander G. Alexander, Detroit, Mich. This invention relates to that class of water-closets in which a valve is held against the neck of the bowl. The improvement consists in the combination, with the water-closet bowl and a trunk fitted to the under portion of the bowl, of a tank connected by a pipe with the bowl, the main service-pipe leading into the bowl, an overflow-pipe formed with a trap and leading from the tank into the trunk, and a small pipe connecting the main service pipe with the overflow-pipe at a point above the trap in the latter. A is an ordinary porcelain bowl. B is a cast-iron shell into which A is set. The inside of the bowl B may be enameled and used without the porcelain bowl A. The bowl B extends below the top of the trunk E, and is bolted to it. E is an ordinary cast-iron trunk connecting with the soil-pipe. D is a metal disk, the edge of which is curved upward to form a rim. S is a rubber disk fitting on the upper surface of D, the two forming a valve, which shall hereinafter be called D. The lower end of B forms a seat for valve D. G is a rock-shaft carrying an arm, F, on the outer end of which arm is bolted the valve D. H is a weight which keeps the valve D firmly closed. L is a small water-tank. K is a pipe which runs from the lower part of tank L into the bowl B, near its bottom, above the valve D. M is an overflow-pipe leading into E, and having a trap, N. O is a small pipe leading from the water-inlet pipe to the overflow-pipe M, between the trap and the tank. P is a ventilating-pipe for overflow-pipe M, which may be led to any convenient ventilating-flue. Q is the water-inlet pipe. R is a float or ball valve, of any ordinary form, for opening and closing the water-inlet pipe Q. It is very desirable in a water-closet using the ordinary tapering bowl to hold the water in the bowl at all times sufficiently high to prevent the side of the bowl from being soiled, to insure a good supply of water when the discharge-valve is opened, and to insure the filling of the bowl to the desired height when the discharge-valve is closed. This cannot be accomplished in the ordinary pan-closet. The construction and operation of this closet are as follows: the tank L is placed at the side of the bowl B, and is connected with the bowl by the pipe K, which should be of much larger diameter than the inlet-pipe Q. As the water in the bowl and tank will stand at the same level, the tank should be so placed that the water-line at which the float-valve R will close will be the line at which it is desired to hold the water in the bowl. The water-inlet pipe Q is connected with the bowl in the usual manner. The pipe Q is connected with the float-valve R. The valve D being closed, and the tank L and bowl B empty, water would enter the bowl B from the inlet-pipe Q, and pass into the tank L through the pipe K, until the water in the tank rose high enough to close the float-valve R, when the flow through the inlet-pipe would cease. When the valve D is opened the water in the bowl escapes into the trunk E, the water in the tank L is discharged into the bowl through K, thoroughly washing the lower part of the bowl and the face of the valve D, and the float-valve R opens and admits water through the inlet-pipe Q to bowl B. On closing the valve D, the bowl and tank are again filled with water and the flow of water checked, as above explained. At each opening of the float-valve R, a small quantity of water passes from the inlet-pipe Q to the overflow-pipe M, above the trap N through the small pipe O, thus occasionally changing the water in trap N.



233,943. WATER CUT-OFF. — W. J. McLeod and G. H. Cormack, Rockford, Ill. The object of this invention is to furnish an automatic cut-off to be attached to rain-water conductors, which shall exclude from the cistern the water that first falls on the roof, and admit only pure water. It consists of a metal casing, as shown, which is divided in its lower part into two divisions by the vertical wall, O, to the top of which is attached a three-armed lever, from one of whose arms is suspended a vessel, I, while from the opposite arm is hung a weight, G, which just counterpoises I when filled with water; the third arm is attached to the tilting spout, L, and directs its movement to one side or the other. The bottom of the vessel, I, is perforated with a hole, which allows its contents to drip slowly away, the drops falling upon the inclined slide, *l*, whence they pass into the waste-pipe, F, and so do not enter the cistern. Water enters the vessel, I, by the pipe, *i*, which passes up through the receiver, P, and is fastened to its top. An opening is cut in this pipe, *i*, the full height of the receiver, P, and means are provided for closing it at will by the handle which projects above the top of P. The rain-water conductor enters P at R. The action of the apparatus is as follows, the normal or dry-weather position being shown by the left hand cut: The first flush of water descending from the roof, more or less befouled, passes through



the receiver and escapes to waste through the spout, L, which is held by the weight, G, in position to discharge into F. But a certain portion of this foul water finds its way into I through the opening in *i*, and as the bore of this pipe is larger than the orifice in the bottom of I, this vessel gradually fills, and at length more than counterbalances the weight of G, and so brings about a change in the position of L, which then discharges the water, now pure, into the cistern through E. This it continues to do while the shower lasts. When water no longer passes into P, that which is in the vessel, I, slowly drops away, and the weight, G, asserting its power once more, returns the apparatus to its dry-weather position.

235,629. FLOAT-TRAP FOR WASH-BASINS, ETC. — John W. Grows, Brooklyn, N. Y.

235,632. SASH-FASTENER. — Antone Hoytt, San Francisco, Cal.

235,659. FURNACE AND BOILER. — Stephen W. Underhill, Croton Landing, N. Y.

235,660. WINDOW-SCREEN. — Jersey Ward, Ottumwa, Iowa.

235,664. ELEVATOR. — John B. Atwater, Geneva, Ill.

235,676. SHUTTER-FASTENER. — Michael Fiset, Albany, N. Y.

235,677. ILLUMINATING TILE FOR ROOFS AND PAVEMENTS. — William J. Fryer, Jr., New York, N. Y.

235,683. HYDRAULIC ELEVATOR. — Orson E. Merrill, Beloit, Wis.

235,737. CONSTRUCTION OF COMPOSITE ROOFS. — John Brokenshire, Kingston, Ontario, Can.

235,754. HOUSE-DRAINAGE APPARATUS. — Caleb W. Durham, Chicago, Ill.

235,793. SASH-FASTENER. — David McCurdy, Ottawa, Can.

235,795. HATCHWAY-DOOR MECHANISM. — Charles H. Mitchell, Chicago, Ill.

235,810. INSECT-GUARD FOR WINDOWS. — Geo. B. Tullinger, Philadelphia, Penn.

235,811. INSECT-SCREEN. — The same.

235,812. The same.

235,837. FIRE-EXTINGUISHER. — Bennett C. Wilson, Philadelphia, Penn.

235,841. PAINT-BRUSH. — Edward Wright, Beckenham, County of Kent, Eng.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS. — Only one building permit has been issued since the last report, viz.:

Jacob Saum, 5 three-st'y brick buildings on Division St., north of Bloom.

WAREHOUSE. — Mr. Charles L. Carson is preparing drawings for a new warehouse for Mr. D. C. Howell, on Lombard St., near Sharp, to be 40′ x 60′, five stories high and basement, of brick, with stone trimmings; cost, $18,000.

Boston.

BUILDING PERMITS. — *Brick.* — *East Dedham Street*, near Albany St., for Wm. H. Leatherbee & Son, dry-house and storage for lumber, 25′ x 82′, three stories.

CLUB HOUSE. — The plans of the new building for the Boston Art Club are now in progress at the office of Wm. R. Emerson. The building is to be located at the corner of Dartmouth and Newbury Sts.

Brooklyn.

BUILDING PERMITS. — *Wyckoff St.*, s s, 201′ 2″ w Fifth Ave., 5 three-st'y brown stone tenements, 20′ x 45′; owner, Geo. W. Brown, 728 Fulton St.; builders, Levi Brown and C. E. Cozzens.

Bushwick Boulevard, e s, 100′ s Forrest St., two-st'y brick stable, 34′ and 24′ x 68′; owner, Claus Lipsius, Bushwick Boulevard, cor. Forrest St.; builder, Geo. Lehrian.

Central Ave., s w cor. Troutman St., three-st'y frame store and tenement, 25′ x 50′; owner, Julius Dewald, Central Ave., near Troutman St.; builders, Mr. Bayer and John Rueger.

Chicago.

BUILDING PERMITS. — C. W. Lasher, 6 two-st'y brick dwells, 120′ x 38′, cor. of Webster Ave. and Sedgwick St.; cost, $18,000.

J. B. Weeks, two-st'y brick addition, 24′ x 52′, cor. of Taylor St. and Western Ave.; cost, $3,000.

Estate P. F. W. Peck, to restore five-st'y building, 45 and 47 Wabash Ave.; cost, $25,000.

Henry Strong, 2 five-st'y brick stores, 40′ x 95′, Fifth Ave., north of Monroe; cost, $25,000.

Gray Iron Co., three-st'y brick factory, 140′ x 40′, cor. of Erie and Kingsbury Sts.: cost, $25,000.

PRICES. — The material market is firm, and, for the season, active. The late long spell of mild weather came opportunely, and has been taken advantage of for the prosecution of a large number of buildings still in course of construction. Should the winter remain mild, the stock of brick and lumber on hand will run low before it can be replenished, and prices will rise.

THE PROSPECT. — Quite a number of extensive building enterprises are on architects' boards for early spring. Spite of the unprecedentedly large number of houses built during this year, all are occupied. Manufacturing capital has been attracted Chicagoward. Existing works are enlarged, and new enterprises about to be entered into. Taken altogether, the activity of the building season of 1881 promises to exceed anything Chicago has known during the last eight years.

New York.

BUILDING PERMITS. — *One Hundred and Twenty-Seventh St.*, s s, 333′ e Eighth Ave., three-st'y brown stone dwell., 16′ 8″ x 50′; cost, $7,000; owner, Clara D. Lynch, 159 West One Hundred and Twelfth St.; builder, Samuel Lynch.

Forty-Ninth St., No. 636 w, one-st'y brick boiler room, 35′ x 100′; cost, $6,000; lessees, Commercial Manufacturing Co.; architect, Chr. Sturtzkober.

Seventieth St., n s, 82′ e Fourth Ave., four-st'y brown stone dwell., 18′ x 61′; cost, $15,000; owner, J. A. Frame; architect, J. G. Prague.

Fifty-Ninth St., No. 38 w, five-st'y brick and Dorchester stone school, 25′ x 65′ 8″; cost, $20,000; owner, Abraham Dowdney, 411 East Sixty-Fifth St.; architects, Schwarzman & Co.; builder, A. Dowdney.

Thirty-Second St., Nos. 116 *and* 118 e, six-st'y brick warehouse, 40′ x 97′ 9″; cost, $20,000; owner, J. H. Morrell, Fourth Ave., s e cor. Thirty-Second St.; architect, M. C. Merritt; builders, Amos Woodruff & Sons and McGuire & Sloan.

Sixty-Third St., Nos. 13, 15, 17 *and* 19, e, 4 four-st'y brown stone dwells., 17′, 20′ and 21′ x 65′, with two-st'y extension, 9 x 12′ 3″; cost, each $25,000; owner, Richard Hennessy, 138 East Sixty-Third St.; architect, James Stroud.

Lexington Ave., s w cor. Ninetieth St., five four-st'y Connecticut brown stone tenements, 20′ and 20′ 8″ x 65′; cost, each $12,000; owner, E. Sharkey, 207 East Seventy-Seventh St.; architect, Thomas S. Godwin.

One Hundred and Sixteenth St., s s, 275′ e Second Ave., 2 three-st'y Connecticut brown stone dwells., 20′ x 50′; cost, each $11,000; owner, James Gault, 210 West Fifty-Third St.; architect, Emil Schultze.

Lexington Ave., w s, from One Hundred and Thirteenth to One Hundred and Fourteenth Sts., 10 four-st'y brick flats, 20′ x 55′; cost, each $9,000; owner, Ann E. Davis, 1658 Lexington Ave., cor. One Hundred and Fifth St.; architect, J. H. Valentine; builder, Jno. B. Davis.

Second Ave., w s, 50′ s One Hundred and Thirteenth St., 3 four-st'y brick flats, 21′ 3″ x 55′; cost, each $9,000; owner, Ann M. Jenny; architect, J. H. Valentine; builder, Jacob Jenny.

Forty-Fourth St., n s, 150′ e Second Ave., 4 four-st'y brick tenements, 25′ x 60′; cost, each $9,500; owners, F. E. Smith, H. Ellis, and P. Toner, Courtlandt Ave., One Hundred and Sixty-Second St.; architect, Jas. Stroud; builders, F. E. Smith and Amy Ellis.

Seventy-Ninth St., n s, 200′ e Third Ave., five-st'y brick tenement, 40′ 7″ x 65′; cost, $20,000; owner, Peter F. M. McManus, 1467 Third Ave.; architect, T. S. Goodwin; builder, P. McManus.

ALTERATIONS. — *Pearl St., No.* 112, building altered for offices; cost, $5,000; owner, Estate J. Caswell, 87 Front St.; builder, J. M. Dodd, Jr., and L. H. Williams.

Ave. A, Nos. 311 *and* 313, one and four-st'y brick extensions, 21′ x 59′ and 28′; cost, $2,550; owner, Wm. Montrose, 311 and 313 Ave. A; architect, F. W. Klempt.

Cliff St., Nos. 29 *and* 31, repair damage by fire; cost, $2,150; owner, New York Life Insurance and Trust Co., 52 Wall St.; builder, Henry Wallace.

Broadway, No. 98, raised two stories, iron and brick roof; cost, not estimated; owner, Wm. Astor, 87 Prince St.; architect, Thos. Stent.

SCHOOL-HOUSE. — Messrs. H. J. Schwarzmann & Co. are the architects of a school-house to be erected at No. 38 West Fifty-Ninth St. It will be 25′ x 65′, of brick, with brown and Ohio stone trimmings, and will cost about $20,000; Mr. A. Dowdney is the owner and builder.

FACTORY. — Mr. Geo. Ehret will have built in the spring, from designs of Messrs. H. J. Schwarzmann & Co. a factory, 65′ x 100′, and tenement house, 30′ x 61′; both buildings to be of brick and blue stone; probable cost, about $80,000.

STATION-HOUSE. — The Board of Police Commissioners have invited proposals for building a new station-house and prison on Elizabeth St.

CHURCH. — The corner-stone of the new chapel of the One Hundred and Eleventh Street Methodist Episcopal Church was laid Dec. 23. The new chapel is to cost $20,000, and will seat about 600 people.

St. Louis.

BUILDING PERMITS. — Eleven permits have been issued since our last report, of which two are for frame structures of slight importance. Of the rest, those worth $2,500 or over, are as follows: —

OWNERS' NAME.	USE.	STY'S.	R'MS.	COST.
J. F. Drummond,	Tobacco fact'y	6	6	$4,000
Blackmer & Rust,	Clay pipe "	3	3	5,000
St. Louis Mutual House Building Co. No. 3,	Dwell.,	3	14	8,500
Frank I. Bauman,	Dwell.,	3	16	1,250

Philadelphia.

BUILDING PERMITS. — *Tasker St.*, west of Seventeenth St., two-st'y dwell., 16′ x 49′; Daniel Drummond, owner.

Sixteenth St., north of Venango St., three-st'y dwell., 18′ x 12′; W. Achuff, owner.

Sixteenth St., cor. Alleghany Ave., two-st'y stable, 25′ x 40′; Rea & Riley, contractors.

McIlwain St., No. 421, two-st'y stable, 16′ x 30′; P. Murtha, owner.

[Continued on next page.]

Publishers' Department.

The American Architect and Building News.

PUBLISHED EVERY SATURDAY BY

JAMES R. OSGOOD & COMPANY,

211 Tremont St., Boston, Mass.

New York Office, 21 Astor Place.

An Illustrated Journal of Constructive and Decorative Art, devoted to the Interests of Architects, Builders, Decorators, etc.

15 cents per copy; $7.50 per year; $6.00 in advance; 12 Monthly Numbers, with Detail Sheet, $1.75.

☞ Payments should be made *directly* to the publishers, either by draft or post-office order.

JAMES R. OSGOOD & CO., *Publishers.*

211 Tremont St., Boston, Mass.

Ninth St., between Reed and Wharton, two-st'y building, 16′ x 20′; Chas. Leach, owner.

Hope St., cor. Huntingdon St., two-st'y stable and smith-shop, 20′ x 20′; J. S. Steel, contractor.

Hope St., No. 2408, two-st'y stable, 15′ x 20′; Jno. McCann, owner.

Additions. — *South Nineteenth St., No.* 115, fourth st'y addition to dwell., 19′ x 20′; Stacy Reeves & Son, contractors.

Washington Ave., No. 2038, second story addition to building, 25′ x 57′: H. C. Luders, contractor.

General Notes.

Anderson, Ind. — A three-st'y brick block is building here for R. L. Hanna; cost, $6,000; B. V. Enos & Son, of Indianapolis, are the architects.

Camden, N. J. — Church of "Our Saviour," to cost about $4,500, just started; Geo. W. Hewitt, of Philadelphia, architect.

Chews Landing, N. J. — Chapel, to be built of Ridley Creek stone; cost, about $3,800; Geo. W. Hewitt, Philadelphia, architect.

Cumberland, Md. — Mr. Frank E. Davis, of Baltimore is preparing drawings for a new alms-house for Allegheny County, Md., to cost $30,000.

Dorchester, Mass. — Mr. Wm. R. Emerson, of Boston, is the architect of a frame house for Mr. J. A. Houston, at Grove Hall; McNeil Bros., of Boston, contractors; cost, $10,000.

Fortress Munroe, Va. — A frame house is to be built for Miss Durham; Wm. R. Emerson, architect; cost, $3,000.

Haverhill, N. H. — In course of erection, for R. D. Tucker, house to cost about $10,000; stone basement and frame superstructure; Geo. W. Hewitt, architect, Philadelphia.

Indianapolis, Ind. — Mr. J. H. Stem, architect, is building the freight depot and general offices of the I. P. & C. R. R.; cost, $40,000.

Kaitokushi, Japan. — Mr. Charles J. Bateman, architect, of Boston, has just completed plans for a museum building, to be built here during the next year; cost, $10,000

New London, Conn. — Mr. George Keller, architect, of Hartford, is drawing plans for a building that the Mariners' Savings Bank expect to build on their land on the corner of Elm and Commercial Sts. If the plans are satisfactory, it is probable that the State will lease it for the use of the military companies.

The building for a drill room at the Naval Station is being rapidly put up. It will be of brick, 182′ x 40′ in size, and will cost $20,000.

North Adams, Mass. — E. C. Baird and C. C. Benton, of Lee, will build a block near Memorial Hall, 100′ long and 60′ wide, two stories high, the first floor for stores and the second probably for a hotel.

Point Concepcion, Cal.—At Point Conception, the lighthouse tower and dwellings are reported in an insecure condition, and should be rebuilt. A complication with the State has arisen on account of the title to the land on which the lighthouse stands, it having been lately decided that the site is included in a Mexican land grant, and that the United States has no title. Before the structure can be rebuilt, it will be necessary to purchase sufficient land, and for this purpose it is hoped Congress will at an early day appropriate $10,000. The rebuilding of the structure will cost $38,000.

Shelbyville, Ind. — Messrs. B. V. Enos & Son, of Indianapolis, are remodelling the M. E. church, at a cost of $12,000.

Salem, Ind. — A stone jail is to be built here, at a cost of $18,000, by Messrs. Huebner & Mueller, architects, of Indianapolis.

Taney-Town, Md. — Mr. J. A. Dempwolf, of York, Pa., is preparing plans of residence and store for T. H. Eckenrode, at a cost of about $10,000..

Vineland, N. J. — Partially completed, Church of "St. John's," to have a seating capacity for 250; brown stone; Geo. W. Hewitt, architect, Philadelphia.

York, Pa. — J. A. Dempwolf, architect, has in hand: Mercantile and law building, for D. E. Small; cost, $21,000.

Church, for A. M. E. Congregation; cost, $4,000.

Dwelling house, for Mrs. S. L. Huber; cost, $6,000; and one for Samuel Small, $5,000.

Bids and Contracts.

Boston, Mass. — The contract for driving piles for the exhibition buildings of the Massachusetts Charitable Mechanics' Association has been awarded to Mr. Eames, of Boston. There will be from 1700 to 1800 required. Mr. Wm. G. Preston, of Boston, architect.

Industrial.

Bristol, R. I. — The National Rubber Company, employing 1100 persons, is about to build another large mill.

Corfu, N. Y. — A canning factory is to be built here.

Lebanon, N. H. — Kendrick Davis & Co. are to build another large shop.

Portsmouth, N. H. — The Portsmouth Hosiery Company is making arrangements to build a structure 100′ long and 40′ wide, with steam power, on Union Street.

Spring Grove, Pa. — Extensive alterations and additions to the paper mills of P. H. Glatfelter are being carried out on the slow-burning principle, at a cost of $120,000; J. A. Dempwolf, architect, York, Pa.

SECOND COMPETITION IN INTERIOR DECORATION.

The publishers of the *American Architect and Building News* offer three prizes of fifty dollars ($50) each, for each of the three designs, submitted in accordance with the following programme, which shall be adjudged of highest merit, the award being made by a jury, the members of which are Henry Van Brunt, Arthur Rotch, and Eugène Létang, all architects of Boston. The conditions governing the competition are these :

1. Every competitor, by taking part in the competition, signifies his willingness that his design be published in the *American Architect and Building News*, if the editors desire to publish it.
2. Each competitor is to submit two sheets of drawings, each measuring 14 inches by 22 within the inner framing line, the drawings being executed in pen and ink, on smooth white paper, in a manner suitable for reproduction in this journal.
3. The authors of the successful designs surrender to the publishers all property right in their respective drawings and designs.
4. In awarding the prizes heed will be taken of the manner in which the programme has been followed, the excellence and appropriateness of the design, and the execution of the drawing.

[Continued on next page.]