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IN connection with the triennial fair of the Massachusetts Charitable Mechanic Association, which is to be held in Boston next September, it has been decided to organize a complete exhibition of building appliances, including materials of all kinds, — stone, brick, marble, terra-cotta and timber, limes and cements, paints and varnishes, roofing materials, glass, builders' hardware, mill-work, such as doors and blinds, mouldings and manufactured joinery, plumbing work and apparatus, with such examples of iron and glass construction as can be exhibited at a small scale; and comprising also decorations, stained glass, gas-fixtures, paper-hangings, tiles, steel and brass work, and the other ornamental details which form so important a part of modern domestic architecture. Thirty thousand square feet of floor-space has been allotted to this department, and the indications are that it will be crowded with objects of great interest to all those concerned with building. The recent exhibition of a similar kind in London, although conducted in a less liberal manner than is proposed for the Boston enterprise, was extremely successful, and there is no reason to suppose that an American one will be less so.

THE credit of the plan for a special exhibition belongs in some measure to the Boston Society of Architects, various members of which have interested themselves for months in the endeavor to organize a technical museum for the use of architects and students, and gladly welcomed the opportunity which the recurrence of the Charitable Mechanic Association's fair afforded for collecting temporarily a very large and instructive special display. The Association has always included building materials and appliances in its triennial exhibitions, and a great variety of objects is usually shown, but being classified with reference to their intrinsic character, rather than their peculiar application, those whose concern is mainly with building have found it inconvenient and laborious to search for what they wanted amid a mass of objects, similar in material, perhaps, but intended for totally different uses; and for those whose time is limited there will be great advantage in having what they particularly wish to see separated for them and arranged in systematic order, while exhibitors will find it no less for their profit to have their goods so placed as to be sure of attracting the notice of the persons whom they wish to interest. In this age of rapid development in architecture, those who are attracted by any novelties or improvements in building, sanitation or decoration form a very large portion of the community, and it is reasonable to predict for this exhibition a large patronage.

YOUNG architects, who show themselves over-ready to spend precious time and money upon competitive designs for public buildings in distant cities, where they have no friends or influence to help them, may learn a useful lesson from the testimony now being taken before the committee appointed to investigate the transactions of the architect who has had in charge the construction of the Chicago Court-House. Our readers will remember that this architect, Mr. Egan, was not long ago accused of conspiracy with a "ring" of contractors and others to defraud the county of a large sum of money, which he was said to have accomplished by means of duplicate plans and specifications, one set of which was signed as constituting a part of the various contracts, while the other set, providing for an inferior class of work, was actually followed, the difference in value between the two being appropriated by the "ring." This accusation was made by one of the conspirators, Mr. C. F. Periolat, who professed to have turned State's evidence in order to be revenged upon Mr. Egan for neglecting to divide the spoils as agreed. According to Mr. Periolat's story, now repeated under oath, he, being at that time influential with the city and county officials, was in 1874 introduced to Mr. Egan, of the firm of Armstrong & Egan, who were preparing competitive plans for the new building, and made with these gentlemen a contract, setting forth that whereas they were in need of three thousand dollars to meet the expense of preparing plans, in consideration of that amount to be advanced by the said Periolat they would, if successful in securing the commission, pay to him one-third of all fees, percentages and emoluments to be derived from the said work; while if unsuccessful, they would pay him nothing. Most people would consider three thousand dollars so advanced as likely to prove what the brokers call a "permanent investment," and so did Mr. Periolat, especially when Mr. Otto H. Matz, by the influence of the German members of the Board of Commissioners, was awarded the first prize, and elected architect of the building; but Messrs. Armstrong & Egan representing to him that if they secured the commission their profits from "extras, charges and percentages from contractors" would be at least two hundred thousand dollars, of which he would have a third, he was stimulated by this dazzling prospect, as well as by the hope of recovering his former advances, to renewed efforts. Fortunately for him, Mr. Matz, as he says, "got drunk one night, and talked too loud," and offended the commissioners. There were still two other prize designs, but as their authors had no money or influence, this circumstance was unimportant, and, as he says, he "bought up enough commissioners to get the job transferred to Egan." The average price of a commissioner was about two thousand dollars, and when subsequently the city authorities appointed another architect to design their wing of the joint building, he was obliged to buy a number of aldermen at one thousand dollars apiece to have this half of the "job" also handed over to Mr. Egan; so that his whole outlay was something like twenty-four thousand dollars. In addition to this, he expended eight thousand dollars in procuring for Mr. Egan the commission for erecting the Criminal Court building, and had him also appointed architect of the Insane Asylum, so that his actual outlay was nearly thirty-five thousand dollars. In return for this, Mr. Egan, instead of sharing his profits with him as he agreed, had only paid him fifty-two hundred dollars, notwithstanding that he had obtained for him an order to pay him fifteen thousand dollars as an extra on account of changes in the plans, with the express understanding that a part of this amount should be applied to his claim. Feeling himself aggrieved by this treatment, he resolved, as Mr. Egan expresses it, to "squeal" upon the ungrateful architect, and it is to the carrying out of this purpose that the present developments are due.

THE plumbers' registration bill has passed the New York Senate and Assembly, and only awaits the Governor's signature to become a law. Whether this is all that will be needed to insure good plumbing for the future in New York houses is more doubtful than the *Evening Post* appears to think, but it will probably be of some use. The portion which appears to us most likely to be serviceable is that providing for the examination of plans and specifications for drainage works by the Board of Health before operations are commenced, and by official inspectors after it is done, and before it is covered up. Notwithstanding some minor differences of opinion among engineers, the main points of efficient house drainage are well settled and generally understood among those who pretend to any technical knowledge on the subject, so that there need be no question of the ability of the Board of Health to perform its duties, while the inspection of the work, and its comparison with the recorded plan, need not be difficult, if the regulation in regard to leaving it exposed is complied with. This regulation will of itself exert a salutary influence over plumbers, since builders and owners, unwilling to submit to the annoyance of keeping their constructions at a stand until the inspector's arrival, will

favor any system by which the concealment of pipes and traps under floors or in partitions is dispensed with, and the principal reliance of the "skin" plumber, the rapidity with which his putty joints, leaky pipes and ineffective traps are covered up and forgotten, will be taken away from him.

An interesting statement has been presented to General Meigs by an experienced surveyor, giving the comparative cost of a number of public and private structures of the first class. The statistics of public buildings were undoubtedly made up from data easily accessible, and are probably quite trustworthy, and there is no reason to suppose that those relating to private constructions are less so, but most of our readers will be surprised to learn that the actual cost of the immense buildings erected by the United States Government in various cities has almost invariably been far less than that of private structures in the vicinity, taking into consideration the relative size. Thus the most costly of all the Government works hitherto undertaken is the San Francisco Mint, the total expense of which amounted at completion to eighty-nine and twenty-four-hundredths cents per cubic foot. The Boston Post-Office and Sub-Treasury will have cost when finished seventy-seven and eighty-eight-hundredths cents per foot; and the most economically constructed of the Government buildings, the National Museum at Washington, was completed, entirely fire-proof, with an expenditure of only six and one-half cents per cubic foot. In contrast with these the cost of the Masonic Temple in New York, a substantial, but not very elaborate structure, is given at one hundred and five and fifty-five one-hundredths cents per cubic foot, while the Western Union Telegraph building, in which the use of brick for walls, as well as other details of construction, show a marked regard for economy, required one hundred and five and twenty-two one-hundredths cents per foot. This comparison certainly speaks well for the care and skill of the Government architect and his assistants. There are few in the profession who could give better proof of a scientific and thorough knowledge of materials than is afforded by the successful execution of so great a variety of fire-proof buildings at so wide a range of cost.

The New York State Board of Health continues its good work with no abatement of energy. At the last meeting Professor Gardner, of the State Survey, a well-known expert, was commissioned to gather information with regard to city and town drainage and sanitation in England, France, Belgium and Germany; and Professor H. B. Nason, of the Troy Polytechnic Institute, has received a similar commission to examine the methods and results of the safety tests for petroleum oils in Europe. A sum was appropriated for maintaining active laboratory and field work in the investigation of the water-supply of villages, and a special committee was instructed to investigate the stench nuisances on Long Island. The Board has been engaged in urging vaccination with animal lymph, communicating directly with the officers of school districts, and already more than eleven thousand such officials have responded to its representations. Within the next few months the Board proposes to prepare a circular containing instructions relative to the proper lighting and ventilation of school-houses of different grades throughout the State, while the committees on Internal Quarantine and Sanitary Duties will compile a code of practical suggestions as to the proper procedure in suppressing nuisances, and in the management of small-pox and other contagious diseases. Such work as this is of inestimable value, and it is hard to conceive of any body of citizens who can look back at their duties performed with greater satisfaction than the members of such a board, whose efficiency is registered in the vital statistics, and who can observe the beneficent operation of the rules which their care has established in every school-house in their State.

The law to prevent the double taxation of mortgaged real estate has passed both houses of the Massachusetts Legislature by a very large majority. As enacted, the bill provides that the interest of mortgagees shall be taxed as real estate in the town where the mortgaged property lies, and that the owner of the equity shall be taxed only for the difference between the assessed valuation of the property and the amount of the mortgage. This plan for ascertaining the just burden which the several interests in mortgaged real estate ought to bear commends itself by its simplicity and clearness, and the effect of the new law upon real property will be immediate and important. Probably the first result of the relief will be observed in a rise in the value of the best lots of unimproved land in or near the larger towns and cities. Hundreds of persons cherish the hope of sometime being able to build for themselves houses on a particular piece of ground, favored by reason of a commanding view, good neighborhood or other attraction; and the consciousness that they will now be able to secure and keep control of the land, and build upon it when an opportunity offers, without being compelled either to take the whole cash value of the property out of their business, or pay an enormous price for carrying it on credit, will urge the more far-seeing of these to take title to the land at once, while prices remain low. Later, it is to be expected that builders will take advantage of the restoration of their business to a rational basis, and that the dull season will be made profitable by the construction of houses for sale, but whether rightly or not, the present prices of labor and materials are generally considered to be inordinately high, and until the market is settled, building operations which are not imperatively necessary are likely to be postponed.

Some new and interesting information regarding the Keely motor has been gathered by a reporter of the *Evening Post* from the president of the motor company, Mr. F. G. Green. According to Mr. Green, no patents have been taken out on the contrivance, because this would make its principle generally known, and other persons might find means to forestall the inventor in those practical applications of it from which he expects to derive so much profit. One might think that the practice of allowing admirals, generals, and newspaper reporters to observe the operation of the machine, inspect its construction, feel of it, smell of it, — we remember one reporter who was much struck by the "cold smell" of the cylinder, — would tend as much to the premature exposure of the secret as a judiciously worded patent; but no doubt the owners of the motor are satisfied that the riddle is insoluble by ordinary intelligence. To the question of the reporter, whether any actual work had been done by the machine, President Green replied, "of course;" going on to say that in Mr. Keely's shop a "small sawmill" had been established, where the motor was used to drive a saw requiring a fifteen-horse-power engine under ordinary circumstances. "Under ordinary circumstances" means, we suppose, when it is sawing logs, as a saw which required a fifteen-horse-power engine to turn it round in the air would be a machine even more extraordinary than the motor itself. But how Mr. Keely contrives to transport logs of the size for which such an instrument is adapted to his shop, and what he does with the boards and refuse which must result from its operation, we are unable to imagine. It seems a pity that all this energy should be so wasted. If Mr. Keely would attach even a modest coffee-mill to his apparatus, and grind samples, let us say, for intending stockholders in his company, at least some good would be accomplished.

The electric railway which has been for some time in process of construction at Berlin by Messrs. Siemens and Halske was completed last week, and opened to the public. At the trial trip a speed of eighteen miles an hour was maintained, but this could have been much exceeded if the paternal care of the German police had permitted. In the conveyance of the general public a rate of nine miles per hour is the maximum which the municipal regulations will allow for the present. The line now in operation is six miles long, connecting Lichterfelder and the Cadettenhaus, in the suburbs of Berlin, and is nearly one metre in gauge, — thirty-nine inches between the rails. The main batteries are at the stations, but a smaller one is suspended between the wheels of the car, and the rails are used to convey currents. Our readers will remember that some months ago, when Messrs. Siemens and Halske's experiments were still in the elementary stage, it was announced that an electric railway, some miles in length, was in full operation near Menlo Park, and about the same time several patents covering similar contrivances were taken out, in the interest, as was supposed, of the elevated-railway companies. What has become of these devices, which would meet with quite as extended use in this country as in any other, we do not know, but if our native genius does not soon succeed in making its own application of electricity to the propulsion of railway trains, we trust that the elevated lines, at least, will lose no time in importing the German motor.

RECENT BUILDING IN NEW YORK.—V.

THE VANDERBILT HOUSES.

Mr. William H. Vanderbilt's building plot is the whole "block" from Fifty-first to Fifty-second Street, on the western side of Fifth Avenue, and one hundred feet deep. On this there are now going up two houses in brownstone, from the designs of Herter Brothers, the decorators. One of Mr. Vanderbilt's sons is building, on the north-west corner of Fifth Avenue and Fifty-second Street, a house in gray limestone, of which Mr. Hunt is the architect; and another, at the north-west corner of Fifth Avenue and Fifty-seventh Street, a house in the same gray limestone and red brick, of which Mr. Post is the architect.

In size and cost, these Vanderbilt houses are the most "important" dwellings which have been built in New York since the "palatial mansion" in white marble of Mr. Stewart, which probably cost more than any two of the Vanderbilt houses, and possibly as much as all four. That edifice, however, of which the late Mr. Kellum was the designer cannot be said to possess any architectural interest; whereas so little cannot be said without qualification of any of the Vanderbilt houses.

Without doubt it comes nearest to being true of the two brownstone houses. These are nearly square in plan, and although there are variations in detail, and even in arrangement, these variations are trivial, and the houses are so nearly duplicates that to describe one is virtually to describe both. Each consists of a very slightly recessed centre and wings, which latter carry a blind attic, or solid balustrade, while the centre stops with the cornice over the third story. The ground floor has square-headed openings in the wall, neither grouped nor symmetrically spaced, and the jambs and lintels are unmodelled. The wall at two-thirds the height of the openings is divided by a line drawn arbitrarily,— that is, with no reference to any constructive feature of the building. Below this line, the wall is rubbed sandstone. Above, it is covered with carved vines and vine-leaves, not arranged in patterns nor conventionalized, but treated with complete naturalism. This carving is stopped against the openings by dwarf pilasters of the same height with the band of foliage, but these do not occur at the outer angles of the wall, where the carving simply ceases at an inch or two from the edge. Over this is a taller story reinforced with doubled pilasters at the angles, and with single pilasters between the openings. The openings of this story also are square-headed, but unlike those of the first story, which are merely holes in the walls, they are covered with developed lintels which are carved in foliage, treated naturalistically like that below. Over this is a shorter story, composed of round-arched openings with very narrow archivolts, grouped over the wings, and separated by pilasters which extend almost to the edges of the openings. At the angles the openings encroach upon the lines of the pilasters in the story beneath. Through the middle of this upper story runs a very wide and deeply cut frieze, of foliage arranged in patterns and conventionalized in the Roman manner. Over this story is an entablature with a convex frieze, which is not decorated, and a cornice crowned with antefixæ of lions' heads, apparently in terra-cotta, and meant to be gilded. Over this, at the wings, is the blind attic already described. There is no visible roof.

It is curious how so much good work as these buildings show can be so ineffective. The material, a very dark, almost black, Connecticut brownstone, which has been almost discarded for many years by reason of its friableness and tendency to rapid decay, is against the effect of the buildings, but the design is still more unfavorable. In strictness, neither building exhibits an architectural design. The essential trouble is that neither is properly a building. There are no features, there is no relation of parts, there is no development of masses or lines, vertical or horizontal, there is no arrangement of openings with reference to each other. The angles of the buildings, emphasized and reinforced by the pilasters in the second story, are cut to pieces in the first by carrying the unframed carving to the angle of the wall, and in the third by interrupting the lines of the pilasters with the openings. The carving throughout is well, sometimes exquisitely cut, and carefully modelled. The foliage of the first story is remarkably good in execution, but *das macht nichts*. It has nothing to do with this building, nor indeed with any building. It is not architectural decoration. It is not designed with reference to its place and function, and so does not help the expression of the wall. It is not framed, and so directly injures the expression of the wall it is meant to decorate. The belts are framed at one end by the preposterous dwarf pilasters, but above and below they are not framed at all. One wonders what the designer imagined that mouldings were invented for. The wide frieze of the third story is well carved, and the carving is well calculated for its distance from the eye; but this makes nothing either. It is not better in its place than it would be in any other place. Meanwhile the upper frieze, which is framed, and in which this enrichment would have been suitable, is left entirely bald. Nowhere, except in the pilasters of the second story, is there an effort to develop and enrich the constructive features of the building. In truth, the justly disesteemed Stewart mansion itself is more properly than this an architectural design, seeing that its parts bear more relation to each other and to the whole, and that its architecture could be less readily removed without injury to the building as a building. These are merely boxes of brownstone with architecture *appliqué*, and the only interest they have is the precision and delicacy of some of the detail taken by itself. How much this detail would gain by being put in the right place and designed with reference to its place may be judged by comparing these houses with the house in upper Fifth Avenue, designed by Mr. Clinton, of which I have heretofore spoken, where the carving is not better in itself than this, and certainly not more profuse, but where it is bestowed with reference to the building, instead of occurring promiscuously along the wall. If these Vanderbilt houses are the result of intrusting architectural design to decorators, it is to be hoped the experiment may not be repeated.

The house opposite these, designed by Mr. Hunt, is a great refreshment after them, and does not need their proximity to be distinguished. It is emphatically a building in design, whereas they are only buildings mechanically. The plan is simple. The main body of the house is nearly square, with an extension, a story lower, at the end on the side street, and with a projection in the centre of the avenue front, which contains in the first floor the doorway, in the second a recessed balcony, and, after a rich cornice, a rich dormer window, the opening of which is covered with a cuspated round arch, flanked by pilasters, which are connected by means of flying buttresses set diagonally with corbelled pinnacles. At the inner angle of this projection with the main building rises from a rich corbel in the first story a round turret which rises for a clear stage above the cornice-line, and is crowned with a steep hood. The southern or corner wing has a story more than the northern, and each wing contains one large square-headed opening in each story, with a rich dormer window above, which is flanked by pinnacles like the central dormer, and the opening of which is surmounted by a moulded and decorated ogee. The side shows a three-sided bay near the corner, and a round corbelled oriel near the centre, with dormers like those of the principal front. The style of the work is fifteenth-century French Gothic, or rather transitional, the style of the Palais de Justice and the Hôtel du Bourgtheroulde at Rouen, of the Hôtel Cluny at Paris, and of part of the Château of Blois. The work is very rich. The doorway and the recessed balcony are very deep and are elaborately modelled for the whole depth of the jambs. The corbels of the angle-turret in front and of the oriel at the sides are covered with carving, and these features are themselves profusely carved. The pinnacles which flank the dormers are panelled and in many instances crowned with grotesques, and the treatment of the dormers is throughout very rich.

As I have said, the work makes the grateful impression of being emphatically a building. In spite of all the richness which I have described, the main impression is of weight and mass. This comes mainly from the treatment of the wings. Each is a pierced wall, and not a sash-frame, and the simplicity of the treatment of the walls enhances the richness of the dormers above them and of the pavilion between them. In this respect the building is more like the Hôtel Cluny than any other example of French fifteenth-century work. The openings, ample in themselves, are not large enough to disturb the massive look of the wall, and they are very simply, though deeply modelled. Except these square-headed openings, the wall is unbroken, except for a narrow but sharp and emphatic string-course between the stories. The composition of the building, too, at least to the cornice-line, is effective, having variety and animation, without fretfulness. The sky-line, however, is needlessly tormented by the variation of level in the ridges of the steep-hipped roofs which proceeds from the dropping of one wing below the other, and the design has not been sufficiently studied in perspective to bring in the steep hood of the turret quite where it belongs, or to make it quite as important as it is meant to be in the general effect. The detail, the execution of which is uniformly excellent, is unequal in design, although one general criticism applies to nearly all of it, and that is a defect of scale which tends to make it look slight and wire-drawn, especially with reference to the massive treatment of the building as a whole. Part of this defect is due to the colorlessness of the material, for which the designer has not made sufficient allowance, but some of it would be felt in any material. The corbel of the round turret, for example, which is profusely moulded and carved, lacks vigor of modelling for its function of support, and the members of which it is composed are too nearly equal to make their relation seem organic. The stone trellis which covers the turret itself, and which would have significance at the angles of a polygonal turret, as in the Hôtel du Bourgtheroulde, loses its meaning when it is applied to a curved surface; and is besides too slight and shallow to be effective. The style which Mr. Hunt has chosen gave him an opportunity of introducing all manner of detail without hurting anybody's feelings, even a purist's; but there is more than an archæological solecism in introducing a dormer so classically treated as that on the north wing, where classic pilasters carry a triangular pediment, as a pendant to that on the south wing, in which a gable, flanked by pinnacles, surmounts a low arch with an ogee canopy. The attempt at a mixture of styles in the large dormer over the central pavilion is the most unfortunate piece of design in the building, for the reason that a construction which implies a lateral pressure cannot be mixed with a construction which implies only a perpendicular pressure. Here the gable is carried on panelled and carved pilasters, and the construction thus completed, but flying buttresses set diagonally abut upon the pilasters just under the capitals, and declare with emphasis that either the pilasters or themselves are superfluous. The inutility and meaninglessness of the arrangement is further proclaimed by corbelling the pinnacles which would receive the thrust transmitted to the flying buttresses, if there were

any thrust, thus referring the construction for ultimate support to atmospheric air. The feature has very possibly been suggested by the buttressed dormers of the Palais de Justice at Rouen, which form a real and consistent buttressed construction, which omit the incongruous vertical supports and apply the flying buttresses to meet the thrust of the arch, and in which the pinnacles crown real buttresses which rise from the ground. One may almost always take refuge in the irrefragable criticism of the Vicar of Wakefield that the picture would have been better if the artist had taken more pains; but one regrets the absence of study in parts of Mr. Hunt's work the more because other parts of it are so thoroughly studied, and because it is upon the whole so dignified, rich, and successful a piece of domestic architecture.

The third Vanderbilt house, that designed by Mr. Post, is also a corner house, at least as large and quite as rich as that designed by Mr. Hunt, and is in the same material except that here red brick is used with the limestone, and the roof is of red slate, and in point of style has a curious resemblance to it, this being in the earliest French Renaissance instead of in the latest French Gothic. The detail of Mr. Post's work is, however, classic throughout. The entrance here is on the side street and the avenue front is unbroken. It consists on the ground floor of three large round-arched openings, the arches deep, of two orders, with projecting keystones, and decorated mouldings, and the faces of the inner voussoirs decorated, each by itself. A strongly moulded cornice separates this from the story above, which consists of square-headed openings aligned over those below, but divided by mullions, and in the central opening by pilasters. A twisted shaft at the outer corner of the wall in this story sustains a small round turret in the story above, and a smaller turret running through both stories occurs at the inner corner. Above the second story is a balcony which stops against the turret. The openings of the third story are arranged without reference to those below, are square-headed, and have quoins at the jambs. Over this story is a very rich, very deep, and very emphatic cornice, with a shell frieze, crowned with a balustrade treated like that of the balcony below, and over the centre of the wall a large two-storied and gabled dormer, very richly treated also. A like dormer crowns the centre of the street front, of which the most conspicuous feature is a broad and richly decorated bay, segmental in plan.

The main motive of the building is the development of the floor lines, which become emphatic horizontal belts. The composition is less broken than that of the house designed by Mr. Hunt, and one great four-hipped roof covers the main building. The sky-line is disturbed, nevertheless, by the obtrusiveness of the dormers, which are pretty clearly either too important or not important enough, — too important for dormers, that is, which occur as appendages to the roof, and not important enough for gables. The chief drawback, however, of the building is the mixture of material, which results in an effect of color which is not fortunate. The red brick is used merely as a filling, and there is so little of it that the effect is patchy. So much stone is used, and it is so richly used, that it would clearly have been better to omit the brick, especially since no characteristic treatment of brickwork has been attempted. The detail is in general well studied, well adjusted and effective, although the supports of the balcony under the third sto[illegible] lack vigor; the unmodified column which carries the angle-turret seems entirely irrelevant to the object it is supposed to support, and the festoons at the angles of the dormer are so obviously meaningless as to be offensive.

Upon the whole, the two Vanderbilt houses which were designed by architects are successful, and as domestic architecture goes in New York, are brilliantly successful. The two Vanderbilt houses which were not designed by architects are, as architectural works, discouraging failures. M. S.

ON THE VENTILATION OF HALLS OF AUDIENCE.[1]

It is not too great an admission to say that the ventilation of halls of audience, that is, assembly-rooms, lecture-rooms, churches, theatres, and similar places, has not yet been generally effected in the most satisfactory manner.

All rooms, where many people are gathered together, are liable to become more or less offensive after a brief duration of session, and noticeably more objectionable as the session lengthens.

The flippant writer who records and publishes the circumstances does not hesitate to ascribe the defect to "want of scientific knowledge," with the implication that either he himself possesses, or that he can readily produce the encyclopædia which contains such information. Those who have practically to do with the erection of buildings or the construction of apparatus for ventilating and warming the same, and especially those in whose charge the finished buildings and their apparatus are placed, are well aware that the teachings of the books or the records of practice have not gone beyond the studies of requirements, most frequently under conditions not applicable to the climate of our northern United States; or farther than an incomplete description of the details of apparatus, which certainly have been evolved in a very perfect way in the workshop. In this regard of apparatus as a whole, it may be averred at once, that for more than twenty years the practice of American contractors has been such as will meet every requirement of supply of air in any quantity and at any temperature desired.

[1] A paper by Robert Briggs, M. A. S. C. E., printed in the Proceedings of the American Society of Civil Engineers.

The literature of ventilation is tolerably voluminous, but a few books, now over a quarter of a century old, give with much uniformity of repetition all that is written on the subject.[2]

Most writers are diffuse. The theory of ventilation has been based upon considerations rather than investigations. Views have to be supported in lieu of facts ascertained. The experiments and observations in the direction of chemical or pathological inquiry have in a great measure failed to give results compatible with evident physical wants. Ventilation of occupied places, in general, means only the supply of air for health and comfort in requisite quantities. But the uncertain element in this simple proposition is, what quantities are requisite?

The real quantity of air impaired by any one individual is small in any case, although it varies in amount with all the conditions of life and health of the individual, especially also for any one individual as to rest or activity, until limits three times in excess and one-half in diminution of what is impaired in the state of comparative rest are reached.

In air, at mean temperature of 60 to 70 per cent of hygrometry, an adult man, when awake and at rest at his ease, in similar condition in general to one of an audience in a public hall, may be taken to make 16 respirations, of 30 cubic inches each, or 480 cubic inches, in a minute.[3] This inhaled air at say 70 degrees will have, when in American summer condition of humidity, about 70 per cent of complete saturation, or about $1\frac{7}{10}$ per cent of its volume will be aqueous vapor, and about $\frac{4}{100}$ of a per cent of its volume will be carbonic acid, while the remainder will be nitrogen and oxygen in the usual constant ratio of about four to one which exists everywhere in the atmosphere. The exhaled air will be found to have lost about one-fifth the oxygen inhaled, by the formation of carbonic acid; it will have nearly three times as much aqueous vapor, and nearly 100 times as much, or about four per cent of its volume, of carbonic acid; while, notwithstanding the greater density of this carbonic acid gas, in consequence of the increase of temperature from 70 degrees to 90 degrees, and also of the levity of the aqueous vapor, the exhaled air is really about three per cent lighter than the inhaled air.

This statement of the figures of respiration has been carefully prepared, and may be implicitly relied upon. It is presented in the outset of this paper, as a foundation on which to build much of the argument to follow, and is especially intended to meet two popular fallacies.

The opinion is entertained by many people, some of whom ought to have informed themselves better, that the expired breath is heavier than the air, and, as a heavier body it falls to the ground. The contrary is certainly the case. Notwithstanding the direction given to the breath when breathing from the nostrils, the column of breath ascends in all places where the temperature of the air is below 85 degrees. The diffusion of the exhaled breath, that is, its mixture into air near by, will of course take place nearer to any person when the flowing off of the stream of exhalation is impeded by the want of difference of temperature between the breath and the air. In any room at the temperature of comfort, 70 degrees to 72 degrees (with proper humidity), the diffusion of the breath will occur above the heads of the persons, and the fresh air for inhalation will be derived from the current ascending along the person; a current induced in part by the ascensive force of the expired air, and in part by the bodily heat of the person himself. This assertion is to be qualified, however, by admission of effect from established or enforced currents of artificial ventilation, which may modify, or even reverse, the natural flow.

The second popular error is that the carbonic acid of itself separates and falls to the ground by virtue of its greater specific gravity (as a pure gas) than that of air. This is altogether a mistake. Carbonic acid has a density as compared with dry air of the same temperature, of 1.524 to 1. It can be poured from one vessel to another as water is poured, but for all that, it "diffuses" or dissipates itself very rapidly, and when once diffused, no length of time effects the least settlement or separation. There will be no less carbonic acid at the top of a tube a hundred feet high than at the bottom. Carbonic acid, if colder than the air above it, will diffuse more slowly; if warmer than the air near it, so as to be more close to the same specific gravity, it will diffuse more rapidly. Whiskey will lie on the top of water without mixing downwards, but once mixed with water, nothing but distillation will separate the two liquors. In point of fact the carbonic acid emitted with the breath is thoroughly, completely, and inseparably mixed with the breath; and the expired

[2] A Course of Experimental Philosophy, by Dr. Desaguilliers, London, 1723; Conducting Air by Forced Ventilation, by the Marquis de Chabannes, London, 1818; Principles of Warming and Ventilation, by Thomas Tredgold, London, 1824; Theory and Practice of Warming and Ventilating, by an Engineer (anon.), London, 1825; Popular Treatise of Warming and Ventilation, by Charles James Richardson, London, 1839-56; Practical Treatise on Warming of Buildings, etc., by Charles Hood, London, 1844; Illustrations of Ventilation, by Dr. David Boswell Reid, London, 1844; Dictionary of Arts, etc., by Dr. Andrew Ure, London, 1846; Practical Treatise on Ventilation, by Dr. Morrell Wyman, Boston, 1846; Traité de la Chaleur, par E. Péclet, Paris, 1843-60; Etudes sur la Ventilation, par Gen. Arthur Morin, Paris, 1863.

The above is merely a list of the more important works. A complete list for this century is perhaps fifty volumes, mostly since 1850, with possibly important articles in a hundred periodical or serial publications. It is proper that the most valuable recent work should be named wherein the physiology of ventilation is most clearly set forth, to wit: Military Hygiene, by Dr. Edmund Parkes, London, 1863. The last edition of this work is edited and enlarged by Dr. F. S. B. François de Chaumont, London, 1878.

The indispensable library books of reference in the above are Wyman, Péclet, Parkes, Reid, Tredgold, Hood. . . .

[3] Experiments of Dr. Edward Smith. Proc. Roy. Soc., 1859.

breath itself, as a whole, is rapidly, almost instantaneously, absorbed and inseparably mixed with the air of the room.

A man vitiates more air than is needed for respiration; an uncertain quantity of fresh air is both needed and vitiated in each minute by transpiration. A constant exhalation of carbonic acid transpires from the skin, by no means so large as that emitted from the breath, but probably one-fourth or one-fifth as great. The regularity of this transpiration nearly equals that of respiration. Accompanying this, it is probable that an absorption of oxygen corresponding to the equivalent of oxygen in the carbonic acid takes place. Experiments do not seem to have found that the expired air from the lungs has lost more oxygen than the carbonic acid exhaled required, whence it follows, that the supply of oxygen to form the carbonic acid transpired must be absorbed concomitantly. If now it be accepted, that air containing the proportion of carbonic acid existing in expired breath is utterly spent for the purpose of breathing over again, and if an allowance of air for transpiration be made, it is established that each person in still life requires 580 to 600 cubic inches, or from 0.33 to 0.35 of a cubic foot of fresh air each minute for perfect ventilation. Even this quantity can be reduced, as it is well known that in diving-bells men do live, and do continue to work when the proportion of carbonic acid in the air of the bell rises to eight per cent instead of four per cent as it is found in once exhaled air. Carbonic acid is an innocuous gas, quite harmless to animal life, except when it is substituted for oxygen in the air for breathing, and except also, in so far as its presence in large proportions interferes with the natural secretions from the lungs, and possibly from the skin.

Besides the carbonic acid, as one of the vitiations of exhaled air, there is known to exist a large proportion of aqueous vapor in the exhaled breath. Only $1\frac{7}{8}$ per cent in volume of the air inhaled at 70 degrees is vapor, while 5 per cent of the same volume is exhaled at 20 degrees higher temperature. (By weight the quantity of vapor will have been increased as 35 to 100.) To this excess of exhaled vapor derived from the lungs or fauces, there is to be added a large, but very variable quantity of moisture imparted to the air of a room by insensible perspiration from the skin. The natural internal warmth of the body is very nearly 100 degrees Fahr., regardless of the heat of the external air, and comfort and health, even existence as a living animal, depends upon the abstraction of heat from the surface of the body, so that the heat generated in the vital functions shall not elevate that internal temperature sensibly for any considerable length of time.

This part of my argument was more fully discussed in the paper "On the Relation of Moisture in Air to Health and Comfort," which was read by me before the American Institute of Architects at their meeting at Boston, in 1877. It was therein stated: "There are three means provided for the healthful dispersion of animal heat. The first is radiation to surrounding colder objects; the second, conduction to the atmosphere, which, for comfort, must be sensibly cooler than the body; and the third is, evaporation from the moist surfaces of the lungs and throat, and evaporation from the roots of the pores of the skin. The first of these means — to the clothed person, at least — is comparatively ineffective, while the relative quantities of heat which may be eliminated in any given time or locality, by the last two, will probably be found nearly equal, in an atmosphere of about 70 degrees temperature and of 65 to 70 per cent humidity."

It may be assumed, as the conclusion from data established by many experiments and observations, that $1\frac{5}{10}$ to $2\frac{5}{10}$ pounds of water are evaporated each day from a person in still life, or from one not taking violent exercise, nor exposed to heat varying essentially from 70 degrees Fahr. This quantity of two pounds gives, under the conditions previously accepted, about three and a half times as much vapor evaporated by insensible perspiration as would be evaporated by breathing. If it be supposed that the moisture from insensible perspiration is to be absorbed and taken up by air of 70 degrees and of 70 per cent humidity, so that this air shall become saturated with humidity, it then follows that no less than four cubic feet of air must be supplied for this purpose to each person each minute.

Aqueous vapor (which is merely the accepted name for steam in its invisible condition below the boiling point of water) is, like carbonic acid, an innocuous gas, quite harmless to animal life, except in so far as its presence in large proportions interferes with the natural secretions.

It would almost seem, from these statements as to the harmless character of respired gases, that the word vitiated was misapplied to exhaled air.

There is present in air, in general, a certain amount of gaseous impurities. Ammonia, sulphuretted hydrogen, and sulphurous acid gas, with numerous others of local derivation (especially near towns or cities), are found in very small quantities, — so small that the hundredth of a per cent is to be taken as a unit in measuring them. But besides these gaseous impurities, there always exists in air of inhabited regions very small quantities of floating organic matter, composed of fragments of organic origin, vapors of the same source, like odors, for instance, microscopic germs or living organisms, together with dust of minerals or metals, smoke, etc., forming an insignificant part of the atmosphere, nearly inappreciable by weight or measure, but of the greatest importance in effect upon the air of ventilation.

The dangerous vitiations of air by respiration or by perspiration are those which proceed from the decomposible organic matter exhaled or emitted. This organic matter appears to be carried to large extent by the aqueous vapor, although much of it exists as floating dust; and small particles of skin, fatty substances, bits of hair, can be caught and identified by the microscope. The quantity of such organic matter is exceedingly diminutive as compared with any given volume or weight of air. Dr. Angus Smith (the only authority, but his authority is sufficient) concludes that not the one hundred-millionth part of its volume for pure air on high ground, or about the one five-millionth part in a crowded railway carriage, is organic impurities. Yet to a very small portion of this very small portion of air is attributed the danger from breathing vitiated air. In all probability the origin of disease can be found only in atmospheric germs of living organisms, which find the perpetuation of their vitality in the decomposible and decomposing organic matter suspended in the atmosphere, and which are disseminated through the agency of the same atmosphere.

The quantity of carbonic acid exhaled in a given time by any number of persons is nearly uniform, and also the proportion in free air is quite uniform, so that the proportion of carbonic acid present in any occupied room can be taken to represent very accurately the degree of vitiation from respiration. Not that the carbonic acid itself is dangerous or unhealthy; but by its presence in excess of the normal quantity, the organic matter proceeding from persons occupying the room, and the related unhealthiness, can be estimated. The measure, however, is not a positive one, as a relationship to the degree of moisture in the air of any room is one of the conditions of the decomposition of organic matter, so that vitiated air laden with moisture may be considered more dangerous than the same air comparatively dry, and this regardless of the carbonic acid present.

This very long preamble to the real subject of this paper has been made because the writer felt it necessary to substantiate fully his fundamental propositions as to the absolute and demonstrable quantities of air needed for ventilation.

So far as carbonic acid and vitiations proceeding from the breath are concerned, it is evident that only a little over one-third of a cubic foot of pure air is needed each minute, provided the entire volume of vitiated air be removed without mixture in the same time. So far as moisture or aqueous vapor emitted is concerned, about four and a half cubic feet per minute supplied at 70 degrees and of 70 per cent of humidity will suffice to prevent the deposition, if the air be evacuated at 70 degrees and in the condition of saturation; while if it be admitted that the effluent vitiated air of the room has a temperature of $72\frac{1}{2}$ degrees, its condition of humidity when carrying the same amount of vapor will be only 90 per cent. Whence four and a half cubic feet of air per minute (under these conditions of supply) is enough to remove all vitiated air from personal sources, to furnish perfectly fresh, pure air for respiration and to provide an *atmosphere* four or five inches thick around a standing individual, which *atmosphere* will ascend around him, and be supplied from beneath, at the rate of motion of about three or four feet per minute.

This proportion for the absolute ventilation of an individual has been stated in all its baldness to make its impracticable character emphatically evident. Men are not going to be ventilated in cases, even to secure perfectly fresh and healthful air. The purity of air in any occupied place can only be relative. The sole mode of removal of vitiated air possible is by diffusion and dilution. A much larger quantity of air will have been supplied or permitted to enter into a room, and will be removed or allowed to escape, than is needed for the use of the persons occupying the room, during the time of their occupancy of the same; and the room itself will have a definite cubical capacity, and form an intermixing chamber for the fresh and vitiated air.

We have now passed all exact computation and come into a field of guesses and assumptions. With a definite supply of air to any room (which supposes in some way a corresponding efflux) a certain quantity of exhalations and emissions will eventually approximate to a definite ratio of the constituent parts of the air within the room. If it be supposed that twice the quantity of carbonic acid is admissible in a continuously occupied room, over that existing out of doors in fresh air, then ninety-five times as much air as is needed for respiration, etc., must be supplied to dilute the exhaled air, — a proportion which gives about 32 cubic feet of air per person per minute, with a result of 0.0008 volume of carbonic acid present. If it be supposed that the hygrometric condition of the air is limited to an *increase* of 5 per cent of the humidity in air of 70 degrees, then the absorption of vapor demands 25 cubic feet of air to each person per minute. These neat results from computation would be very satisfactory, if there were any grounds for the assumption of 8 parts in 10,000 as the exact ratios for carbonic acid and air in rooms, or for acceptance of 5 per cent of humidity in place of some other ratio, smaller or larger.

The whole matter, then, resolves itself into opinions as to individual personal comfort, and to observations upon healthfulness of some of the very few rooms and places where, for a period of time, more or less extended, a definite ventilation has been maintained.

It seems pretty well established, for rooms continuously occupied by persons, either in good health or at least not subject to offensive disease, that thirty cubic feet of air per person per minute, if of proper temperature and humidity (temperature and humidity being considered to have related values), and if adequately introduced and removed into and from rooms which have a cubic capacity of not less than a thousand cubic feet per person, will pleasantly, healthfully, and satisfactorily ventilate such rooms.

When one considers the various conditions comprised in this rule, he will comprehend how generally inapplicable the fixed rule of thirty cubic feet per person per minute becomes. The condition of the persons as to health, etc., will change the figures from thirty to sixty for surgical or obstetrical wards in hospitals; while for some diseases even the larger quantity will not remove offence, and for yet others no quantity of air can be named sufficiently large. Increase of temperature and humidity, for degrees and percentages above 70 degrees and 70 per cent of humidity, begin to demand larger quantities of air for comparative comfort; with 90 degrees out-of-doors, and 60 per cent to 70 per cent of humidity, even 60 feet per minute is not an excessive quantity of air, where 30 is named above.

The continuity of occupancy and cubic capacity are in some respects interchangeably related values. Where any room is to be occupied for a short time only, its cubic contents may be taken as so much fresh air, and deducted from the amount of air required for ventilating the same room for the same time. Thus let it be supposed the room itself has the cubic contents of eighteen hundred feet; that one person alone occupies this room for an hour (supposing it to have been filled with fresh air at the commencement of the time), and that no fresh air is supplied during the hour: the degree of vitiation will only have reached the point which would, eventually, have been attained in a continuously occupied room, where thirty cubic feet of air had been regularly supplied each inmate. This almost self-evident proposition is of the highest importance in ventilation. The homes of those in humble circumstances, and even of those who live in moderate ease, are made healthful, not by abundant constant supply of fresh air, but by frequent freshenings of the air of dwelling or sleeping rooms. No systematic ventilation, however well devised and constructed, however extensive its supply of fresh air, however regularly or judiciously operated, can afford to dispense with repeated displacement of the air of rooms, and substitution of entirely fresh air through open windows and doors, at times during all seasons of the year. This law of change of air taken in connection with a limited supply during time of occupancy applies directly and at once to the halls of audience, the ventilation of which is the theme of this paper.

In all civilized countries, people congregate in churches, halls or theatres for devotion, instruction or amusement. The ends of government require legislative and council chambers and court-rooms which have at times crowded sessions. There are thousands of rooms in this land, and in other countries, in which crowds are gathered and often packed for sessions of one to six hours on the average, with occasional sessions, in some legislative halls in particular, of twelve and sometimes more than twenty-four hours. Anything may be called tolerable that is tolerated, anything may be esteemed endurable that is endured. Churches, halls, schools, theatres, statehouses, court-rooms, etc., are rendered tolerable when judicious care is taken in changing the air after a session, and in having fresh air in the audience-rooms at the commencement of the same. They are endurable: not only can little illness or actual disease be traced to them as places of origin, but on the whole, the audiences, accustomed or habituated to the closeness of the air which accompanies any lengthened session, cease to notice what would be excessively disagreeable to a new-comer into the confined room. People do not willingly find fault where there is apparently no remedy.

Perhaps the most striking example of this salutary effect of occasional change of air as a substitute for ventilation by constant supply is to be found in our American railroad-cars, where, in cold weather, the least of regular supply is furnished to the largest number of persons temporarily crowded into the smallest space. To the outsider the heat becomes intolerable; to the insider it is more tolerable than any draught of fresh, cold air.

To the chemist, the air is found "vitiated" to the extreme, both with carbonic acid and with vapor of water, while it is laden with organic impurities that are hastening towards the condition of offensive decomposition. The unhealthful condition of the air, in thousands of cars on any day during six months of any year, cannot be questioned. And yet no serious illness that can be attributed to the want of ventilation is found amongst the tens of thousands of passengers, and it is well known that the conductors, brakemen, and others connected with the trains, who live in and out of the cars from day to day, are healthy beyond the healthiness of most other men.

Comfort is found in warmth. Whatever supply of fresh air be given, not the slightest sensation of cold must be appreciated from the current of fresh air by any occupant of a room. There is only one exception to this dictum, and that is when a person having come to a sense of oppression from the air of a room (a sense which is almost invariably one of heat and not of badness) voluntarily endures the admission of fresh, cold air upon himself. Such a person will be more likely to enjoy a blast from an open window when the external air has the temperature of zero than to endure a gentle current of four or five feet per second of air at 60 degrees to 65 degrees, and 45 to 50 per cent of humidity. The requirements of ventilation are not positive. Those of comfortable warmth are innumerable facts. The air of any room may have become much vitiated, and even offensive, and if its temperature be kept down to the point of comfort, most persons will deem such air to be fresh within the desirable degree of purity, while an overheated room is apt to be pronounced to be "filled with bad air," although the air may be as pure as is attainable.

The popular appreciation of ventilation is founded upon effluvia and heat. Effluvia may proceed from two sources: first, from the decomposition of organic matter exhaled or emitted,—a very short time is needed for this decomposition to become apparent,—and second, from odors which emanate from the person or clothing of those occupying a room, whether the odor be offensive or defensive. In either case effluvia, when marked as pervading a room, or any portion of it, is a legitimate evidence of inadequate ventilation. The effect of odors, however, on the senses is very imperfectly marked. A habitude is established, and nine persons out of ten of an audience do not realize the degree of vitiation which has been reached by gradual steps during a session, and at the end of the same, when passing to the outer air, the change of temperature will not allow the change of quality to be perceived. Unless one has had occasion to enter the hall during the sitting he will never know the air had become impure. Heat becomes, therefore, almost the sole standard by which ventilation of halls is judged. The overheated condition, especially of the upper portions of halls, obtains the designation of closeness, and is generally submitted to be the limit of endurance, at which point some window near by is opened, greatly to the discomfort, in cold weather, of those on the floor of the hall, and little to the relief of the overheated portion of the room.

Except in very cold weather, crowded halls do not require the supply of much heat. Many halls, with corridors and passages on one, two or all sides, especially auditoriums of theatres, require no more than to be warmed to a comfortable temperature before the audience collects, after which the heat from the persons composing the audience will more than supply what heat is lost at the windows or walls. For ventilating a hall in such case it becomes necessary to introduce air of lower temperature than that of the room. The problem, then, is how to introduce and distribute cold currents of air amongst a crowded audience without producing the sensation of cold to any one of them.

The air-supply demanded may not be strictly cold. Its desirable temperature may rise considerably above the proper temperature of the room, and yet it will, in currents, be perceptibly and sensibly cold.

The feeling o. cold from currents of air proceeds from two sources: First, the abstraction of heat in warming the air itself, and second, from the absorption of vapor by the air, which vapor will have been formed at great expenditure of heat from the natural moisture of the skin. "The quantity of heat taken up in the vaporization of the moisture of the skin by dry and cold air, compared with that abstracted in warming the air, is so great, that the heat imparted to the temperature of the air becomes much the least in the ratio. Thus air at 35 degrees and of 70 per cent humidity demands nearly the same quantity of heat to warm it to 70 degrees that is requisite to vaporize the moisture which will raise the humidity to 75 per cent at 70 degrees.[1] It is very nearly correct to assert that the cool-sensation from a breeze in summer proceeds entirely from the evaporation of moisture thereby induced. A current of saturated air at 100 degrees will neither remove heat by contact nor by induced evaporation, and is consequently incapable of producing a cooling effect; while as the temperature or the degree of humidity is supposed to fall, the same velocity of current becomes first a pleasant, cooling one, and next a decidedly cold one. With a high temperature and dry air the cooling effect of a current (even at 100 degrees) may be pleasant to the sensation, but will be attended by sun-burning (even without exposure to the sun), and blisters will be produced by the excessive deprivation of moisture from the cuticle or surface of the skin. With 80 degrees of heat and a high dew-point a strong breeze is not unpleasant, nor likely to be injurious, after the person shall have acquired some accustomed habit of body to endure it; but at 70 degrees and a low dew-point, which is the only possible condition of heated air in mid-winter, the annoyance of a current of even five feet per second and its unhealthiness are positive facts."[2]

It is proper that I should advert at this point in my discussion to the marked differences of the variations and requirements of warming and ventilating that exist in this country from those which are found in England or France. The subject has been considered in the paper "On the Relation of Moisture in Air to Health and Comfort," but it may be now again referred to, in support of the view that American practice should be directed to meet the special requirements of American conditions, and not to conform with other requirements, however well established in themselves. As was set out in the paper "On Moisture in Air," it seems at first inexplicable to an American how the statement can be made by foreign writers that 56 degrees to 62 degrees Fahrenheit are comfortable temperatures for living-rooms, when in cold weather he is scarcely warm at 70 degrees, and in mid-winter is not overheated at 80 degrees, although clad at the time in the thickest of underclothing. The fact is that the deprivation of heat from the person is greater from the evaporation of moisture than from radiation or convection of the air, and the hygrometric state of the atmosphere has so much influence as to make a temperature of 56 degrees in Ireland, the West and South of England, or in Normandy, sensibly as warm as 80 degrees in Canada or Minnesota at about the same season of the year.

All mankind complain of the weather, and an Englishman espe-

[1] *Vide* addenda to paper "On the Relation of Moisture in Air to Health and Comfort."

[2] Quoted from a paper by the author, "On the Ventilation of the Hall of Representatives," Washington, 1876.

Wm. G. Preston · Architect · New Building of the · Massachusetts · Charitable · Mechanic · Association · Huntington Ave. & West Newton St. Boston.

· Unanimously adopted by the Association July 21. 1880 ·

· Length of Huntington Avenue Frontage . 600 feet · Length of West Newton Street frontage 325 Feet ·

· Area covered . 92000 square feet · Total area of floor space . 6 Acres ·

Dimensions of the Grand Hall . 150 × 200 ft: seating capacity . 8000 persons ·

No. 252 American Architect and Building News, May 21, 1881.

DWELLING HOUSE FOR C. VANDERBILT Esq.

Cor. 57th Street & 5th Ave. N.Y.

Geo. B. Post Architect 120 Broadway

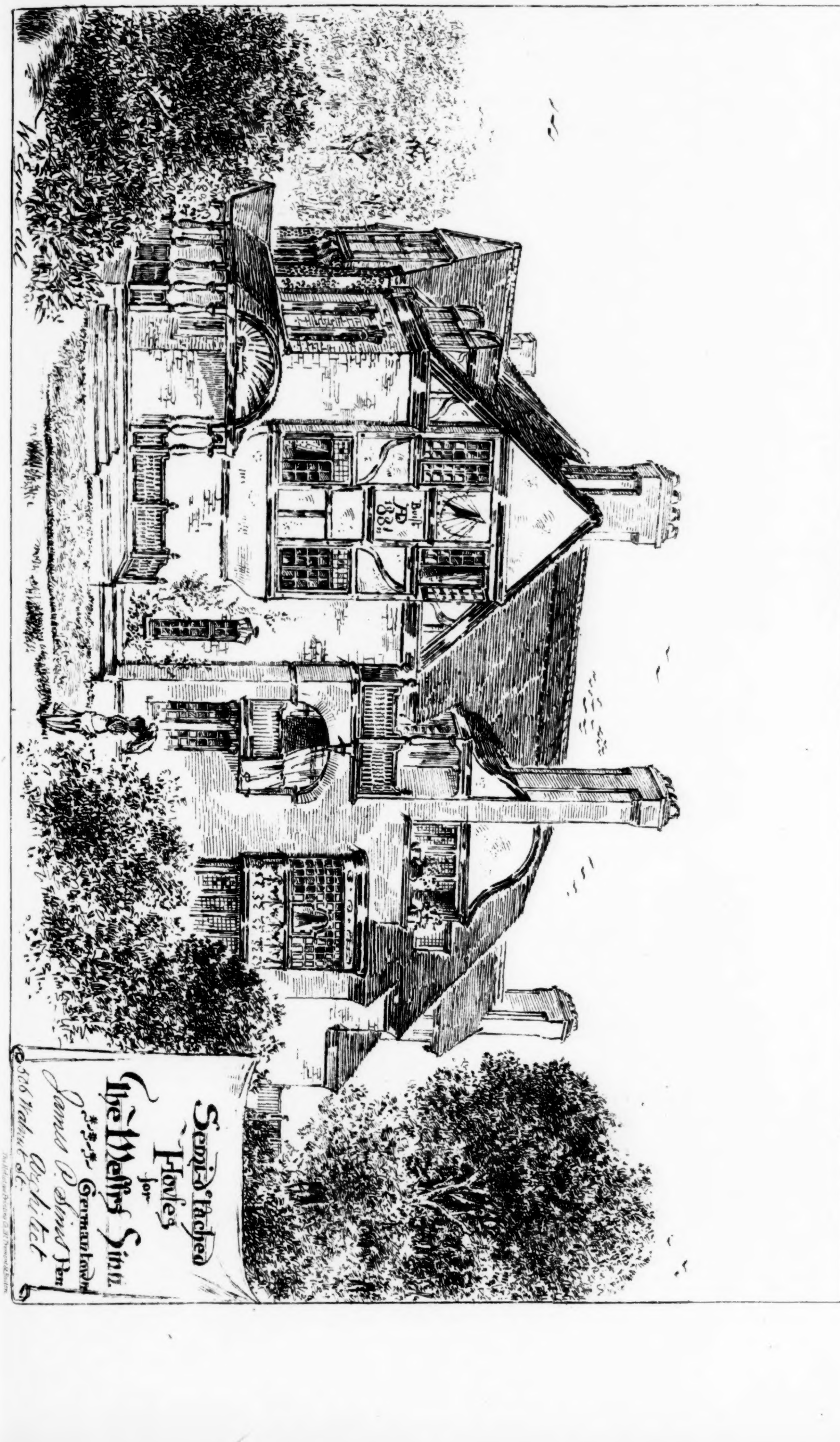
Scale of Feet

57th STREET ELEVATION

Scale of Feet

5th AVENUE ELEVATION

The Heliotype Printing Co. 211 Devonshire St. Boston.



cially. But there are in England, eight months of the year when the thermometer ranges between 40 and 60 degrees in the shade (and there is very little sunshine), with a dew-point so high that it is a pleasure to exercise in the invigorating air; one month of 60 to 80 degrees, and three months from 25 to 50 degrees. While in Northern America there is scarcely one month (or thirty days) with the average temperature of 50 to 70 degrees (temperatures which, from the difference in humidity, correspond sensibly to 40 to 60 degrees in England), and there are about three months from 75 degrees to 90 degrees, three months of 30 degrees to 50 degrees, and five months of excessive variation of temperatures from zero to 40 degrees or 50 degrees, these last five months having about thirty days of warm weather at intervals. During the three hot months, and also during the five cold ones, open-air exercise to those whose avocations are generally within doors is almost impossible. Any one who is called upon to endure the fervid summer heat, or who will habituate himself to the inclemencies of our Arctic winter, will not suffer great discomfort therefrom; but the weak and the tender, the workman of the factories, the tradesman of the shops, the merchant in the counting-house, the student at the desk, cannot acquire the endurance or the habit, and must shelter or warm themselves.

It follows that the ventilation of halls in England for eight months of the year is simply the quiet introduction of a given quantity of external air, little or no increment of heat being necessary, and for three-twelfths of the year the similar introduction of air, heated 15 degrees to 20 degrees. There is one month of altogether open windows; but except on a few very stormy days, there are few times when relief from overheat or closeness in a room cannot be obtained without serious discomfort, by partial or controlled admission of external air, directly from windows. The small addition of heat demanded at any season, and especially for the most of the year, prevents the adoption of our system of ventilation by means of warmed currents of air. The use of the levity of the entering current ceases to be available when that current must necessarily be only very little, if at all, higher in temperature than the room itself. On the other hand, the operation of an exhaust system, where an exhaust shaft or fan is made to remove air from the room, becomes eminently feasible, when the general conditions are such that the outer air may be taken in freely, at any provided or arranged inlet, without discomfort from its want of heat. The great support of the exhaust system for American usage is derived from English authority and example, together with its applicability to ventilation for the American single month of the year, of 50 degrees to 70 degrees, when closed windows and a supply of unheated air is the requisite for occupied places.

Our season of open windows is longer than that of England, but it is also much hotter, and we are constrained to some forced supply of air during the hot season to render audience-halls tolerable. Our term of mean temperature is so brief that its especial consideration may be neglected for audience-halls; but for asylums or hospitals this term must be adequately provided for. The real point of discussion is how to warm with an average temperature outside of 25 to 30 degrees to the inside temperature of 70 degrees to 75 degrees, and how to supply with the warming, sufficient air for breathing and for the preservation of relative purity.

There are two respects in which ventilation of halls becomes easier in America than in England The greater humidity of the English climate prevents the dispersion of exhaled vapor with the same rapidity as with us, and exhaled vapor is laden with organic impurity on the verge of decomposition. Only a very few minutes are required for surcharged air at the temperatures existing in close rooms to become offensive. The fœter of a long occupied hall in England is distinctive to an American and unapproachable in a dryer climate. In another regard we have, in the court-rooms, theatres and public buildings in general in America, the advantage of superior cleanliness in dress and person for a considerable portion of the audiences. We have comparatively no lower order to ventilate against.

THE ILLUSTRATIONS.

HOUSE OF CORNELIUS VANDERBILT, ESQ., NEW YORK, N. Y. MR. GEORGE B. POST, ARCHITECT, NEW YORK, N. Y.

SEE for description of this building "Recent Building in New York," printed in another column.

EXHIBITION BUILDING OF THE MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION, BOSTON, MASS. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

The portion of this building which has been allotted to the special Exhibition of Building Materials (see circular of invitation in another column) is marked A on the basement plan.

SEMI-DETACHED HOUSES FOR MESSRS. SINN, GERMANTOWN, PA. MR. J. P. SIMS, ARCHITECT, PHILADELPHIA, PA.

SETTLEMENTS.[1] — II.

So far I have assumed that the settlement is to be a friendly one. It is hardly necessary to say much about settlements of a less pleasant complexion. The matter quickly leaves the architect's hands. The arbitration clause comes into operation, and where there is any great display of obstinacy on either side it saves a great deal of trouble, no doubt. Unfortunately, the eminent members of the profession who are wont to be appointed as umpires are often well qualified for the position in all respects save that of a knowledge of accounts. If the case be large enough to justify calling in a surveyor assessor to sit with the umpire and to deal with the measurements and prices, no harm is done.

There is something in a name, — and although by any other name "extras" are no cheaper, I thing some of the sting is removed by calling them additional works. I note that the Institute conditions adopt this phrase, and there is certainly less of a suggestion of spontaneous growth in the term "additional works" than there is in the other word. The one phrase seems to imply that the client ordered more to be done, the other suggests that the architect "let him in;" — the word may be good enough, but this is the meaning which it has to a great extent acquired.

I shall be leaving a very important part of my subject untouched unless I say something about the valuation of the variations, always supposing that the necessary steps have been taken to settle the extent of them. The schedule referred to in the Institute Conditions of Contract is supposed to govern the valuation, and this schedule is, as we know, in the majority of cases a copy of the builder's detailed estimate. The use of it presents little difficulty, if the user cultivate that judicial impartiality to which it should be his ambition (as it is by practice in his power) to attain. But where there is no such schedule the difficulty is sometimes very great. I often wonder why the ordinary published price-books do not take a little more trouble to keep pace with the times. Perhaps it is beyond their power; the differences of locality and the rapid fluctuations of markets must render it very difficult. Still, I think that a good deal might be done, and that if a trustworthy, not too-elaborate, price-book were published in London and in the provinces (just as the Post-office Directories are), giving the prime-cost rates of builders' work in the several localities, it would be extremely useful. I fear I cannot say to what extent such a venture would be profitable. One result of such a publication would be a great assimilation of modes of measurement, — a very desirable reform. More work would be let on schedule, insuring perhaps better work, because it would be done with a certainty that it was not being done at a loss; and the little country builder, very good at his work, but very weak in his estimating, would perhaps be able to realize that modest fortune which, under the present system of tendering, seems only too certain to evade his grasp. Perhaps at some future day our Architectural Association and its allied societies throughout the country will be able to do something towards collecting information of the kind.

I spoke of the schedule referred to in the Institute conditions. In this particular (as in some others which it is not within my province to mention here) the conditions are a little weak. They do not clearly say that the bills of quantities are the schedule, although we know that where quantities have been supplied they generally do form it.

The question of the cost of measuring variations is, perhaps, one which fairly comes within the limit of my paper. Where an outside surveyor has been employed, his fees, as we all know, are generally added to the extras, and, as we probably all also know, would be the subject of much indignation on the part of some clients if they knew they were paying them. This is very unreasonable and unfortunate. I hope the day will come when the position of the measuring surveyor will be more clearly defined with us, as I believe it is in Scotland and on the Continent, and that there will be no mystery whatever about the matter.

Settlements in those parts of the country where the sub-letting of the various trades is the rule are perhaps the most tedious and troublesome of any. With five or six different sub-contractors to meet, it may be well imagined that there is room for occasional controversy. The rule with some architects is, I know, to deal only with the contractor-in-chief, and to leave him to settle with the rest. Probably this course is the easier; although in practice I admit that I have generally followed the other. There is certainly an advantage in going over the work of each trade with the man who is a perfect master of that trade. One is pretty sure to get some practical wrinkle in the course of the interview which quite compensates for the additional trouble involved. In passing, I may, perhaps, observe that for districts where work is thus sub-let, the conditions of the contract require to be modified as regards the sub-letting clause ordinarily inserted for London jobs. Not only should the sub-letting be recognized, but the architect should reserve some sort of right of approving the sub-contractors, if he means to have the work properly done.

A good system of settlement (but one not always practicable) is to agree not only as to what are extras, but as to what is their value, as the works proceed. One hears and knows of cases where this has been done, and where, of course, much trouble has been saved; and it certainly sounds like the simplest thing in the world. But supposing you cannot agree? There is then nothing for it but to fall back upon the old system. Of course, the arbitrator could be called in, but that would be too ludicrous. You could not have an arbitration once a week.

It may occur to you that I have omitted to abuse the builder, and to quote him as the creator of extras. I can only say that the omission is intentional. One can but speak from one's own experience, and mine may be of the more fortunate sort; but I have not found that contractors, as a rule, desire to create extras. When a con-

[1] A paper read before the Architectural Association by Mr. L. C. Riddett, April 1.

tract is taken, the builder, if he be a man of any method at all, and in a fairly large way, of course makes his arrangements for certain supplies of materials and labor, all of which arrangements are apt to be upset if there be any material alteration in the intended works. It is not necessarily to his interest to have any such disturbance.

I must not forget to refer to one sort of settlement which is quite free from extras. Under such a system as that to which I just now referred (building by schedule), there would, in a certain sense, be no extras, and there would be one bugbear the less to worry the architect.

I do not know how far the Scotch or French architects, who build by schedule, may suffer from the difficulty in question. In both those countries the work is, as we know, measured and valued on a schedule. In Scotland, and, I presume, in France, some kind of estimate is given. But, where it is understood that all is to be measured at the finish, I do not see how the absolute total cost can be calculated beforehand. No doubt, it is understood, that it is approximate. Speaking to a French architect on the question of the cost of work, a short time ago, he assured me that, in his own individual practice (and he has a large one), a client was always very meek and manageable on this score, and "he lends me his purse," was the expression which he used, in order to convey the idea of his complete docility, — a beautiful and resigned spirit, quite unusual among English clients, so far as my experience carries me.

A very familiar form of extra is that which arises from the weakness of sub-contracts. The chief contract embraces, perhaps, a number of provisions as to gas-fitting, hot-water work, sculpture, stained glass and other decorations. You make sub-contracts with various tradesmen or artists. At the close of the job you find that you were not quite so careful in the clauses of your specifications for these sub-contracts as you were with those of the specification-in-chief. What I say may sound superfluous, but I have a good many accounts to deal with, and I get only too much evidence that it is not. There is sure to be a loophole for an extra in some of these items. The gas-fitters have required and received such an amount of attention from the carpenters that you could almost believe that they had been lady gas-fitters! The hot-water man wants you to find him all the materials for setting his boilers and building his flues, and often all the labor too; but he was not nearly so emphatic about these requirements before signing his contract. You ought, perhaps, to have understood him more clearly. I do not say it was his fault. The other people scorn to bring so much as a step-ladder onto the premises, and proceed to use the plant belonging to the builder, who instead of carting away his scaffold-poles, and cords, and planks, practically invests them at a good rate of interest, charging so well for the hire of them that you might almost expect the "plant" to fructify in its unexpected state of prosperity. The carver has no scaffolding, and you must not only find it for him (unless you bargained otherwise), but must shift it about to suit him. I do not say that any of these claims are fictitious or unjust. I merely remark that you should guard against them.

A cause — though a less frequent cause — of extras is the old "p. c." difficulty. You provide your little sums of money for locks and latches, for stoves and chimney-pieces, but you have omitted to say that the amounts did not include the builder's profit. You are not too busy, perhaps, to go about and order these things yourself. When you get the bill you tell your builder to pay it, and he does so; but if he finds the merchants deaf to his appeals for discounts, he fairly enough charges your client with a profit. You cannot object, because you had omitted to put the letters "p. c." after the sums provided, or to arrange that he should have a discount. This, again, is a most elementary piece of instruction, and I am almost ashamed to introduce it, but I know it is a caution much required by those who have not had experience in difficulties of the sort.

Another cause of extras in connection with the prime-cost difficulty occurs to me. The preventive is simple enough; but the difficulty often arises. Your client being anxious to choose his grates or tiles, or some similar little matters, all provided in the contract, but in the selection of which you give him discretionary power, asks you to take him round to the headquarters of the dealers in such things. The merchant supplies the goods, and invoices them to your client or to yourself, and does not press anybody for the money. The account has been delivered to you, but you have sent it on for your builder to pay. Circumstances over which he has no control, or at any rate you have not, prevent him from paying it at once. The same circumstances, however, induce a rather speedy winding-up of the contract accounts, and you give your builder a certificate for his balance, quite unconscious of the fact that the goods remain unpaid for. "Circumstances" again assert themselves in a way unpropitious to your late contractor, who liquidates, and starts again, regenerate and ready for fresh troubles. You are a little surprised to find the merchant so calm and unmoved. Having just settled down to admire this good man struggling — one might almost say, satisfied — with adversity, you are further surprised by the delivery of his account, made out to you or to your client. The disturbing effect of this upon your recent settlement is easy to imagine. The preventive is equally easy. Take care another time that the order to the merchant goes through the contractor.

The grandest safeguard against extras is, of course, the "money provision," to be expended as directed. I think the builder generally is directed to expend it. In contracts of a heavy sort for public bodies who are perhaps borrowing the amount which they propose to spend, and who perhaps cannot afterwards enlarge their borrowing powers, ten per cent would be a prudent provision. With an ordinary client, I think that a sum of at least five per cent on the amount of the contract should be thus placed at the discretion of the architect. And it is all the better for the client if he does not know the extent of the provision. However perfect may be your confidence in your client, or his in you, I do not believe that he can, as a rule, be safely trusted with a money provision. He will spend it three or four times over.

A word with reference to omissions will nearly finish all I have to say on the subject of settlements. Some system of booking omissions at least as clearly as the extras are recorded is much to be desired. No doubt, the young architect with one job will be pretty clear as to his omissions; but when work gets more plentiful, and particularly when it happens to spread over a long term, he is very likely to forget a few of them. Most architects have, I fear, a kind of horror of bookkeeping; but a certain amount of it is a necessity, and will save much time in the end. At any rate, a little debtor and creditor account might be kept against the "provisional" items, by which could be seen at a glance how you were getting on, and when to enforce severe economy with reference to these. Many an unpleasant surprise at the finish would be spared by even this little exercise of commercial intelligence.

And now, to conclude, I am only too conscious of having left unsaid much that might have been said, and of having said much which, from its "elementary" character, might have been omitted, and yet have left many of you none the less instructed on the subject.

I started by saying that I desired to address those members of the Association who were still in the student stage, or but at a very slight remove from it. I have assisted at many meetings and classes in this room, and have learned many useful hints in attending here. The instances have been rare — in fact I can remember none — in which the lecturer has put anything too simple before us. I trust that you will forgive your lecturer this evening if he may have been the first to transgress in this particular.

AN EXHIBITION OF BUILDING MATERIALS AT BOSTON.

At the suggestion of the Boston Society of Architects, the Massachusetts Charitable Mechanic Association has decided to enlarge one of the features of its usual exhibition, so as to make a complete special exhibition of

BUILDING MATERIALS AND APPLIANCES,

and has requested the undersigned gentlemen to charge themselves with the organizing and perfecting of such an exhibition on a scale not before attempted in this country.

It is the intention of the committee to arrange a full and classified exhibition of all the materials, raw and manufactured, that enter into the construction and equipping of modern buildings, and full exhibits in at least the following classes are earnestly desired: —

GROUP I. — MATERIAL.

Gross Materials: —
Wood, plain and fancy, domestic and foreign.
Stone, of all kinds, rough and dressed in every style.
Brick, plain, ornamental, and fire.
Iron, from the ore to highest grade of steel.
Cement, Lim Plaster, etc.
Paints, Oils, Chemicals, etc.
Glass, Window flooring, etc.

GROUP II. — CONSTRUCTION.

Tools: —
Trade Implements.
Machines for working Wood, Iron and Stone.
Brick and Tile Machines, etc.

Fire-Proofing: —
Systems of Fire-Proofing.
Fire-Proof Material.
Fire-Extinguishing Apparatus, etc.

Structural Devices: —
Portable Houses (Models).
Paper Houses.
Trusses.
Built beams.
Roofing Systems and Materials.
Scaffolding, etc.

Builders' Hardware: —
Locks, Knobs and Door Finish generally.
Bolts, Pulleys, Sash-Fasts.
Stable Fixtures,
Bells, etc.

GROUP III. — SANITATION.

Sanitary Appliances: —
Drainage Systems (Models).
Water-Closets, Traps, Urinals, etc. (Glass apparatus showing action desirable)
Disinfecting Apparatus.
Plumbers' Supplies generally, etc.

Heating: —
Steam-Heating Apparatus.
Hot-Water Apparatus.
Furnaces, Heating-Stoves, Gas-Stoves, etc.

Ventilation: —
Ventilators.
Ventilating Systems (Models).
Blowers.
Fans, etc.

Hygienic Establishments: —
Hospitals and their fittings (Models).
School-Houses and School Apparatus (Models), etc.

GROUP IV.—COMFORT AND CONVENIENCE.

ELEVATORS:—
Steam Elevators.
Hydraulic Elevators.
Freight Elevators.
Parlor Elevators.
Hand Hoists.
Dumb-Waiters, etc.

PUMPS:—
Pumps, Common and Force.
Rams.
Windmills, etc.

COMMUNICATION:—
Speaking-Tubes.
Telephones, etc.

SAFETY:—
Fire-Escapes.
Automatic Hatchways.
Elevator Safety-Catches, etc.

LIGHTING:—
Chandeliers.
Gas-Fixtures.
Electric-Lighting Apparatus.
Gas-Machines, etc.

GROUP V.—DECORATION.

INTERIOR FINISH:—
Veneers.
Parquetry.
Stair-Railing.
Stained Glass.
Stucco-Work.
Wall-Paper.
Tiles.
Furniture.
Hangings, etc.

Ample power will be furnished, free of charge, to exhibitors who may wish to show their machines in operation, and it is hoped that this class of exhibitors will be large.

No fee is exacted for entries, or for space occupied.

It is the intention to have tests made during the exhibition of those articles which lend themselves to such treatment at such a time, as, for example, elevators, safety-catches, fire-escapes, fire-proof material, heating and lighting apparatus, and patented appliances of all kinds, traps, water-closets, etc. (which tests will be subject to special official report by experts).

Further information as to the scope and limits of the several classes here named, and as to the manner in which the committee feel it desirable that exhibits should be prepared, will be published from time to time in the *American Architect and Building News*.

The exhibition opens September 1, 1881, and closes October 31, and all goods must be removed on or before November 10.

As the portion of the building devoted to this exhibition will be finished sooner than other parts of it, exhibits for this section will be received as early as August 1. This will allow ample time for the instalment of exhibits and the setting up of machinery.

All exhibits are submitted subject to the rules and regulations of the Massachusetts Charitable Mechanic Association, as set forth in the general circular of said association.

Applications are to be addressed to George B. Hanover (Clerk of the Board of Managers), 40 Bedford Street, Boston, Mass.

EDWARD ATKINSON. O. W. NORCROSS. HENRY A. TURNER.
THEODORE M. CLARK. WILLIAM G. PRESTON. HENRY VAN BRUNT.
JOHN S. DAMRELL. J. PICKERING PUTNAM. GEO. E. WARING, JR.
WM. ROTCH WARE, *Secretary*.

CEMENTS AND GLUES.

DR. JOHN PHINN recently told the Polytechnic Club of the American Institute that pastes are all made from starch in some of its forms. Gluten is also used for a paste, but starch is the best. All additions of rosin, etc., commonly recommended are a damage to paste.

Dextrine, or "British gum," is of immense value in the arts as a cement. It is derived from starch by roasting, or by the action of nitric acid. It was discovered by the accidental overheating of starch, and its process of manufacture was for a long time kept secret. Its chief use for some time was in the cotton manufacture. It is the standard gum for postage stamps, though it is said that gum-arabic and cheaper substitutes are used in this country. [Dextrine is one of the most valuable substances which we have for making pastes, etc., and deserves to be more generally known. Its usefulness as a material for sticking paper is much greater than gum-arabic, being free from many of the objectionable features of the latter.]

No cement can be fire-proof which contains organic matter, since this is decomposed at a temperature about that of melting lead, or, say, 600° Fah. Cements containing oils will not be fire-proof.

Silicate of soda mixed with asbestos is the nearest to a fire-proof cement. It will stand a low, red heat. It is decomposed at a bright red.

Water-proof glues are made in two ways. Glue and linseed oil are recommended, but I have had little success with the mixture. The chromates may be used with glue. These, when exposed to the light, render the compound insoluble. Unfortunately, although water will not dissolve a glue thus treated, it still has an action upon it. The glue has in fact been, as it were, tanned by the combined action of the bichromate and the light. It will, like leather, swell up and soften when long exposed to water.

Aquariam cement is the best water-proof cement I know. The formula is:—

Litharge	3	Rosin	1
White sand	3	Boiled linseed oil	1
Plaster-of-Paris	3		

The solids are to be taken by measure in powder and mixed. As it sets rapidly, the set must not be added until it is wanted for use. It is better for being put into a mortar and pounded. It hardens in three days. It will hold glass firmly, and with it glass tanks may be made without frames, if the angles are well filled with cement. It is a kind of mastic, and could be used on brick.

What is technically known as marine glue stands almost by itself. Where it can be put on hot it is admirable. It is composed of India-rubber and shellac, dissolved in naphtha. Some kinds are hard, some almost liquid. I have seen this glue adhere to glass so firmly as to tear the glass when plates were separated.

In answer to a question the speaker said that stratena, whose wonderful powers are so frequently exhibited upon the streets, is probably only the old Armenian cement. This is so strong that it will hold jewels in place, and is used for this purpose by the Armenian jewellers, who merely flatten the settings of their precious stones and then stick them in place upon the metal with this cement. It is made by dissolving isinglass in alcohol along with gum ammoniac. When well made it is perfectly transparent.

COST OF BUILDINGS PER CUBIC FOOT.

WASHINGTON, D. C., May 10, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—The first fifteen items of the following table were communicated by the owner of a large building in Washington, for whom they had been prepared by an architect and surveyor of buildings. To this are added some other public buildings, which will serve to illustrate the difference in cost of large buildings for various purposes and of various methods of construction:—

BUILDINGS.	Cubic Feet.	Total Cost.	Cost per Cubic Ft.
			Cents.
1. Sub-Treasury and Post-office, Boston, Mass	2,671,338	$2,080,507	77.88
2. U. S. Branch Mint, San Francisco, Cal	1,680,795	1,500,000	89.24
3. Custom and Court House, and Post-office, Cairo, Ill	444,376	271,081	61.42
4. Custom and Court House, and Post-office, Columbia, S. C	587,916	381,900	64.96
5. U. S. Building, Des Moines, Io	413,987	221,437	53.48
6. U. S. Building, Knoxville, Tenn	542,362	398,847	73.53
7. U. S. Building, Madison, Wis	541,483	329,389	64.39
8. U. S. Building, Ogdensburg, N. Y	447,585	216,576	48.38
9. U. S. Building, Omaha, Neb	654,703	334,000	51.01
10. U. S. Building, Portland, Me	524,886	392,215	74.72
11. German Bank, Fourteenth Street, Newport, R. I	600,000	475,000	79¼
12. *Staats Zeitung*, New York City	508,000	475,100	93.52
13. Western Union Telegraph, New York City,	1,330,000	1,400,000	$1.05.263
14. Masonic Temple, New York City	1,800,000	1,900,000	$1.05.555
15. Centennial Building, Shepherds, corner Twelfth Street and Pennsylvania Avenue, Washington, D. C	931,728	246,073	26.41
ADDITIONAL.			
New fire-proof building for U. S. National Museum, Washington, D. C	3,843,611	250,000	06.504
The brick depot of the Quartermaster's Department on the Ohio River, at Jeffersonville, Ind., 801'4" x 801'4", surrounding an open court-yard 636' square. This is a storehouse. Cubic contents under roof	2,700,000	150,000	05.55
A similar depot of the Quartermaster's Department at San Antonio, Tex., built of stone, 624' x 624', with an open court of 558' x 591'	1,100,000	100,000	09.1
A dwelling in Washington, built by days' work in 1868-69, in time of very high prices, 36' x 50', by 37' high, with a masonry loggia or porch, 12' x 34', one story high	.....	.....	43.5

If you find the above of interest to the profession, it is at your service. Very respectfully, M. C. MEIGS,
Quartermaster-General, U. S. A.

CALIFORNIAN ARCHITECTS AND THE AMERICAN INSTITUTE OF ARCHITECTS.

NEW YORK, May 9, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Gentlemen,—I notice a slight error in your first editorial of last Saturday. A regular meeting of the Trustees of the Institute is due every month, except in July and August. Every fourth meeting is called a "quarterly meeting" just as every fourth issue of your weekly journal is called a "monthly number."

The advice you give your correspondent, however, is excellent, and the only thing that strikes me as a little odd in the matter is that while, in the course of my regular official duties as Secretary of the Institute and of the Board of Trustees, I have been for several months in correspondence with some of the most prominent architects of San Francisco in relation to the establishment of a chapter, there should be others who seemingly prefer to adopt what appears to me a work of supererogation by troubling you in the matter of preliminary correspondence; though it is by no means an evil either for the Institute or for outside members of the profession that the conductors of the recognized organ of American architects and architecture should be made the confident of professional perplexities, either personal or would-be associative.

"A local society" is precisely what the divisional or chapter system was meant to and does provide for, and the best way to ensure the realization of a local association in affiliation, for purposes of reciprocal advantage, with other local associations, through a co-ordinating central one, is first to obtain all necessary information from the proper official authorities, and then to get rid, as far as human nature will permit, of personal rivalries, jealousies and indulgence in the *lex talionis*. These may be inseparable from the objects of mere personal pursuit; but, if long or largely indulged in, they are fatal to associative objects, and to all the protection and benefits derivable from them. The law of association absolutely demands the sacrifice, to a certain extent, of personal feeling, during the exercise of associative functions.

A. J. Bloor.

MR. GAMBRILL'S COLLECTION OF PHOTOGRAPHS.

The Secretary of the New York Chapter of the American Institute of Architects sends for publication the following: —

New York, April 16, 1881.

Dear Mr. Bloor, — I wish to present to the New York Chapter of the Institute of Architects Mr. Gambrill's valuable collections of photographs.

I trust they will be carefully handled and their numerical arrangement preserved as planned by Mr. Gambrill, who gave much thought to the matter.

Hoping that they will give much pleasure to many earnest students of art, I remain very cordially yours,

Emily T. Gambrill.

NEW YORK CHAPTER, AMERICAN INSTITUTE OF ARCHITECTS.

New York, May 4, 1881.

Resolved, That this Chapter most gratefully accepts the munificent gift of Mrs. Gambrill, widow of its late esteemed fellow-member, Mr. Charles D. Gambrill, as proffered in her letter to the secretary, of 16th April, 1881, and comprising over twelve hundred (1,200) illustrations of architectural subjects, — nearly all mounted photographs, — and all collected and carefully classified by her late husband while travelling in Europe, together with the receptacle in which, by means of ingenious contrivances, they may be readily inspected.

Resolved, That while Mr. Gambrill's memory, without any such visible memento, would necessarily be held in honor and affection by his colleagues, this Chapter recognizes the peculiar fitness of this gift from his widow, as a last instance, through her sympathy with him, of that faithfulness (so ill comprehended and often imposed upon by the over-bearing and self-seeking) to the interests of his professional brotherhood of which he gave early proof, and as associating his name with the continued edification of students in architectural and graphic art, even after he rests from his labors.

Resolved, That the letter of presentation of the generous and thoughtful donor, Mrs. Charles D. Gambrill, be spread on the minutes of the society, together with these resolutions, and that the secretary transmit to her a copy of said resolutions.

ROOFING TILE.

St. Louis, May 9, 1881.

To the Editors of the American Architect: —

Please send me the address of some manufacturers of roofing tile in terra-cotta. I wish to have a house covered with red tile, and there is no nice tile in this market. Yours,

Charles K. Ramsey.

[Merrill, Ewart & Co., Akron, O., are very large manufacturers of roofing tile, in several patterns and colors, and of good quality. Some tiles have been made in Baltimore, but we understand that the manufacture has been discontinued; and several of the terra-cotta workers deal in them to a small extent. — Eds. American Architect.]

NOTES AND CLIPPINGS.

The Brooklyn Suspension Bridge. — An idea of the magnitude of the work already accomplished may be had from the following figures, which are furnished by Mr. E. E. Farrington, master mechanic of the bridge: —

Length of the main span	1,595½ ft.	Total height of tower above high water	271½ ft.
Length of the land spans, 930 feet each, total	1,860 "	Height of roadway at towers.	119 "
Length of the New York approach	1,562½ "	Height of arches above roadway	117 "
Length of the Brooklyn approach	971 "	Height of towers above roadway	159 "
Height of main span above water	135½ "	Width of openings through towers	33½ "
Depth of New York foundation below high water	78½ "	Size of anchorages at base	129x119 "
Depth of Brooklyn foundation below high water	44½ "	Size of anchorages at top	117x104 "
Size of New York caisson (for foundation)	172x102 "	Height in front	85 "
Size of Brooklyn caisson	168x102 "	Height in rear	80 "
Cubic yards of masonry, New York tower	46,945	Width of flooring	85 "
Cubic yards of masonry, Brooklyn tower	38,214	Grade of roadway	3½ ft. in 100 "
Size of towers at high-water mark	140x59 ft.	Number of cables	4
Size of towers at top	136x53 "	Diameter of cables	15½ in.
		Length of each cable	3,578½ ft.
		Wrapping wire on each cable, 243 miles	943 "
		Number of wires in each cable	5,434
		Total length of wire in each cable	3,515 miles.

Number of suspenders: —

Each cable, main span, 208; in all	832
Each cable, each land span, 86; in all	688
Total	1,520
Number of post bands: each land span, each cable, 35; in all	280
Number of double floor beams supported by cables	450
Strength of each suspender	140,000 lbs.
Sustaining power of each cable	12,600 tons.
Greatest weight on a single suspender	20,000 lbs.
Greatest weight on a single cable	3,000 tons.

Electrical Devices in Fire-Engine Houses. — A Western paper says that the engine-house of No. 9, Cincinnati, is fitted up so as to show in a most remarkable manner the uses of electricity. In the sleeping-room the beds, instead of being ranged against the wall, are placed in the same relation to each other as the spokes of a wheel. Running through the centre of each collection of coverlets, and attached to the under one, is a brass fastening, and from this leads a stout white cord that, with the others joining in a common centre, form a rope that passes up through the ceiling, where the other end riding over a grooved wheel is made fast to an eighty-pound weight. At the initial movement of the "little joker" that begins its round while the alarm is being sent in from the box to the tower, a catch releases the weight and the same instant the bed-clothing is dangling in a united bunch half-way to the ceiling. The time used, therefore, by the men in disengaging themselves from the coverlets is saved, and the amount, while small in itself, when added to the other second-saving devices, becomes an important factor. The service rendered by the "little joker" seems almost incredible. Operated by electricity, it performs the following wonderful feats, all of which are done simultaneously. Registering the number of the box from which the alarm is coming, and before it is sounded on the bells; it swings a bracket under the engine-boiler, and, turning on the gas, sends a half inch in diameter jet a foot high through the well seasoned kindling; the stable doors are thrown open, and at the same time a revolving wooden bar at the rear of each stall, and to which is affixed rawhides, turns rapidly, giving the horses an incentive to vacate as quickly as possible. Meanwhile the trapdoors, thrown back by the same means, make clear the descent on slippery poles to the firemen, from whom the coverlets have been snatched. — *Fireman's Journal.*

Effect of the Electric Light on the Skin. — It is maintained in some quarters that the electric light which so brilliantly illuminates the city is apt to tan the skin and freckle the face. An anxious investigator, who has taken some trouble to ascertain the opinions of such authorities as Edison, Maxim and others, which he has checked by the experience of those who have constantly used the electric light, comes to the conclusion that when it is very bright it unmistakably tans the skin. Mr. Edison declares that an arc of twenty thousand candle-power took the skin off his face in two hours, and "tanned an assistant's hide in an hour as brown as a butternut." All electric lights except those of a low incandescence, in Mr. Edison's opinion, will tan the skin. Mr. Maxim says that on one occasion his light tanned the skin off his face in fifteen minutes. The Brush light or any blue white light will tan, and the light of the voltaic arc will fade delicate fabrics. Girls in stores where the light is used are freckled and ruddy as if they had worked in the sun, and the electric light was so unpopular with the ladies in New York that it has been discontinued at establishments where it was formerly in use. If the gas companies can enlist women on their side the electric light will have a harder battle to fight than its advocates anticipate. — *Pall Mall Gazette.*

Mountain Elevators. — An ingenious system of lifts for mountain ascent is about to be put in operation near the town of Carterets, in the Pyrenees. A large number of tourists, and especially bathers, frequent this place in summer, the latter on account of the sulphurous thermal waters, thought highly curative. Some of the springs — *e.g.*, those of La Raillère — are nearly a kilometre from the town and one hundred and twenty-five metres uphill. The water has a temperature of thirty-nine degrees C., and could not be brought directly to the town without cooling and chemical change, so that bathers have had to go to the place in conveyances. The mode of transport now adopted by the town is the invention of M. Edoux (whose lift was one of the curiosities in the Paris Exhibition of 1878). A series of five towers, for lifts, are to be raised on the mountain-side, and the top of each of the lower ones will be connected with the bottom of the next higher by means of a piece of slightly inclined railway. The carriage conveying the passengers is raised in each tower by hydraulic power derived from the abundant falls of water at hand, and it passes from tower to tower by the force of gravity (controlled, of course, by brakes). The return of the carriage is effected by letting it, on a special truck, run down a winding line of rail on the mountain-side to the second tower, which, with the first, has a double arrangement, and it then descends through these two towers to the starting-point.

Small-pox Hospitals. — Dr. Richardson has in a late lecture described the principles which should guide architects and others in designing and constructing hospitals for the reception and treatment of persons suffering from small-pox and other infectious diseases. He states: 1. That each hospital should not be larger than is sufficient to accommodate twenty-four persons at one time. 2. That every hospital should be constructed on the separate system for the patients. 3. That the material of construction should be iron, in order that the hospital may at any time be absolutely purified by fire throughout with the least possible cost. 4. To secure direct ventilation and lighting from the roof, the hospitals proper should occupy the top stories of buildings. 5. All the air which passes out of the wards should have an escape only through a vent so heated as to destroy all deleterious substances. 6. Each patient should be carried into the hospital by a valved elevator passing through a shaft so as to draw up air during its ascent, and to be capable of flushing the hospital with air, as occasion may require.

Blast-Furnace Cinder. — Herr W. Sonnet, of Dusseldorf, proposes a method for utilizing blast-furnace cinder. He melts 60 to 80 parts of cinder, 10 to 20 parts of soda residues, 1 to 20 parts of lime, 1 to 10 parts of manganese ore, and 1 to 10 parts of diabase rock in a cupola so as to obtain a material having the following composition: Silica, 60 per cent; lime, 10 per cent; alumina, 10 per cent; oxide of iron and oxide of manganese, 8 per cent; and alkalies, 12 per cent. It is stated that this material is so hard and tough that it can be turned like steel. It resists the action of water so well that it can be used for pipes, tubes, masonry, doorsteps, window-sills, etc.

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.]

241,115. ELECTRIC GAS-LIGHTING APPARATUS.—Osmon S. Armstrong, Cambridge, Mass.

241,146. WASTE OR SEWER TRAP.—Colin Lightbooty, Brooklyn, N. Y.

241,163. BLASTING-POWDER.—True P. Sleeper, Amboy, Ill.

241,166. BUSH-HAMMER.—John B. Sullivan, Westerly, R. I.

241,190. DOOR-CHECK.—Jacob H. Coffman, Philadelphia.

241,205. AWNING BLIND HINGE.—Charles Garlick, Syracuse, N. Y.

241,225. LOCKING-LATCH.—Pierre Lacroix, Montreal, Quebec, Canada.

241,230. PROTECTING METALLIC OBJECTS FROM RUST, ETC.—Thomas J. Mayall, Reading, Mass.

241,241. PROFILE-GAUGE.—Dellef Ruge, Providence, R. I.

241,268. LIME AND CEMENT KILN.—Ernst Ziegler, Heilbronn-on-Necker, Germany.

241,280. HINGE.—C. H. Baush and John M. Fleming, Holyoke, Mass.

241,281. FIRE-PROOF MATERIAL FOR BUILDING PURPOSES.—Wm. H. Beers, Brooklyn, N. Y.

241,338. SHUTTER-BOWER.—Jean Escoubés, New York, N. Y.

241,353. WRENCH.—John Grein, Maine Prairie, Minn.

241,364. FIRE-GRATE.—Travice R. Houston, Louisville, Ky.

241,370. PIPE-CUTTER.—George P. Jacobs and Jacob Jamer, Brooklyn, N. Y.

241, 374. SASH-HOLDER.—Calvin M. Keefer, New Castle, Pa.

241,400. WINDOW-CORNICE.—James M. Montgomery, Jr., Columbus, O.

241,407. WOOD-DRYING APPARATUS.—David F. Noyes, Lewiston, Me.

241,427. FILTERING-FAUCET.—William M. Sack, Oakland, Cal.

241,468. SPRING-HINGE.—Alva Worden, Ypsilanti, Mich.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Twenty building permits have been issued since the last report, the following only being of sufficient importance to be mentioned:—

Union File Co., two-st'y brick building, Worth St., near Eager St.

Symington Bros. & Co., three-st'y brick building, Clagett St., between Stewart and Reynolds Sts.

John Bowers, two-st'y brick building, Light St., between Falls and Winder Sts.

Jno. T. Graham, 8 three-st'y brick buildings, North Ave., near Greenmount Ave., one 23′ front, seven 20′ front.

Poulton & Bro., three-st'y brick building, Ridgely St. between Fremont and Sterrett Sts., 25′ x 50′.

Jno. Farber, addition and improvement to dwell., Eden St., between Orleans and Jefferson Sts.

L. Vierecht, three-st'y brick building, Sharp St., between Hamburg and Cross Sts.

ELECTRIC LIGHT.—A resolution has passed both branches of the City Council authorizing a contract with the Brush Electric-Light Company of Baltimore to light one or more of the market-houses or public squares for a period of not less than six months or more than twelve.

HOUSES.—Mr. John Q. Coaling is building 47 houses on the east side of Hanover St., between Randall and Barney Sts., to be 14′ x 56′, three stories high.

Mr. Alexander Reid is about to build 24 dwells. on Charles St., between Randall and Heath Sts.

Mr. R. E. Diffenderfer is building a row of 20 dwells., on the north side of Boundary Ave., between Park and Mount Royal Aves., to be 18′ 8″ x 130′, three stories high. The house at either end of this row will have white marble fronts, the centre three houses will have greenstone fronts, and the intervening houses will be brick with stone finish.

Mr. Francis White is building 7 three-st'y dwells. on Mount Royal Ave., between McMechen and Wilson Sts., 17′ x 70′, of pressed brick, with stone and terra-cotta finish; Mr. A. R. Shipley, builder.

CHEMICAL WORKS.—Messrs. Grafflin & Co. are building extensive chemical works on their property at Canton. The building and machinery will cost about $150,000.

FACTORY.—Messrs. J. S. Farren & Co. are building an extensive factory on Boston St., to be 40′ x 100′, three stories high.

Boston.

BUILDING PERMITS.—*Brick.—Baker St.*, for Town of Brookline, dwell., 18′ x 30′; W. H. Bowker, builder.

Alexander Ave., for Alex. McDonald, 6 dwells., 18′ x 32′, three stories; Alexander McDonald, builder.

No. 184 *Endicott St.*, for John J. O'Connor, dwell. and store, 31′ x 40′, four stories; McNamara & Kelley, builders.

Newbury St., near Fairfield St., for John R. Briggs, 2 dwells., 23′ x 42′; John R. Briggs, builder.

Moreland St., near Blue Hill Ave., for James Fisher, 2 dwells., three stories; Jas. Fisher, builder.

Wood.—Monadnock St., near Bird St., for Franklin Holden, stable, 28′ x 30′; Samuel T. Long, builder.

Norfolk St., opposite Milton Ave., for Ebenezer Martin, dwell., 28′ x 30′, two stories; Edw. Merrill, Jr., builder.

Holmes Place, off Mill St., for Thomas Knapp, dwell., 15′ x 34′, two stories; John A. Tucker, builder.

Sunderland St., near Warren St., for Samuel Weld, dwell., 32′ x 36′, two stories; Theodore G. Brown, builder.

Norfolk St., near Lambert Ave., for Solon W. Bush, 2 dwells., 20′ x 30′, two stories; Thomas Merriman, builder.

No. 174 *Main St.*, for M. J. O'Brien, dwell. and store, 22′ x 44′, three stories; James W. Hill, builder.

West Eighth St., Nos. 139 *and* 141, for Daniel Sweeney, 2 dwells., 18′ x 30′, two stories; James T. Tighe, builder.

Sawyer Ave., near Thacher Ave., for Samuel J. Burrows, dwell., 41′ x 43′, two stories; Edw. McKechnie, builder.

Dorchester Ave., near Greenwich St., for Patrick and Michael Finegan, 2 dwells. and store, 23′ x 30′, three stories; Manuel Silva, builder.

Gates St., near Telegraph St., for Wm. H. Flynn and John A. Allen, 2 dwells., 21′ x 34′, two stories; John A. Allen, builder.

Brooklyn.

BUILDING PERMITS.—*Quincy St.*, n e cor. Bedford Ave., 5 three-st'y brownstone dwells.; cost, each $8,000; owner and builder, James A. Thomson, 300 Lexington Ave.

St. John's Place, n s, 404′ e Seventh Ave., 2 three-st'y brownstone dwells.; owner and builder, William Gubbins, 20 Seventh Ave.

Spencer Place, w s, 110′ s Hancock St., 3 three-st'y brownstone dwells.; cost, each $7,000; owner, A. Miller, Pacific St.; architect, A. Hill.

Schermerhorn St., No. 125, n s, 100′ w Smith St., three and one-half st'y brownstone dwell.; owner, John Hanley, Atlantic Market; architect, C. F. Eisenach; builders, O. Nolan and Morris & Selover.

Flushing Ave., n e cor. Bogart St., 2 three-st'y frame tenements; cost, $6,500; owner, R. C. Williams, 140 Carlton Ave.; builders, George Welsch and J. Rueger.

Garden St., w s, 300′ n State St., three-st'y brick dwell., 22′ x 52′, tin roof, wooden cornice; cost, $8,500; owner, Stephen Loines, 103 Joralemon St.; architect, W. B. Tubby; builder, T. W. Rollins.

Skillman St., w s, 250′ s Flushing Ave., three-st'y brick factory; cost, $10,000; owner, Gutta Percha & Rubber Co., 23 Park Place, New York; architect, John Murphy.

Oakland St., n e cor. Paidge Ave., two-st'y brick factory, 140′ x 208′ x 97′ x 202′; cost, $15,000; owner, E. C. Smith, Greenpoint; architect, James S. Carpenter; mason, J. B. Woodruff; carpenter, Mr. Morrison.

ALTERATIONS.—*Fulton St.*, s e cor. Concord St., one and two st'y extensions, front of bank altered, etc.; cost, $90,000; owner, Brooklyn Savings Bank, Fulton St., cor. Concord St.; architects, N. Le Brun & Son; builders, W. & T. Lamb, Jr., and Hartt & Boyd.

Cincinnati.

BUILDING PERMITS.—Alice Harrison, two-st'y brick, Dayton St., between Coleman and Riddle Sts.; cost, $3,000.

Geo. Ehrhart, three-st'y brick, n w cor. York and Freeman Sts.; cost, $8,000.

Mills, Spellmire & Co., three-st'y brick, 272 John St.; cost, $2,500.

George Schilter, two-st'y brick, Slack and Liberty Sts.; cost, $2,500.

H. W. Brockman & Co., three-st'y brick, 56 West Twelfth St.; cost, $3,000.

John G. Koehl, three-st'y brick; cost, $3,000.

Twelve permits for repairs; total cost, $4,400.

HOTEL.—The Emery Brothers will build a seven-st'y hotel, cor. Sixth and Vine Sts.

CLUB-HOUSE.—The cost of the new club-house of the Cuvier Club is about $30,000.

Denver, Col.

BUILDING PERMITS.—H. Mullandin, two-st'y brick store, 24′ x 70′, cor. Wewatta and Nineteenth Sts.; cost, $5,500.

Brown & Keifer, three-st'y brick store, 30′ x 90′, Lawrence St., between Fourteenth and Fifteenth Sts.; cost, $7,000.

Thomas Jones, two-st'y brick dwell., 21′ x 41′, Stout St., between Twenty-fifth and Twenty-sixth Sts.; cost, $4,000.

Doll & Robinson, two-st'y store, 50′ x 80′, Arapahoe St., between Fifteenth and Sixteenth Sts.; cost, $7,000.

Theodore G. Lyster, two-st'y brick house and barn, 40′ x 64′, Lincoln Ave., between East Sixteenth St. and Colfax Ave.; cost, $9,000.

BLOCK.—Crandall Block; Wm. Quayle, architect; cost, $24,000.

NEWSPAPER OFFICE.—Office-building, three stories and basement, 50′ frontage, for the *Daily Denver Times*; R. W. Woodbury, proprietor; R. S. Roeschlaub, architect; cost, $28,000.

(*Continued on next page.*)

Publishers' Department.

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New Advertisements.

BUILDING INTELLIGENCE.

New York.

Building Permits. — *Ninth Ave., Nos.* 73 *and* 75, 2 four-st'y brick tenements; cost, $7,000; owners, Vehslage Bros., 69 Ninth Ave.; architect, etc., Jas. F. Longen; mason, J. Hankinson.

Eighteenth St., n s, 190' e Ave. A, one-st'y brick shop; cost, $6,600; owner, The Steam Heating & Power Co., New York, 16 Cortlandt St.; architect, C. E. Emery; builder, J. V. Donvan.

Fifty-eighth St., No. 426 e, five-st'y brownstone apartment-house; cost, $12,000; owner, Patrick McManus, 954 Third Ave.; architects, B. W. Berger and J. W. Marshall.

Fifty-fifth St., n s, 100' e Second Ave., 2 five-st'y brick tenements; cost, each $12,000; owner, Minnie Rinaldo, 220 East Thirty-third St.; architect, A. B. Ogden.

Fifty-sixth St., n s, 100' w First Ave., rear, three-st'y brick factory and stable; cost, $6,000; owner, Walter Shriver, 333 East Fifty-sixth St.; architect, A. B. Ogden; builder, George Dollinger.

Madison Ave., n e cor. Sixty-sixth St., one-st'y brownstone church; cost, $40,000; owner, Church of the Holy Spirit; architect, R. H. Robertson; builders, F. Lyons, Jr., and S. D. Lines.

Forty-eighth St., Nos. 425, 427, *and* 429, 3 four-st'y brick tenements; cost, $10,000; owner, James Lewis, 349 West Fifty-first St.; builders, Findley & Gardner.

Twenty-third St., Nos. 424 *and* 426 e, two buildings, of brick; cost, $6,500; owners, J. J. McKenna & Bro., 396 Broome St.; architect, J. M. Dunn.

Fortieth St., Nos. 123 *and* 125, 2 three-st'y brick dwells.; cost, about $10,000; owner, Wm. F. Mott, 83 Irving Place, cor. Nineteenth St.; architect, Robert Mook; builders, G. D. Hilyard and J. V. Mettler.

Sixty-eighth St., n s, 250' e Second Ave., 8 three-st'y brownstone dwells.; cost, each $9,000; owner, William C. Schermerhorn, 68 Wall St.; architect, H. J. Hardenberg; builders, D. & E. Herbert and Jas. Elgar.

Sixty-fifth St., s s, 350' e Eleventh Ave., three-st'y brick tenement; cost, $6,000; owner, George Vogt, Sixty fifth St., n s, 175' e Sixteenth Ave.; architect, J. M. Forster.

Broadway, e s, 30' n Thirtieth St., brick, bluestone and freestone theatre; cost, $100,000; owner, John Lester Wallack, 13 West Thirtieth St.; architect, G. A. Freeman, Jr.

One Hundred and Fifty-third St., s s, 175' e Tenth Ave., 6 three-st'y brick and brownstone dwells.; cost, each $9,000; owner, Henry Webendorfer, 288 Bowery; architect, Julius Boekell.

Eleventh St., No. 21 e, five-st'y Connecticut brownstone apartment-house; cost, $20,000; owner and builder, Samuel McMillan, 245 West Forty-sixth St.; architects, Thom & Wilson.

Thirty-eighth St., No. 252 w, five-st'y brownstone apartment-house; cost, $20,000; owner and builder, Samuel McMillan, 245 West Forty sixth St.; architects, Thom & Wilson.

Fifty-eighth St., s s, 245' e Seventh Ave., four-st'y brownstone dwell.; cost, $15,000; owner, Mrs. Joseph D. Oppenheimer, 22 White St.; architects, D. & J. Jardine.

Eighth Ave., Nos. 312 *and* 314, three-st'y brick theatre; cost, $30,000; owners, Thomas H. Miner and T. Canary, 165 and 169 Bowery; architect, W. Graul.

Fifteenth St., Nos. 102, 104, *and* 106 e, seven-st'y brick hotel; cost, $80,000; owners, A. J. Dam & Son, Union Square Hotel; architect, J. E. Ware.

Broadway, s e cor. Nineteenth St., with extension to Eighteenth St., six-st'y brick store; cost, $400,000; owner, Wm. D. Sloane, 649 Broadway; architect, W. W. Smith; builders, P. T. O'Brien & Son; carpenter, A. C. Hoe; iron work, J. B. & J. M. Cornell.

One Hundred and Eleventh St., n s, 225' e Fifth Ave., two-st'y brick stable; cost, $5,000; owner, Thos. F. Treacy; architect, C. Baxter.

Madison Ave., n e cor. One Hundred and Twenty-second St., 5 four-st'y brownstone dwells.; cost, each $20,000; owner, Thos. F. Treacy; architect, Chas. Baxter.

Twenty-eighth St., s s, 125' w First Ave., three-st'y brick stable; cost, $7,000; owner, The Manhattan Brass Co.; architects, H. J. Schwarzmann & Co.; builders, C. W. Klappert's Sons.

Eighty-ninth St., s s, 125' w Ave. A, four-st'y brownstone tenement; cost, $15,000; owner, John Askey, 443 East Seventy-seventh St.; architect, J. Brandt.

Alterations. — *Bleecker St., No.* 225, raised two stories, etc.; cost, $6,000; owner, Matthew Monahan, on premises; architect, W. José.

City Hall Place, No. 20, two-st'y brick extension; cost, $7,000; owner, St. Andrew's Church, 26 West Fiftieth St.; builders, G. Vassar and W. J. O'Connor.

Seventeenth St, No. 6 w, raised one story flat, interior rearranged, etc.; cost, $7,300; owner, A. J. Vanderpoel, No. 1 West Sixteenth St.; architect, J. E. Terhune; builders, E. Vreeland and Van Dolsen.

Twenty-third St., No. 350 w, four-st'y brick extension; cost, $7,000; owner, S. L. Bradley; builder, G. H. Sigler.

Broad St., No. 108, altered for offices; cost, $6,000; owner, Robert Chesebrough, 17 East Forty-fifth St.; builder, J. M. Kelly.

Mulberry St., Nos. 145 *and* 147, front alteration; cost, $6,000; owner, William Schmidt, 218 East Fifty-seventh St.; builders, Haight & Monnia.

Beaver St., No. 21, alteration for offices; cost, $5,000; owners, Leszynsky & Troup, on premises; builder, Leonard Green.

Fifth Ave., No. 121, one-st'y brick extension; cost, $3,000; owner, Mr. Wallace, Westmoreland Hotel; architects, Babcock & McAvoy.

Pine St., Nos. 73, 75, *and* 77, raise roof; cost, $5,000; owner, Amos R. Eno, Fifth Ave., cor. Twenty-seventh St.; builders, A. G. Bogert & Son.

One Hundred and Sixteenth St., No. 215 e, four-st'y brick extension, etc.; cost, $6,000; owner, John Smith, 114 East Twenty-fifth St.; architect, J. Kastner.

Building Operations. — The great preponderance of the work this week seems to be tearing down old buildings, on the sites of which so many magnificent structures are to be built. Broadway, particularly, is subject to this nuisance to foot-passengers. Very few new buildings are now in the market, most of the work having been contracted out. The D. O. Mills building has been awarded to Mr. David H. King, Jr.

Railroad Work. — For the New York, Ontario & Western Railroad, Messrs. Wilson Bros. & Co. are preparing plans for the terminal buildings at Weehauken. These will embrace ferry-house, depots, elevators, and freight-houses.

Philadelphia.

Building Permits. — *Twenty-third St.*, n Race St., four-st'y store-house, 38' x 40'; W. L. Atkinson, contractor.

Fifty-sixth and Race Sts., one-st'y chapel, 20' x 30'; R. C. Dothard, contractor.

Tasker St., between Seventeenth and Eighteenth Sts., 5 two-st'y dwells., 15' x 40'; W. Galbraith, owner.

Queen St., w Fifth St., 2 three-st'y dwells., 20' x 43'; W. H. Doyle, owner.

Carpenter St., No. 1717, three-st'y dwell., 18' x 40'; Robert Ramsey, owner.

Christian St., above Fourth St., 2 three-st'y dwells., 14' x 54'; M. J. Jennings, owner.

Dounton St., between Wayne St. and Germantown Ave., 10 two-st'y dwells.; W. D. Dounton.

Canal Bank, M'y'k, four-st'y factory; Jno. Dobson, owner.

Bristol St., e Fifth St., 2 three-st'y dwells., 12' x 26'; Thos. Middleton, owner.

Thirty-third St., s Story St., 5 two-st'y dwells., 16' x 48'; J. E. Pennock, contractor.

Sedgley Ave., w Thirtieth St., three-st'y dwell., 20' x 47'; John Howder, contractor.

Ridge Ave. and Master St., second and third story addition to factory, 18' x 50'; Jas. H. Young, contractor.

Tacony St., between Frankford and Pratt Sts., one-st'y chapel, 30' x 50'; W. Chamberlain.

Ridge and Girard Aves., one-st'y store, 50' x 74'; W. D. Carter, contractor.

Fortieth St., s Eadline St., three-st'y dwell., 30' x 30'; M. De Haven, owner.

Howard St., s Lehigh Ave., 10 two-st'y dwells., 12' x 35'; F. Hefling, contractor.

Ridge Ave., above Thirty-second St., 5 three-st'y dwells. and stores, 18' x 48'; Robert Manly, contractor.

Earl and Gerker Sts., 5 three-st'y dwells., 13' x 20'; J. R. Pyle.

East Somerset St., No. 1002, three-st'y dwell., 18' x 32'; A. McClay, contractor.

Wistar St., e Cottage Lane, 2 three-st'y dwells., 20' x 60'; B. Ketcham & Sons, contractors.

South Twenty-second St., No. 116, four-st'y dwell., 19' x 90'; Jno. Doyle, contractor.

School Lane, s Township Line, three-st'y dwell. and two-st'y stable, 39' x 65'; Geo. Hearst.

Spring Garden St., w Thirty-seventh St., 5 three-st'y dwells., 18' x 52'; D. C. Cleaver.

Oxford St., w Twentieth St., 8 three-st'y dwells., 16' x 40'; G. W. Blabon, owner.

Beach and Otis Sts., two-st'y shop, 32' x 55'; Hughes & Patterson.

Berk St., No. 908, two-st'y office and stable, 15' x 55'; D. Lukens, owner.

Ripka Ave., n Washington St., three-st'y dwell., 18' x 32'; Thos. Scanlan, owner.

Thirteenth St., s Susquehanna Ave., 14 three-st'y dwells., 16' x 65'; Samuel Rain, contractor.

Arabella St., Nos. 1113 *and* 1115, 2 dwells., 14' x 34'; T. C. Nesbit, contractor.

Salmon St., Nos. 1260 *and* 1262, 2 three-st'y dwells., 18' x 34'; J. C. Stackhouse, contractor.

Reed St., No. 316, three-st'y dwell., 17' x 61'; W. Powell, owner.

(*Continued on next page.*)