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WE have received the first three numbers of the *Quarterly Architectural Review*, published by Messrs. Wolfe & Burnham, architects, of San Francisco, California. This is a journal mainly of advertisements, not of essays and discussions, as its ambitious title seems to promise, circulated gratuitously at a cost to the original projectors, as stated in the July number, of eight hundred dollars for the first two numbers, while they have received, according to the same authority, not more than half that sum for advertising space. It is to be hoped, however, that the enterprising firm finds its reward in a due public appreciation of the merits and experience of Messrs. Wolfe & Burnham, which are set forth in the eight pages of reading matter in every number with a fullness and frankness which certainly merits recognition. They now are encouraged to issue monthly editions, to meet the increased expense of which they propose hereafter to furnish their journal to subscribers at a cost of \$1.50 annually. The prospectus for this new departure embraces certainly a scheme of greater professional usefulness than is promised by the gratuitous numbers already issued. If the ideas of the prospectus are fulfilled in a proper spirit, and with as much of literary ability as the authors have already displayed of energy and self-confidence, the new journal can hardly fail to be an active agent in the civilization of the Pacific coast. The illustrations are very various in quality, and the designs, as might have been expected, largely partake of those peculiar characteristics of untutored invention applied to the conventional forms of architecture which constitute the true vernacular style. If this vernacular style is destined ever to develop and bear good fruit, we may look to the Pacific coast for its first manifestations of promise. Notwithstanding the illiterateness and awkwardness of these beginnings, they may be the foreshadowing of a new energy in architecture, to which perhaps we of the Eastern coast, who spend our time in refining and adapting the details of the historical styles of the Old World, may ultimately turn for the refreshment of new inspirations. The function of the most thoughtful architects in California with respect to this possible development is obvious enough, and the *Review*, if properly used by them, may be no inconsiderable agent in the work.

THIS enterprise of our Western brethren has our heartiest sympathy in its advocacy of the organization of a society of architects on the Pacific coast, and in its efforts to create a common cause and a public spirit among the architects of San Francisco, Oakland, San Jose, Sacramento, and the other new cities of California, to the end that they may better support one another and arrive at a more complete understanding of their duties to society. That such combination, mutual support, and instruction are sadly needed by the profession in those regions is plainly indicated by the tone of nearly all the articles in the *Review*. According to these the attitude of the public towards the profession is one of constant hostility and suspicion, and the journal is compelled to devote the greater part of its space to the sustaining of the architectural side, to the defence of the architect as opposed to the builder, and to the stout maintenance of propositions regarding sanitary construction which here have been long accepted by laymen and architects alike as the commonplaces of practice, though even they certainly cannot claim

to have reached any formula of perfection in this matter. Perhaps it is to this strenuous atmosphere that is to be attributed somewhat of the advertising boastfulness and self-assertion with which the professional proprietors so copiously set forth their qualifications. Such a tone cannot subserve any good purpose; it is inconsistent with true self-respect and real knowledge, and, what is of more importance, with the promise of the prospectus of the monthly edition, which, if maintained discreetly, will unite the profession on the Pacific coast, will raise its standard of acquirements and conduct, and make it less like an advertising trade competing with builders, and more like an art which needs no apology or defence.

IN our larger cities it is now not unusual to see retail merchants, in emulation of their more modest brother, the country shopkeeper, extending their business so as to include merchandise of various kinds, having no essential relations one with another. This approximation to the idea of the Oriental bazaar is to be carried still farther by the enterprise of a company lately formed in the city of New York, with a capital of \$100,000. It has leased from Mr. Vanderbilt, at an annual rental of \$30,000, the square, measuring 425 by 200 feet, bounded by Fourth and Madison Avenues and Twenty-sixth and Twenty-seventh Streets, known as Madison Square Garden. It is the purpose of the company to occupy this space with what is known as "an arcade," after the fashion of the famous prototype at Milan, perhaps, but only in one story, to cover it with a continuous roof, and to divide it by passage-ways running lengthwise and across the building. The spaces thus made accessible for traffic are to be sub-leased to merchants and manufacturers in every branch of trade, who will erect booths, as at an exposition, with a view each to setting forth his goods to the greatest advantage. The company reserves to itself, of course, the privilege of discriminating among tenants, so as to secure the greatest variety of business, and to exclude objectionable traffic; it will also establish an express delivery and lunch department. This comprehensive arrangement will enable the visitor to do shopping on an extended scale with a minimum of inconvenience. If this undertaking is established on a firm foundation of success, there will apparently be opened to the modern architect still another opportunity of design such as none of his predecessors have ever enjoyed, and such as, together with markets, exhibition buildings, mills, railway stations, free public libraries, steam elevators, and churches, with their characteristic modern appliances of social parlors and class-rooms, will contribute its share towards the development of new forms in architecture. The temple, the basilica, the cathedral, the Renaissance palace, can hardly offer the remotest suggestion towards the fulfilment of such problems as these. They compel us to break loose from conventions, and to start, without the embarrassments of tradition, from considerations purely of convenience and structure.

DURING the last three or four years, the profession throughout the country has been amused, if not instructed and edified, by the surprising succession of mishaps and investigations which has marked the growth of the two important buildings in Chicago, the City-Hall and County Court-House and the United States Custom-House. No sooner has the last City-Hall investigation been closed by the substantial exoneration of all the parties whose conduct formed the object of the investigation, than the attention of the professional public is called to the Custom-House by a very noteworthy incident. Every one is familiar with the inexplicable and phenomenal differences which the opening of every batch of sealed proposals is sure to reveal, but even the most experienced practitioner will feel that he has not yet fathomed the mysteries of builders' mathematics, when he learns that the difference between the highest and lowest bids for the plastering—ordinary three-coat plastering, seemingly the simplest thing to make estimates on, the lathing, too, being let out in another contract—of the Custom-House was \$42,573.55. The lowest bid, \$16,426.45, was made by Mr. Joseph Eastman, of Chicago; and the highest bid, \$59,000, was made by Messrs. Tobey & Smith, also of Chicago. The average of the sixteen bids submitted, the complete list of which is printed in our columns of building intelligence, is \$34,187.33, and, if the lowest two bids are thrown out, the average would be

not far from the \$40,000 which, we are given to understand, would be a fair price for the work. This disparity may partly be accounted for by the cost of the greater or less labor and skill which the competitors proposed to expend on the cornices and other enrichments, of which there possibly may be a great deal. But even this cannot account for a difference of over forty thousand dollars.

WHETHER or not the fortunate or unfortunate Mr. Eastman is to be held to his bid, as he may be by virtue of that clause of the specification which declares that "the contractor is required to make his measurements from the drawings and the building, and be held responsible for any errors arising therefrom," it would be interesting to know what were the methods of computation employed by him and the Messrs. Tobey & Smith, which could produce such different results. We take it for granted that the bid is a *bonâ fide* bid, and that there is such a person as Joseph Eastman, since it is stated that proposals "will be considered only when received from parties who are practically engaged in this class of work;" although this clause did not, in a recent government competition, prevent the presentation of a bid for certain fixtures by a man who was not a manufacturer or dealer in them, who, furthermore, submitted specimens of material which were shown to be superior to what he really intended to use. This mysterious affair at Chicago has its significance, since it shows in what an undignified position the Government places itself in consenting to become a party to a game of chance, in which it seemingly shows itself willing to victimize, or to acquiesce in being made a victim by, a contractor. If there are any buildings for which bills of quantities should be prepared, either by the architect or by a regular quantity surveyor, they are the government buildings, built with the public money, some little of which may be held to be properly used, if it guards the Government on the one hand from accepting a bid far in excess of the real value of the work, or from being imposed upon by work which will be scamped, in spite of all inspection. The Government should have some other aid in gauging the trustworthiness of the bids submitted than the approximative estimates which architects in private practice prepare for their own guidance. Indeed, it almost seems as if the only uncertain factor in the cost of a government building should be the amount of the contractor's profit.

THE story which is told by a correspondent in another column at once shows how large a portion of responsibility for the present imperfect style of building in this country really lies with the fire-underwriters, and how necessary, in all our large cities, is the passage of a theatre act such as we published last week. Reforms come slowly, and we must be content if we advance at all. Some of the reforms which were made in compliance with the imperative demand of the public after the burning of the Brooklyn Theatre have been very real, as was shown in an inspection of the New York theatres by a reporter of the *Evening Post* in consequence of a slight fire on the stage of Niblo's Theatre, September 4, who found in the dozen leading theatres visited that all scenery was invariably painted in water-color on canvas prepared either with tungstate of soda or with a solution of alum. From this it seems that managers are willing to take certain precautions voluntarily, while the inspectors of the building departments are able to enforce certain others; and now that our correspondent E. A. admits that much of the blame does rest with the underwriters, we may hope that they may soon be induced to discriminate more wisely in favor of the better protected buildings. When once owners, architects, underwriters, and lawmakers have reached a common understanding of the duties they mutually owe the public, we may expect a steady improvement in our methods of building to date from that time.

QUITE as much in need of reform as our methods of building is our system of scaffolding, as is shown by the numerous fatal accidents that have happened in the last week or two. The most serious of these was the fall of six bridge builders in Baltimore, who, working on a large plank, apparently unsecured to the floor girders of the bridge on which it rested, attempted to overturn a large iron girder, which weighed some fifteen hundred pounds. This, because of its shape, turned with unexpected suddenness, and their effort, being unresisted in one direction, was transferred to the plank on which they stood, so

that it shot out behind them, and let them fall between it and the iron girder to the rocks, fifty feet below. Two were killed outright, and two others are not likely to live. The next accident, at East New York, on September 2, was caused, not so much by the common ignorance of strains and thrusts, as by the uncommon stupidity of the two men, who will probably answer with their lives for their folly, in using the half-burned timbers of the building they were to replace, in the scaffold they expected to work upon. The particulars of the scaffold accident at the opera-house in Leavenworth, Kansas, and the one at Covington, Kentucky, are not given in the daily papers.

AMONG the subjects which might engage the attention of students of architecture, in connection with such a technical museum as that we suggested three weeks ago, may be mentioned the trial of native building-stones, bricks, and terra-cotta, either by Brard's test or by the later form, in which actual freezing takes the place of the crystallization of sulphate of soda, with record of results; investigations of the causes and cure of white efflorescence on brickwork, and black stains on some varieties of Ohio freestone; experiments with the microscope on the power of chlorine, ozone, carbolic acid, or other disinfectants, to destroy minute organisms in the air; observations, with models at a large scale, on the flow of air and water currents through drain-pipes and traps, a subject on which little is yet understood; on adulterations, with the means of detecting them, in oils, varnishes, and paints; tests for soundness and seasoning in timber, for distinguishing sapling from mature wood, exhausted pitch-pine from virgin lumber; trials of the transverse strength of beams of Portland, Rosendale, selenitic, and other cements, which can be made at a small scale, and would be of vital importance to the extension of concrete construction; besides impartial examinations of patented materials which are thrust upon architects in every variety, and of every shade of merit. We remember being once visited by a vendor of "incombustible felting" for protecting roofs and other wood-work from the flames in case of fire. The "fire-proof felt" had the appearance of being made of woollen rags; but supposing that it might have been treated with alum or alkaline silicate in some new and interesting manner, we lighted the gas and held the *soi-disant* incombustible material over it, whereupon it took fire and burned up. The agent looked on with apparent surprise, but departed without attempting to explain the phenomenon. From impositions of this kind, well-conducted experiments would be a great safeguard, and there are many other articles of manufacture of more or less value, such, for instance, as the "asbestos," "chemical," and other mixed paints, of which architects would be very glad to have a trustworthy and thorough criticism. Such criticism, under the prestige of a State technical school, would be courted by the manufacturers of really valuable articles, and it would cause us no regret if materials of a different kind were to be driven from the market by fear of it.

THE WASHINGTON MONUMENT.

THE ugliest monument in the world is in a fair way to be completed, — not according to the original plans, for not only has every vestige of them disappeared, but the design as we know it from tradition is to be despoiled of what proportion and dignity it once had by omitting a hundred feet of its height and the whole of the imposing colonnade which was to surround its base.

By whose authority these somewhat important modifications of the conception of Robert Mills are made, we do not know, and indeed, those who have ventured to suggest what they considered improvements on the original scheme have been so roughly handled by the officers of the Monument Association that it seems only prudent for the promoters of this monstrous mutilation of a design which, in the language of the Secretary, has been so "fully approved by the people" that they "will not tolerate any attempt to abandon it," to keep themselves concealed. So sure is the Secretary that "the people" demand the immediate completion of the monument in some shape, however mangled, that he objects to any attempts even to strengthen the foundation, claiming that as the earth has supported the present structure, which weighs 32,000 tons, for twenty years, there is no reason to fear that it will not support indefinitely the completed building, which, even in the form now proposed, will weigh 54,000 tons, and protesting against "any sanction by the Executive of the impression that the foundation is insufficient."

Fortunately, those to whom the matter was intrusted did not think that the "sanction of the Executive" was sufficient to hold up a tower five hundred feet high without at least a reasonable degree of coöperation on the part of the foundation on which the structure stood, and a thorough survey of the monument has been made, a plan for strengthening it adopted, and a considerable amount of work

executed in accordance with the plan, the connected history of which is quite interesting.

After considerable discussion, as will be remembered, by Act of Congress approved August 2, 1876, a Joint Commission for the Completion of the Washington Monument was created, consisting of President Hayes, Mr. W. W. Corcoran, General A. A. Humphreys, Chief of Engineers, U. S. A., and Messrs. Edward Clark and J. G. Hill, the former architect of the Capitol Extension, and the latter Supervising Architect of the Treasury Department. Under their direction, a board of engineer officers was appointed, consisting of Col. J. D. Kurtz, and Generals Duane and Gillmore, who caused a scientific inspection of the foundation in its present state to be made.

On testing the ground upon which the monument stands, taking specimens from different depths, it was found to consist of sand and clay, the clay varying from one third to two thirds of the whole, but the proportion being everywhere greater than that which would just suffice to fill the voids of the sand, and the mixture being therefore compressible to a greater or less degree throughout. The site is near the river bank, and but little above it, and the ground is therefore constantly wet. Not far from the water level, twenty-two feet below the present surface of the ground, the soil changes to a hardpan of gravel mixed with boulders. Enclosing prisms of the soil in strong boxes and submitting them to the action of a hydraulic press, it was found that they were shortened more than two per cent by a pressure of seven tons to the square foot, which was about that which the ground would have to bear at the completion of the structure. This experiment indicated the probability of settlement by simple compression of the soil, independent of the further movement from lateral escape of the soft ground from under the load, which is generally to be looked for in such cases; and these considerations, joined to a comparison of the actual weights borne by similar soils under other structures, led the Board to the conclusion that the present pressure of the monument on the underlying earth, five tons per square foot, was as much as it could be expected to bear, and that the completion, even to the greatly reduced height of four hundred feet, would bring a load upon it which no similar soil had ever been known to bear safely. This was in perfect accord with the report made three years before to a committee of the House of Representatives by the Board of Engineers for Fortifications, consisting of Generals Barnard, Tower, and Wright.

The natural inference from the ascertained compressibility of the ground was that the monument would have already sunk slightly since the suspension of operations on it. In the hope of obtaining indications on this point, the Board tried to discover some benchmark which might have been used for levels, and misunderstanding the directions given them by the Monument Association, they came upon a stone nearly corresponding to a bench, of which there was a record in the archives of the Association. Levelling from this, they ascertained that the whole structure had settled eight and one half inches into the ground. On the announcement of this discovery, the Monument Association, who seemed to consider any suggestion of settlement in the building as an aspersion on themselves, published a long review of the report of the Board, showing that the stone which had, on their information, been taken for a bench, had really nothing to do with the monument, and that there was no existing mark from which the fact of settlement could be ascertained.

This, however, did not prove, as they thought it did, that there had been no movement, but only that the amount of the movement, if any, could never be known, and the Joint Commission, preferring to trust the conclusions drawn from actual experiment and the history of similar structures, rather than the opinions quoted to them of "thousands of visitors," who have expressed themselves "perfectly satisfied of the strength of the foundation to sustain any weight which could be placed upon it," or of the "distinguished architects" and "practical men" who "declared that it could not be better," began to consider plans for enlarging the area of the footings, or confining the earth under them, so as to insure the stability of the building.

The cheapest device seemed to be a wall of concrete or masonry, enclosing the ground below the footings, to prevent its lateral escape. The Board suggested a circular wall of concrete, tied with iron bands, while an engineer member of the Monument Association proposed to build a quadrangular wall of brick and concrete, with curved sides, forming arches having their extrados toward the centre. The cost of this would be, according to the plan of the Board, \$39,300, and according to Mr. Stuart's plan \$36,000, and the additional security thus gained would, it was thought, enable the shaft to be carried up, with thin walls, to a height of four hundred feet.

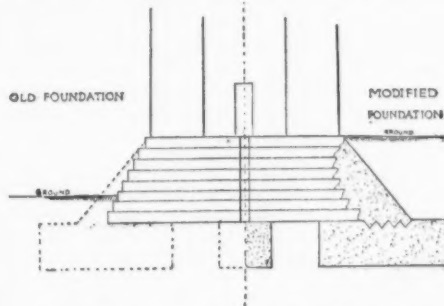
The more costly alternative presented by the Board was to tunnel under the footings of the monument and underpin with concrete to a depth of fifteen feet, extending the area of the concrete slab to about nine thousand square feet.

What reception these propositions met with does not appear, but the Commission, which seems to have brought enthusiasm as well as prudence to its work, finally resolved on a more ambitious scheme, for in June, 1878, we find Lieutenant-Colonel T. L. Casey, of the Corps of Engineers, U. S. A., directed by special order to report to the Commission as engineer in charge of the construction of the monument, and required to prepare a project for carrying the shaft, which by its rapid mutations in length begins to remind one of Jack's bean-stalk, to a height of at least 525 feet.

As a preliminary to this undertaking, Colonel Casey made a new examination of the entire structure. The shaft he found to be faced with white marble, in courses of two feet rise, fourteen to eighteen inches thick, with a certain proportion of headers about six feet in the wall, but with no attempt to obtain a regular bond. The backing was of bluestone rubble, laid in mortar which appeared to have some cement in it. The workmanship of the ashlar was bad, the joints and beds only extending a few inches from the face, and the stone then tapering irregularly. The vacancies were filled with chips, but the greater settlement of the backing had thrown the pressure on the facing blocks, nearly all of which, in the lower portions, were cracked or "flushed" at the joints from this cause. To obviate the further crushing which would ensue from loading the part already built with the weight of the superstructure, he recommended to cut back all the horizontal joints of the lower portion, pointing up at some future time, when the whole work should have completely settled. The shaft, as it would be constructed, Colonel Casey proposed to divide into three portions: the first consisting of the 156 feet already built; the second to be 172 feet high, faced with ashlar, the stretchers two feet on the bed, and the headers to run through the wall, which would vary from eight and a half to five feet thick, and would be backed with coursed rubble; and the third to comprise the remainder of the stone-work, to a height of five hundred feet, which would be of solid marble blocks, the wall varying in thickness from five feet at the bottom to eighteen inches at the top. The remaining twenty-five feet, in Colonel Casey's proposition, was to consist of a pyramidal roof of iron and glass. The interior angles of the new structure would be rounded, thus giving strength at the corners, and iron cramps and stiffening beams would be built in wherever needed. The weight of the masonry of the present shaft was found to be 164.88 pounds per cubic foot, and the total weight of the incomplete shaft, foundation, and the earth on the foundation, amounted to 32,176 tons of 2,240 pounds. Why the ton of 2,240 pounds should here be used is, by the way, an unsolved question. In the reports of most of the other experts the ton of 2,000 pounds is the standard, and one gives results in terms of the "American ton," whatever that may be. Nothing is more annoying than such uncertainties in tabulating results which will serve for reference to engineers and architects for centuries, and it is to be hoped that before any more such important documents are issued, a conference between the high authorities may agree either upon a metric notation or an official ton, which shall not need to be accompanied with explanations.

The area of the present foundation, which Colonel Casey found to be of rubble of blue gneiss, laid in lime mortar without any trace of cement, was, at the bottom, 6,400 square feet, making the present pressure 5.027 tons per square foot on the earth beneath it. The total weight of the monument, exclusive of new foundation, completed as he proposed, would be 54,093 tons, giving 8.452 tons per square foot, and with the usual allowance for wind-pressure this might be increased on certain points to 9.941 tons. These, as Colonel Casey says, are far greater pressures than such soil has ever been known to sustain, and it seemed to him necessary to underpin and spread the foundation itself, instead of attempting to enclose the earth beneath it, as might be sufficient for a shorter shaft.

This he proposed to do, in brief, by inserting beneath it a mass of concrete in the form of a hollow square, 126½ feet each way outside, and leaving a vacancy 45 feet square inside. The concrete was to be introduced by tunnelling under the foundation, so that the earth now occupying the middle portion of the space beneath the present footings would not be disturbed, except that it was also proposed to excavate a circular space under the middle of the shaft, which could be reached through the existing well left in the middle of the old foundation. The concrete was to be 12½ feet in thickness, and the



outer line to be 23½ feet beyond the outside line of the present footings. The mass extended 18 feet under the present foundation, the inner edge being 5 feet inside of the ashlar line of the foot of the shaft. To unite the present foundations with the new concrete footing, buttresses of concrete were proposed at intervals. The whole area enclosed by the perimeter of the concrete mass was 16,002 square feet, and the weight of the whole structure, as proposed, 80,378 tons; giving a pressure, even with allowance for wind, of only 5.398 tons per square foot of the earth beneath. As was shown by the former trials, the earth at the depth reached by the new concrete footing was far more solid than that nearer the surface, and in con-

sideration of this, as well as of the important fact that, when terraced as proposed, the new bed of the foundation would be 35½ feet below the surface, Colonel Casey felt justified in regarding the scheme as a satisfactory solution of the problem proposed to him.

The cost of the new foundation and the buttressing was estimated at \$99,102. When the work should be done, Colonel Casey advised that a weight equal to that of the actual portion of the monument which remained to be built, some 20,000 tons, should be piled upon the foundation, and the effect carefully observed.

On the first of October last, the engineer in charge received the orders of the Joint Commission to commence the work of strengthening the foundation in accordance with the plan submitted, and operations have been since steadily continued. Some modifications were made in the original scheme; the depth of the slab of concrete was increased to 13½ feet, and it was decided to make the buttressing continuous instead of limiting it to the partial props on each side. So far, the work has gone on most successfully. At the present time, August, about two thirds of the concrete underpinning has been put in place, without accident of any kind. The trenches, or rather tunnels, were driven in pairs, on opposite sides of the foundation, so that any settlement caused by the compressed earth under the footings escaping into the excavation might be alike on the two sides. The trenches were four feet wide, and large stones were built in, projecting from the side, as dowels to secure the adjoining slices of concrete.

At first the excavation caused perceptible settlement, the greatest effect amounting to 1.96 inches at the southeast corner, and the least 1.46 inches at the northwest corner. The monument had at the start an inclination toward the northwest, and the excavation was purposely managed so as to cause the greatest sinking at the opposite quarter. As the number of concrete walls increased, the settlement caused by driving each tunnel diminished, and latterly it has been almost nothing. The concrete is all made of Portland cement one part, sand two parts, pebbles three parts, and broken stone four parts, all mixed by machinery. The buttressing has not yet been commenced.

The original engineering difficulties of so simple a structure as the monument, even if carried to the height of six hundred feet as originally intended, are, with proper care, not very formidable; nothing, indeed, compared with such a problem as the balancing of Salisbury spire, 404 feet high, on the top of four lofty columns, so as to stand secure for seven hundred years, or the buttressing of the double dome of Santa Maria del Fiore; but to amend and supplement the work of constructors whose only idea of the foundation of such a building seems to have been that it should go "below frost," is a different undertaking, and one of which every step will be watched with interest.

In discussing the scheme for completion of the monument, the strongest feeling which we experience is the hope that the parsimony and ignorance which showed itself at the commencement of the work, thirty years ago, in abuse of those people who "wanted to have all the contributions on hand buried beneath the surface," instead of "carrying the work along under the banner of the people," will not make its appearance again. The Americans have gained the reputation of doing some things well: if the "popular will" demands the erection of a clumsy chimney to the memory of Washington, let this generation, for its own credit, try to have it so built that it will not fall down. A thorough and ample foundation alone, if the money will go no further, is a respectable and even interesting object, but a cracked and tottering pile, betraying at every moment the thinness of wall, the slighted workmanship and insufficient foundation which a cloud of "Executive sanctions" and bursts of eloquence strive in vain to conceal, is an object which could only bring upon us laughter and contempt.

Colonel Casey's scheme, admirably scientific and thorough as it is, still, to the expert, shows signs of the urgency with which the need of economy was pressed upon him. His formula for concrete, for instance, is made up with perfect knowledge of his materials, so as to secure the utmost strength which can be obtained with the given proportion of cement, which is the costly ingredient, but it certainly seems unfortunate that the quantity of cement should need to be restricted to one part in ten of the mixture. It is to be regretted also that the concrete mass should not extend under the whole of the foundation, instead of forming simply a hollow square. The pressure which will be brought upon the ground beneath, more than five tons to the square foot, supposing the distribution perfectly equal, is the utmost that it should be called upon to bear, and is nearly double the load that Rankine considers safe upon a concrete substratum. There is therefore no strength to spare, in case any part of the foundation should be unable to bear its share of the burden, and the failure of the enclosed square of earth to present as much resistance as the concrete would compel the latter to assume a double load, increasing the strain perhaps to a dangerous extent. It would seem that the prism of earth, which is almost a brick clay, might in the course of years, by the varying amount of moisture which will be contained in it as the neighboring Potomac rises and falls, undergo a swelling and shrinking, imperceptible at first, but capable in the course of years of producing serious results. The expansion of the clayey mass would compel it, as it could not lift the monument, to compress or penetrate the earth below, and on the retreat of the water this effect could not be recovered, but the shrinking of the prism must necessarily

withdraw it from the stone-work above. Such an action takes place around pile foundations, and it seems by no means improbable in this case: If then the weight should by degrees be thrown entirely, or nearly so, upon the hollow square of concrete, how would that be affected?

The proposed buttressing is very skilfully applied so as not only to unite its action with that of the footings, but to carry even more than its share of the weight out to the centre of the concrete footing slab, thus applying the vertical load nearly in the line of the upward pressure or reaction of the earth, which is virtually applied at the centre of the under side of the slab, at B, in Figure 2. If the rubble foundation were as incompressible as the concrete buttress, the point of application of the downward pressure would be at A, in the centre of the portion of the slab which the superstructure covers, instead of at X, which is somewhere near the actual point, and the opposing forces acting at the ends of the lever A B would form a couple of enormous force, tending to turn the slab in the

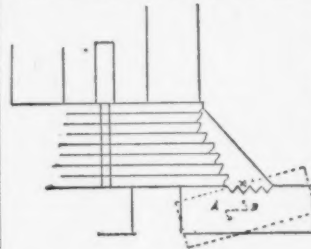


Figure 2.

direction shown by the dotted line.

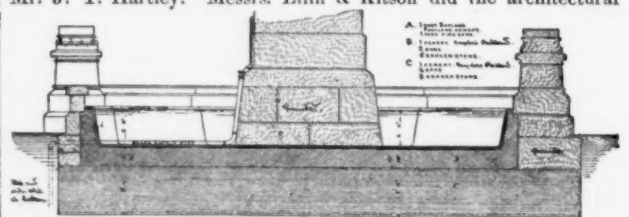
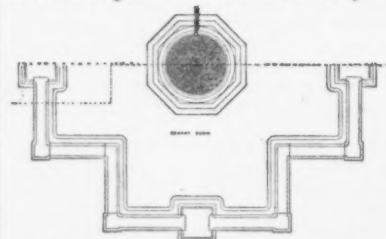
The size of the footing slab was prescribed by the area of earth over which it was necessary to distribute the load, and this device for taking advantage of the known indefinite compressibility of rubble masonry in lime mortar to carry out the pressure, by an incompressible concrete strut, to the proper point of application is as bold as it is scientific.

A piece of construction so delicate requires, however, to be executed with materials which can be thoroughly relied upon. The oblique action of the buttresses, opposed to the vertical resistance of the earth, will leave a resultant outward pressure which will severely try the tensile strength of the concrete, as well as its resistance to crushing, and no misplaced economy should be allowed to rob the material, all whose powers are thus so skilfully brought into action, of the degree of strength which shall not only be sufficient for the work, but shall leave ample security against the contingencies of earthquake shocks, winter freshets, and the various accidents which try high buildings far more than others. The modifications which Colonel Casey has already introduced in the execution of his plan, by increasing the transverse strength of his concrete footing, and substituting a continuous for an interrupted buttress, show that he has himself felt the need of increasing the margin of safety in the essential parts of the scheme, and the expenditure of a much larger sum in adding to the strength of the remainder of the work would not deprive his plan of the deserved credit of combining efficiency with economy in an admirable manner, nor will any thinking and patriotic American wish to have the money needful for such a purpose withheld.

THE ILLUSTRATIONS.

THE SOLDIERS' MONUMENT, MANCHESTER, N. H. MR. GEORGE KELLER, ARCHITECT, HARTFORD, CONN.

THE design for this monument, which was dedicated September 11, was submitted in answer to an advertisement that appeared in the *American Architect* about two and a half years ago. The material is Concord granite for the structural portions, and bronze for the statues, bas-reliefs, trophies, etc., except the statue of "Manchester," which is of granite. The basin is thirty feet square, outside measurement, and is cruciform in plan. The monument stands about fifty feet high above the ground. The four statues surrounding the monument are six feet eight inches high, and the figure of "Manchester," eight feet high. The statues of the cavalryman, the artilleryman, and Manchester are the work of Mr. C. Buberl, the sailor and infantryman being designed by Mr. W. D. Richards, and the bas-reliefs by Mr. J. T. Hartley. Messrs. Ellin & Kitson did the architectural



carving. All casting was done by the National Fine Art Foundry. Special pains have been taken to insure a permanent and sub-





THE HALLOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON.

— A GROUP OF RUSSIAN SPIRES. —
— FROM THE ZODTCHY. —



Heliotype Printing Co.

220 Devonshire St., Boston.

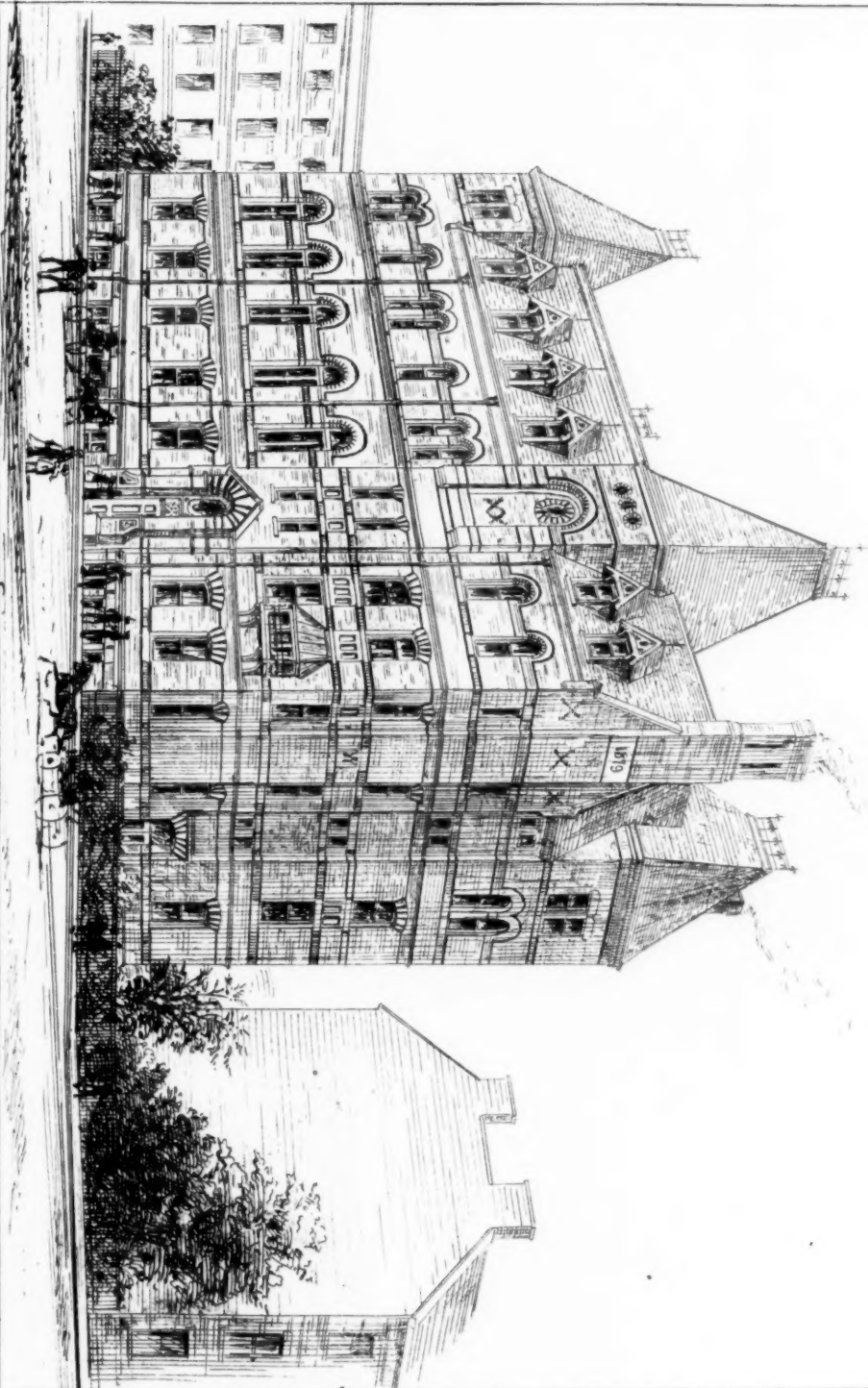
SOLDIERS' MONUMENT AT MANCHESTER, N. H.

MR. GEORGE KELLER, ARCHITECT, HARTFORD, CONN.



BOYS LODGING HOUSE AND SCHOOLS—EAST BROADWAY—N.Y.
NOW BEING ERECTED—FOR THE CHILDRENS AID SOCIETY—BY MISS WOLFE

VAUX & RADFORD,
ARCHITECTS. 1878.



stantial construction for basin and foundation of the monument. The foundation is of concrete composed of Saylor's Portland cement, sand, and broken stone, small enough to pass through a one and a quarter diameter ring. The lowest course is of coarse concrete; the next is finer, and the finishing course still finer. The proportion of cement, sand, and broken stone, in volume, are given on the cuts, and were recommended by Captain Maclay, engineer in charge of works of "Department of Docks," New York.

EXAMPLES OF RUSSIAN SPIRES AND TOWERS.

These illustrations are reproduced from the pages of our Russian contemporary, the *Zodtchy*.

NEWSBOYS' LODGING-HOUSE, NEW YORK, N. Y. MESSRS. VAUX & RADFORD, ARCHITECTS, NEW YORK.

This building, which is to cost about \$40,000, is a free gift to the Children's Aid Society on the part of Miss Wolfe. It is to be built of common hard brick with Peerless brick strings, etc.

CORRESPONDENCE.

THE CONNECTICUT THEOLOGICAL INSTITUTE AND ITS ARCHITECT. — CHRIST CHURCH. — THE FIRST REGIMENT'S ARMORY.

HARTFORD, CONN.

THAT the progress of architectural schemes is sometimes like the course of true love, which does not "run smooth," is illustrated by the exceptional action of the building committee of the Connecticut Theological Institute in relation to the professional services of their retained architect. In the spring of 1878, Mr. F. H. Kimball was employed to prepare plans for the institute, which were to embrace a main building with extensive wings, and so arranged that additions could be built as the demands of the institute required. A gymnasium, in a detached structure, was also designed. Much delay was occasioned by the absence of members of the committee whose views regarding the interior arrangement of the buildings must be considered, and under these circumstances the completion of the plans was deferred. Early in the fall the gymnasium was built; and, the work being in the hands of a builder who boasts that he gets rid of the "architect" as soon as the plans are finished, the appearance of the structure was marred, and the drawings were not followed, under the builder's pretence that he was "saving money" for the committee by carrying out his own ideas. A deaf ear was turned to the architect; and the builder, having thus succeeded in spoiling one building, thirsted for more. It was stipulated that the institute should cost, complete, a specified sum, and at the same time the accommodations called for were large. It was further desired by a leading member of the committee, who had devoted the best energies of his life to printing, and was therefore *au fait* on architectural matters, that the building should be plain, and should have no "improper" ornamentation. The privilege of putting the work into the market, and obtaining reliable estimates from several contractors, was not granted the architect; and the cost of the structure was computed by the invaluable builder, who was unable to take off his own quantities, and by one mason who was able! The result showed the cost in excess of the sum originally specified, and the plans were modified by the architect, who was restricted as before. In the late fall the building was laid out according to the plans, and the work, to be done by the day, was put into the hands of the parties who estimated.

Principally upon the grounds of excessive cost, the building committee, in the spring of 1879, relieved the architect of his position; and the builder, with plans and details altered so as to be unrecognizable, has pushed the work until it now approaches completion. It is rumored that he has been assisted by a New York architect; but to what portion of the indiscriminate slaughter of a good design this architect has contributed is not wholly apparent, so much of the "builder" class of treatment is conspicuous. The general features of the institute, as described in a former letter, have been maintained, and the distribution of the masses is the same; while upon the foundation has been erected a building which far from graces its fine location, and is a caricature of the merest approach to architecture. But this grand triumph of economy and ugliness over so-called prodigality and beauty pales before the fact that estimates were afterwards obtained guaranteeing the erection of the building according to the architect's modified plans for some \$14,000 less than the figures submitted to the committee for the same work by the present builders. These estimates were obtained by the architect for his own satisfaction, and were accompanied by sufficient security bonds in each instance. In the original design for the institute the effect of the exterior was enhanced, at no fabulous outlay, by the introduction of much moulded and ornamental brickwork; and the principal windows were turned with full, round arches, displaying moulded work advantageously. The windows are now built with square heads, the caps making a melancholy show of ornamentation by means of incised work (which it is presumed is eminently "proper"). The ornamental brick have been left out of the building, and, in place of the brick and stone dormers, the roof — changed from the original — is equipped with wooden ones devoid of design, and in their baldness and poverty of treatment but keeping pace with the timid buttresses, the feeble cornice, and other features now attracting the public eye. Altogether the affair is the most unprofessional on record here; and that the course taken should have been allowed is a matter of wonder, in view of the fact that some

members of the committee were gentlemen of unquestioned business capacity and able judgment.

The building in the rear of Christ Church which is now being erected from plans by Mr. Withers, of New York, is progressing rapidly. It measures about 40 by 60 feet, and is connected directly with the church. It will be two stories in height, except that portion directly back of the chancel. The walls are of rock-faced ashlar of Portland stone, with a finish of the same stone tooled. The north façade is diversified by a square bay, which is carried up two stories, and crowned with a high, pitched roof. On the east is a gable with tracery windows and shields for inscription. The walls are pierced by square-headed windows with stone mullions and transoms; gargoyles spring from the eaves of the bay, and moulded courses and carved work enrich the façades, at objective points. The main entrance upon Church Street gives access to a wide hall, from which on the right and left open respectively the rector's study and the vestry room, — well proportioned, lighted, ventilated, and adapted to their special requirements. The second entrance, which is on the west, is chiefly for the use of the Sunday-school, the room being on the left. It is 24 by 50 feet, and is built with exposed trusses, which (like the finish of the room) are of oak. A staircase in the main hall leads to the first floor, which contains one large room for parish work. It is 24 by 40, and will be finished in ash in its natural color. A robing-room opens from the new chancel on the left, and beneath is a library, connected by stairs with the Sunday-school room. The rear wall of the church will be in part removed to admit the chancel arch, which will be cut in stone. The chancel will be handsomely tiled, and a stained-glass window will be placed in the rear wall. The entire work will be completed before next Christmas.

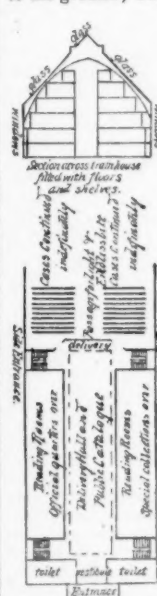
Another important building now being carried on is the armory for the First Regiment, opposite Bushnell Park. It includes the old skating rink, with extensive additions upon the front and rear, the work being executed from plans by Mr. Keller. The drill-room will be 79 by 184 feet, the company rooms opening into it at the same level, from the north and south. The new addition affords, beside the company rooms, accommodations for the colonel and adjutant, a squad drill-room 32 feet by 36, a band-room, and a gallery for visitors. A rifle range will also be built upon one side of the armory, 10 by 220 feet. The main building on the front is three stories in height, with an ample entrance midway in the front, which is 80 feet wide. A central tower is carried up about 70 feet. The building is of brick, laid in red mortar, with a finish in Ohio-stone, relieved by bands of diaper brick; moulded brick being largely used for jambs and arches of windows, and black brick is introduced in ornamental courses. The alterations, when complete, will cost in the neighborhood of \$20,000; and the armory will be ready for occupancy in October.

CHETWOOD.

LIBRARY BUILDINGS.

At the conference of librarians lately held in Boston, Professor Justin Winsor, Librarian of Harvard University and President of the Association, declared as follows his appreciation of the essential points of a library building, in words which we find reported in the *Library Journal* : —

"I had occasion to address a club of gentlemen the past winter, and exercising a librarian's prerogatives, I talked of the shop, and told them that of all the buildings in the United States, fitted to hold conveniently a very large library, that which, in my judgment, was the typical one, was owned by the Boston and Providence Railroad Corporation, — their admirable station in this city. That building is built a little irregularly to conform to the ground; but taking it in its broad indications, I sketch it thus : —



"The main body or head house, over 200 feet long, I would convert into the public and official working quarters of the library; this is two stories high, the lower one lofty. What is now the main waiting hall, lighted by a lanterned roof, would serve for the grand delivery room. On either side are reading-rooms, large and small, to be fitted up in detail as required. Over these, the official quarters and work-rooms, all opening on a balcony (indicated by the dotted line) which overlooks the grand hall and communicates with the stack-room or train-house. This last extension, of which you see the section, and which may be continued indefinitely, is, as built, about 600 feet long and 130 feet wide, external dimensions. I would leave a 30 foot passage down the middle, open to the roof, for light and for running the endless belts, which are to be kept in constant motion by hydraulic power, carrying boxes into which the books are put by pages on the different floors, these boxes inclining automatically, and delivering the books into cushioned receptacles near the desk, where the attendants take them and serve them over the counter. The books are called by numbers, a key-board at the counter working an annunciator, which gives the information to the pages waiting on the various levels. The transverse cases to be two feet eight inches apart, eight feet high; the floors to be glass; the side-walls to be as much of glass as possible, and also the roof. Tables to be placed between the lateral walls and the ends of the cases, for convenience of work at the shelves.

"A stack-room of the size of the present train-house could be made to hold, conveniently, near four millions of volumes, all, by means of mechanical appliances, practically close adjacent to the points of delivery. The building cost

\$800,000, and might cost something more, converted to this purpose. That building round the corner which holds the public library of Boston cost half as much, and holds an eighth part of the books, and inconveniently at that. The new building of the Ridgeway Branch in Philadelphia cost, I believe, nearly as much as this Providence station, and will hold one tenth of the books.

"I throw out what I have said simply as a guiding idea, to indicate what I hope will be the conditions under which a librarian may be called upon to administer large libraries in the future. The same principles adapted to narrower conditions of purse and more contracted limits of books, of every degree downward, may still obtain advantageously, as I believe, in the planning of all library structures, where there is to be large use by many people not known to the librarian."

Mr. Henry Van Brunt, of Ware & Van Brunt, Boston, the architects of the extension of the Harvard University Library, was called upon by the President, and responded more briefly than the Conference desired. By special request he has written out his opinions more fully, as follows:—

"I conceive that I shall make the most acceptable use of the opportunity afforded by your invitation if I base what I have to say less upon speculation than upon professional experience, which certainly is the safest, if not the most picturesque and interesting stand-point from which to view a practical question like this.

"The architect, when called upon to study this subject, cannot but recognize at the outset that there is involved in it one point of construction and design paramount to all others, viz.: how to provide accommodation for a great accumulation of books in such a manner that the utmost compactness of storage shall be made consistent with the most convenient classification, with accessibility, equality of temperature, abundance of light, complete security from dampness and from fire, and with provisions for the indefinite enlargement of the collection in any department without unnecessary waste of space. To meet these difficult requirements with due economy of construction and with a respectful independence of the traditions of architectural style, but with a proper regard for the essential qualities of architectural expression, there is made upon the resources of invention, of planning and constructing, a demand far more exacting than is felt in providing for any other department of the building. For to secure proper facilities for the administration of the library, with all its subordinate services of distribution and delivery, of cataloguing, bibliography, etc., to provide reading-rooms for the public and studies for scholars, galleries for books of reference and special collections, all this of course complicates the question more or less, but requires from the architect no very unusual effort of design.

"It is probable that the part of the problem which is concerned with the storage or stacking of the books never yet met with a perfectly satisfactory solution. I believe the provisions made in the British Museum, and by the accomplished M. Labrousse in his late additions to the National Library at Paris, are necessarily adapted to the accommodation of certain existing conditions of service, or traditions of practice in those monumental collections. For our own use these precedents can afford useful hints indeed, but the purposes for which mainly our own public libraries are established are new to the world of literature and books, and materially affect the question under consideration. For the continued rapid and prompt delivery of books in all departments, and the corresponding return of them to their proper shelves without confusion, as required in libraries established for popular use, imply an especial need for arrangements securing the greatest accessibility of the books and for mechanical appliances for their transmission, both horizontally and vertically. We have to provide also for accessions much more rapid than has been customary hitherto, and for frequent enlargement of special departments by gift and bequest. It may be fairly assumed that these new conditions are a continual inspiration for new contrivances of accommodation, varying according to local requirements and means, and, in the aggregate, showing a natural advance towards perfection through experience. It has been suggested to-day that the ideal library can only be realized by forgetting all these results of experience and by beginning anew, as all that has been done is fundamentally erroneous. Obviously, such a method of progression, if not unscientific, would be wasteful in the extreme. Doubtless we made a false start by endeavoring to adapt our large public collections to the traditional architectural library halls surrounded by chapel-like alcoves in several open stories (an arrangement excellent for small and for social libraries), but examples are not wanting in more recent structures wherein there has been exhibited an absolute freedom from such embarrassing precedents as this, and a direct development of form and structure from necessity.

"Among these I venture to refer you to the new wing of Gore Hall, the Library of Harvard University, which I understand you are to visit this afternoon. I refer to this, not because it is a perfect adaptation of means to ends, but because it marks a distinct intention of progress towards such a result, and because I am in part responsible for it, and for that reason better fitted perhaps to explain as an architect the conditions under which it was developed. In this construction the architects had the advantage of constant coöperation and advice from the authorities of the university, and were enabled thus to work, through experience, directly towards a practical end.

"The old library is a structure of granite, fashioned somewhat in the form of a chapel in the English Gothic of the fourteenth century, as this style was imperfectly understood some fifty years ago. It is about 85 feet long and 45 feet wide, and within has a narrow nave lighted by large pointed windows at each end; this nave is flanked by grouped shafts sustaining a plaster imitation of Tudor groining in the roof. Between these shafts, and occupying the usual position of the aisles, is the common old-fashioned arrangement of book alcoves, in two stories. The building was very much overcrowded and sadly needed more space. The new problem was to build a wing or east transept, about 40 feet wide and about 100 feet long, arranged to accommodate, in the part adjoining the old building, a central delivery room, with the catalogue cases, and, beyond this, a large book-room, 36 feet by 70 feet, to contain as many volumes as could be stacked in such a space, fulfilling at the same time the conditions of accessibility, equality of temperature, abundance of light, convenience of classification, and security from fire and dampness,—conditions which, as I have stated, should be fundamental in such constructions. The new wing was also to contain ample accommodations for the librarian and for his numerous as-

sistants in the bibliographical department. The only architectural embarrassment to which the architects were subjected was the obvious necessity of establishing a certain conformity of exterior between the old and new work.

"I propose to direct your attention only to the book-room, as exhibiting an attempt to meet conditions which are of general occurrence in all large libraries. This, as I have said, is a room 36 feet wide by 70 feet long, its side-walls being a series of piers and buttresses, with windows occupying the whole of the spaces between them. The room is lined with brick throughout, with an air-space between the lining and the outward wall; this brick forms the interior finish of the room. The roof is of concrete fire-proof blocks laid upon iron rafters, with a ceiling of hollow slabs of the same material hung three inches below. It has at the ridge a continuous sky-light of Hayes's patent, and ample ventilating shafts at the ends. The entire area of this room is occupied by transverse courses of shelving, facing in two directions, with alleys between, two feet four inches wide, so arranged as to receive the light from the side windows at either end of each alley, the piers or buttresses between the windows coinciding with the shelving. A passage of sufficient width is carried around against the outside walls. The shelving is supported on a series of iron skeleton uprights, two feet wide and three feet apart, extending the whole height of the building, each having foundation on a short brick pier in the basement. These piers also sustain a floor of North River stone slabs, about four feet above the concrete cellar floor. This space is left open so as to permit a free circulation of air between the earth and the floor, and to prevent dampness from arising. The vertical height of fifty feet from this floor to the concrete ceiling is divided into six stories, each seven feet high, by open iron gratings or foot-plates, carried along the alleys and passages and bolted to the iron uprights, thus forming continuous floors. There are iron stairs at either end, and lifts in each corner for books. Horizontal railways for barrows or sliding boxes may be established on each floor. The iron uprights also sustain the weight of the roof. Each shelf is of wood, thoroughly oil-filled and shellacked, a foot wide and three feet long, resting upon movable galvanized iron hooks adjusted to notches cast in the uprights.¹

"It seems impossible by any other system to secure the safe and accessible storage of a greater number of books in a given space. Thus this area of 89,000 cubic feet accommodates 263,000 volumes, an average of ten (10) to each running foot of shelving space. The absolute similarity of divisions and subdivisions on each floor offers all needful facilities for defining the locality of every volume by the usual system of numbering, and at least presents no obstacle to classification. In the contingency of any one department of literature overcrowding the space allotted to it, this recurrence of similar divisions and subdivisions, both in horizontal and in vertical directions, seems to offer sufficient opportunity for the necessary expansion without the confusion which is inevitable when the latest acquisitions have to be bestowed in distant parts of the library, as is the case with the ordinary methods of book-stacking. Thus, if we suppose this great mass of shelving space divided into cubic spaces or blocks, and every alternate cubic space allotted to a special division of literature, leaving the others vacant, there remains an opportunity for the enlargement of each division at least in four directions, upwards, downwards, and horizontally, without exposing the collection to the obvious embarrassments of geographical separation. Ordinary arrangements, so far as I am aware, do not offer such advantages,—at least, not in so great a degree; and the expedient of movable book-cases, in use at Oxford, and noted by Mr. Winsor, implies waste of space, an accumulation of combustible material, and other inconveniences which seem to me sufficiently apparent.

"The device of open flooring facilitates the distribution of light, diminishes the weight of constructive material, and renders it easy to maintain an equality of temperature throughout while confining the circulation of radiating steam pipes to the lower story. The end walls are occupied by ventilating or exhaust shafts. It would be strange if the practical use of this book room for two years has not suggested to the accomplished librarian in charge various ameliorations of structure and arrangement. I am not informed as to what improvements he finds desirable and practicable, nor, on the other hand, have any complaints touching any essential points reached my ears. This attempt to solve the most difficult point in the construction of libraries is therefore offered as a convenient point of departure for further developments towards perfection. It is to be observed that in this structure no sacrifice of convenience or economy has been made for the sake of any architectural pretence. The external aspects of the building are a legitimate growth from necessity, and have been adjusted so as to secure a proper and decent harmony of proportions and a just significance of detail, no more and no less.

"A dry and fire-proof book-room, such as I have described, accommodating 263,000 volumes, may, at present prices, be built for between \$20,000 and \$30,000. The administrative and working force required to organize and make useful such a collection of books must of course require ample additional accommodation. It is difficult to offer any useful type for this essential and central portion of a library building; it is a part of the problem which must be governed by local conditions, by the amount of money available, by the character and shape of the ground to be occupied, and by various other circumstances which must give individuality to each case. A public library should occupy a central, accessible space in the town, and it is not to be assumed that areas of indefinite extent are available in which to build ideal libraries. I have simply attempted to explain a structure in which has been secured what seems to me the greatest degree of economy as regards space, material, and cost yet attained in the fire-proof and damp-proof stacking of books for the uses of a public library.

"How such a structure may be adapted in the form of wings to a complete library building of the first class is indicated in the accompanying diagram, which may serve to suggest arrangements compatible with various conditions of service. In this example, each fire-proof wing, at present rates, would cost about \$25,000, and the central portion, to which properly a more distinctly architectural character should be given, about \$50,000. The book-rooms should be separated from the central building by fire-proof walls, and entered only from the bibliographical and librarian's department. It is to be observed that every additional 4' 4" of length to each book-room will enlarge its capacity by 18,720 volumes. The book elevators at A A

¹ See *American Architect* for November 23, 1873. Plates.

building would meet with some recognition at the hands of the underwriters. But how were they met? The gentlemen to whom they applied, representing companies within the "Union," proposed to take from them the same percentage that they were charging for an old theatre in a neighboring city, also in the second story, but built with light walls, wooden under floors, and heated by furnaces, the gas lighted with matches, or however otherwise, and all without a single protection other than the fire department of the city against a sudden and fatal conflagration. They simply made no concession whatever on account of what had been done or what it was proposed to do. In view of this, the owners thought it about time to begin to economize, so, naturally, the *sprinklers were not put in*. Subsequent to this, insurance was taken at somewhat reduced rates, by companies outside the "Union." The logical inference from all this seems to be, that recognition by underwriters of the efforts of owners to improve their risks is to be considered an irregular proceeding.

Now, all along for weeks previous to the completion of the theatre, the entire building had been full of dry lumber, chips, shavings, and other combustible materials. Neither the sashes nor the doors to close the openings in the theatre walls were in place. Work was being pushed on the theatre by night as well as by day; a huge ring of open gas-jets in the centre of the house giving the needed light, while from the stagings above, shavings occasionally fell, being carried through the gas light on their way to the wooden floor of the parquet, where watchmen were supposed to be on the lookout for them. Pails of water scattered about were the only means at hand for checking on the instant a conflagration for which the fuel, the fire, and occasionally the wind were present and ready, and which, under the conditions then existing, would probably have led to the destruction of the entire building; and yet, for this great risk the underwriters charged the contractor *two fifths less* than they proposed to demand of the owners for the completed building with all its safeguards, including the condemned sprinkling apparatus all in working order!

H. W. HARTWELL.

NOTES OF EXPERIENCE AND INEXPERIENCE.

37. Echo. — I should be obliged if any of your readers could suggest a remedy for an echo in a church of the following dimensions and shape: 62' x 40', with side wings or transepts 40' x 15' each, all angles hipped, with gables formed on two sides and front; ceiling 25 feet to plate, and 13 feet in roof, following rafters part way, and thence at about an angle of 30° to centre. Walls and ceiling plaster, moulded ribs to ceiling. 9" recessed arch at back of pulpit only. There are diagonal tie-rods, which I thought would break sound-waves, but they do not appear to. Would wires be of any use? If so, how should they be placed? PROVINCIAL.

NOTES AND CLIPPINGS.

A MONUMENT TO LAFAYETTE. — A meeting has lately been held in Baltimore at which was organized the Lafayette State Association, which purposes to raise about \$20,000 by subscription for the erection of a monument to General Lafayette in Druid Hill Park, to be unveiled on the centennial of the declaration of peace between the United States and Great Britain, in 1883. We trust that his memory is not to be perpetuated by a builded obelisk.

THE MAIN EXHIBITION BUILDING AT PHILADELPHIA. — The fate of the Main Building is still undecided. Mass meetings have been held in the interest of its preservation, and long petitions praying the Park Commissioners to rescind their order have been received by them. Even the City Council adopted at a recent meeting the following resolution: —

"Resolved, That the Park Commission is hereby requested to rescind their action in reference to the Permanent Exhibition Building."

AN AMERICAN SCHOOL OF SCULPTURE. — The ladies of Cincinnati have exhibited during the last few years an energetic pertinacity in their endeavor to advance the interests of the polite arts in that city, which is rather unusual in the sex, and we trust that the enthusiasm which has borne such promising first fruits will increase with the development of the several schemes for education in the various branches of art which they have set on foot. Their latest enterprise is the endeavor to establish a school of sculpture. To this end the ladies of the Art Museum Association have opened negotiations with Mr. Preston Powers, whose name is almost as familiar to American ears as that of his father, hoping to induce him to make his home in Cincinnati, and to receive pupils into his studio after the manner of the modern masters in Paris.

AN ANCIENT CRYPT IN LONDON. — In laying the foundations of a bank building in London, adjoining the Temple Bar, the workmen have discovered a series of Gothic arches in stone, springing from circular columns, the bases of which and the floor area, now revealed to view, are upwards of twenty feet below the street level of the Strand and Fleet Street. The arches are at right angles, and seem to have belonged to a crypt under some ecclesiastical edifice.

THE LATE INHABITANTS OF THE TUILERIES. — The architects of the city of Paris were surprised on taking possession of the palace of the Tuileries to find it inhabited in every nook and corner. Numerous families were found living in the wing by the river-side. Many of them could not say by what right they were there; some dated back their residence to the time of the restoration, in 1830; and at the time of the fire in 1871 they took refuge in the wing from which they have just now been ejected to make room for the municipal council. But the most extraordinary thing was that in the imperial stables, with their marble troughs and mahogany managers and racks, were found a numerous company of horses, which have for many years been gratuitously stabled there. — *Echange*.

TUNNELLING MONT BLANC. — The Geneva correspondent of the London Times telegraphs: "A Savoy newspaper states that M. Charden, senator from the department of Haute-Savoie, has been informed by M. Freycinet, French Minister of Public Works, that the engineer-in-chief of the department of public works has been instructed to make a preliminary study of a project for tunnelling Mont Blanc."

WOMEN AS ARTISTS. — According to the *Gazette des Femmes*, 871 female artists exhibited at the last Salon, of whom 73 have been recompensed at one time or another in their careers, as follows: 14 have received first medals, 19 second medals, and 39 third medals, while one, Rosa Bonheur, has been decorated with the order of the Legion of Honor. Of those exhibiting this year 31 were represented by sculptures, 138 by portraits or figure paintings, 277 by paintings on porcelain or enamel, 112 in water-colors, 21 by engravings or lithographs, while the remainder exhibited pastel drawings, fruit-pieces, and miniatures.

THE PANTHEON. — The Pope and College of Cardinals at a late meeting discussed the propriety of requesting the Italian Government to restore to the Holy See the Pantheon of Agrippa. To what use they propose to put it is not stated, but there is small likelihood that the request, if ever made, will be granted, for by the burial within it of the late Victor Emanuel it may be considered consecrated as the mausoleum of the kings of Italy.

THE INDIAN TEMPLE AT AMRITSAR. — As to the golden temple at Amritsar, called Hari-mandir, or sometimes Durbar Sahib, it may be said to rank next to the Taj at Agra as one of the most striking sights of India. To form an idea of the unique spectacle presented by this sacred locality one must picture to one's self a large square sheet of water, bordered by a marble pavement, in the centre of a picturesque Indian town. Around the margin of this artificial lake are clustered numerous fine mansions, most of them once the property of Sikh chiefs, who assembled here every year and spent vast sums on the endowment of the central shrine. One of the houses is now occupied by Sirdar Mangal Singh Ramgharia, a well-known and much-esteemed member of the Sikh community. It has two lofty towers, from one of which I enjoyed a grand panoramic view of the lake and its vicinity, — one of those rare sights seen at intervals during life which fix themselves indelibly on the memory. In the centre of the water rises the beautiful temple with its gilded dome and cupolas, approached by a marble causeway, and quite unlike any other place of worship to be seen throughout India. In structure and appearance it is a kind of compromise between a Hindoo temple and a Mohammedan mosque, reminding one of the attempted compromise between Hindooism and Islam, which was once a favorite idea with both Kabir and Nanak. In point of mere size the shrine is not imposing, but its proportions strike one as nearly perfect. All the lower part is of marble, inlaid, like the Taj, with precious stones, and here and there overlaid with gold and silver. The principal entrance facing the causeway looks toward the north. The interior is even more gorgeous than the exterior. On the ground floor is a well-proportioned vaulted hall, its richly gilded ceiling ornamented with an infinite number of small mirrors, and its walls decorated with inlaid work of various designs, flowers, birds, and elephants. Four short passages, entered by carved silver doors, one on each of its four sides, lead to this vaulted chamber, giving it a shape not unlike that of a Greek cross. All around on the outside is a narrow corridor. In the interior, opposite the principal entrance, sits the presiding Guru — his legs folded under him on the bare ground — with the open Granth before him. He is attended by other officials of the temple, who assist him in chanting the sacred texts. And be it observed, that although the temple is conspicuously free from images and is dedicated to the one Supreme Being (under his name Hari), a visible representation of the invisible God is believed to be present in the sacred book. The Granth is, in fact, the real divinity of the shrine, and is treated as if it had a veritable personal existence. Every morning it is dressed out in costly brocade, and reverently placed on a low throne under a jewelled canopy, said to have been constructed by Ranjit Singh at a cost of 50,000 rupees. All day long chowries are waved over the sacred volume, and every evening it is transported to the second temple on the edge of the lake opposite the causeway, where it is made to repose for the night in a golden bed within a consecrated chamber railed off and protected from all profane invasion by bolts and bars. — *Contemporary Review*.

ASSYRIAN EXPLORATIONS. — Lieutenant Kitchener, R. E., who has done such good work for the Palestine Exploration Fund Society, will henceforth conduct for the trustees of the British Museum the explorations at Mosul and elsewhere in Assyria, which have hitherto been carried out by Mr. Hormuzd Rassam.

RUSSIAN TRACTION ENGINES. — It is reported that the Russians will use steam traction engines on the steppes, without rails, in the Turcoman expedition.

THE EFFECT OF PRESSURE ON POWDERED SUBSTANCES. — A member of the Belgian Academy of Science, Mr. Spring, has made some experiments on the effect of pressure on powdered substances. He subjected, amongst other things, a quantity of powdered poplar wood to a pressure of twenty thousand atmospheres (about 280 tons per square inch). The result was a block having greater hardness than the natural poplar wood, and having a specific gravity of 1.328, while the natural wood has a specific gravity of only .389.

JEWISH PATRONS OF CERAMIC ART. — In the eighteenth century the laws of Prussia required that every wealthy Jew who married should buy his porcelain at the royal manufactory in Berlin. The director often took the money and made his own selection of pieces to be given in exchange. Moses Mendelssohn, although celebrated as a philosophical thinker and writer, was obliged to submit to the law, and he received forty porcelain apes, of life size. Some of them are still preserved in the Mendelssohn family. This method of oppressing conscience for the development of ceramic art was established during the reign of Frederic the Great, the philosophical king. — *Archives Israelites*.