TABLE III.

No. of Test Piece.	Deflection in inches under						Ultimate Deflection.	Breaking Weight, lbs.
	30 lbs.	40 lbs.	100 lbs.	400 lbs.	500 lbs.	550 lbs.		
1	0.0610	0.0826	0.2071	0.8303	1.0906	1.2791	1.5646	588
	.0610	.0815	.2070	.8120	1.0130	1.1165		
2	.0616	.0801	.2043	.8177	1.0677	1.2811	1.3941	575
	.0616	.0820	.2050	.8200	1.0230	1.1275		
3	.0606	.0815	.2023	.8076	1.2764	1.4800[1]	1.4800[1]	550
	.0606	.0808	.2020	.8080	1.0100	1 1110		
4	.0582	.0765	.1929	.7929	1.1146	1.3197	1.4658	575
	.0582	.0776	.1940	.7760	0 9700	1.0670		
5	.0580	.0774	.2004	.7876	1.0170	1.1827	1.5788	637
	.0580	.0773	.1993	.7732	0 9665	1 0651		
6	.0605	.0803	.2138	. . . .	1 2520	1.4662	. . . .	565
	.0605	.0806	.2016	. . . .	1.0080	1.1088		
7	.0624	.0833	.2083	.8961	1.3595	. . . . .	. . . .	550
	.0624	.0832	.2080	.8320	1.0400	. . . . .		
8	.0632	.0839	.2102	.8315	1.1111	1.3331	1.5709	585
	.0632	.0842	.2106	.8424	1.0530	1.1583		
9	.0619	.0823	.2083	. . . .	1 0800	1.2830	1.4254	580
	.0619	.0825	.2063	. . . .	1.0315	1.1346		
10	.0661	.0884	.2220	.9276	1.1772	1.3775	1.8100[1]	637
	.0661	.0881	.2203	.8812	1.1015	1 2116		

From these experiments I think we may draw the following conclusions: —

That the modulus of elasticity depends not only upon the elasticity of the material, but also upon the length of time the load is applied.

That when subjected to loads not exceeding one-sixth of the breaking weight, spruce beams do not take a permanent set.

That even under very small loads, if applied for any length of time, there will be a temporary set.

That knots and knarls in beams loaded at the centre, when not within one-eighth of the span of the centre of the beam, do not materially affect the elasticity under small loads.

That the deflection is very nearly proportional to the load, far beyond the customary limits of strain, and that the modulus is consequently very nearly constant for all moderate deflections.

That a high modulus of elasticity does not always accompany high transverse strength; for, as shown by Table I, piece No. 10, which had the greatest transverse strength, gave next to the lowest value of *E*.

That in spruce beams the upper fibres commence to rupture by compression under about four-fifths of the breaking weight, and the neutral axis is very near the centre of the beam, as shown by the fracture.

That beams which are subjected to severe strains for a long time bend more before breaking than those which are broken in a comparatively short time.

That the modulus of elasticity of small spruce beams, of a quality such as is used in the best buildings, may be taken at from 1,600,000 to 1,700,000 lbs., and the modulus of rupture at about 11,000 lbs.

The only other experiments on American spruce with which the writer is familiar are those made by Mr. R. G. Hatfield, on small beams, 1.6 feet between supports, and some experiments by Mr. Thomas Laslett, of England, on pieces of Canada spruce 2 inches square and 72 inches between supports.

Mr. Hatfield gives as the average value of the transverse strength of a unit beam, 612 lbs.,[2] which would give 11,016 lbs. for the modulus of rupture.

From data given by Laslett,[3] we obtain as the value of *R*, 9,045 lbs.

The value generally given for the modulus of elasticity of spruce is 1,600,000 lbs.

PAYING FOR ESTIMATES.

THE stone-cutters' circular which is referred to in the Summary this week is as follows: —

TO WHOM IT MAY CONCERN.

CINCINNATI, May 19, 1881.

Our Association of Master Stone-Cutters have adopted the following resolutions to take effect June 1, 1881: —

That no member shall make any sub-contracts.

That no estimates be made unless the plans, specifications and detail drawings are shown complete.

That all bids shall be opened upon a specified time, and in presence of those bidders who desire to be present.

That all estimates shall be paid for at the following rates: —

Estimates amounting to less than	$200.00	. . . . .	$5.00
" from	200.00	$500.00 . .	2 1-2 per cent.
" "	500.00	1,000.00 . .	2 "
" "	1,000.00	2,500.00 . .	1 1-2 "
" "	2,500.00	5,000.00 . .	1 "
" over	5,000.00	. . . . .	3-4 "

ISAAC GRAVESON,
JOHN BOYLE,
J. R. LAUBE,
KELLINGHAUS & CO.,
L. C. BUENTE,
WM. HURTER,
JOS. P. DREYER,
JOHN M. MUELLER,
DAVID HUMMEL,
M. FINNEGAN,
HOFFMAN & LOEWE,
KLEKAMP & STEMAN,
LOUIS DOEBBLING,
F. W. KASSEBAUM, Jr.,
JAS. McDONOUGH,
JOS. FOSTER & SON,
LOGAN & PARKS,
WM. GRAVESON & CO.,
GREGOR DAUCH,
C. LANG & CO.,
N. FUCHS, Jr.,
G. HUSCHART & CO.,
GUSTAV CADEN.

[1] Approximately.
[2] Hatfield's Transverse Strains, Table XLII.
[3] Timber and Timber Trees, Native and Foreign, by Thomas Laslett, Inspector to the Admiralty, London, 1875.

PLASTERING ON BRICKWORK.

NEW BEDFORD, May 21, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — We are having quite a controversy in our little hamlet on the merits and demerits of plaster applied directly upon the brickwork without the interposition of wood furrings. The building on which the question was raised was a primary school-house, designed to accommodate two hundred scholars. The architect caused the plaster to be applied directly upon the brickwork. The walls are double, with a two-inch air-space bonded with brick, four-courses thick in first story, three-courses thick in second story. The building was plastered in winter, and dried by direct steam heat. To all appearances the walls were dry, and after the acceptance of the building by the city, the fires were stopped; in about a week the walls showed a considerable amount of dampness. The Board of Health objected to the building being occupied, and fires were once more started. But the walls remain damp at the present time, and there is considerable talk of taking off the plaster, and furring the walls; the architect purposely omitted the furring on account of fire. The walls that show damp are faced with pressed brick on outside, and *all* brick were thoroughly wet before laying. The building has been finished about three months. Now the question is, Was he right or wrong, and in your judgment what is the proper thing to be done? I ask through the columns of your valuable paper knowing that a statement from you will be impartial and fully up to the information of our times. I am very respectfully yours, JUSTICE.

[WE suppose "Justice's" description to mean that the hollow wall was tied, not by vertical withes as is the usual way, unless where metal anchors are used, but by two continuous horizontal bands of masonry, ten inches high in the first story, — that is, we suppose, just under the second story floor-beams,—and seven and a half inches high under the plate; and we infer from the other circumstances described that the air-space was completely enclosed. Such a construction would be open to objections, but its faults might, we think, be remedied. Any continuous horizontal division of the air-space seems to collect the water which passes through or is condensed on the inner surface of the exterior wall and conduct it directly into the lining wall, so that provision should have been made for preventing this, perhaps by tarring the upper surface of the bonding belt, and leaving openings for the water to drip through to the bottom of the wall where it would do least harm. Again, openings should be made for ventilating the air-space from top to bottom as freely as possible. Confined air often becomes so saturated as to carry moisture rapidly from the outer wall to the lining. These changes might be made without much difficulty, and would at least render the building quite dry enough for safe occupancy. Although moisture will probably always show itself after rains opposite the bonding belts. Such spots and streaks of dampness are almost inevitable with hollow built walls, however constructed, and should not be allowed to outweigh the great advantage in point of wholsomeness, and safety of dispensing with wooden furrings. — EDS. AMERICAN ARCHITECT.]

SCHEDULE OF THE AMERICAN INSTITUTE OF ARCHITECTS.

WASHINGTON, D. C., April 8, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Gentlemen, — Could you inform me where, and at what cost, I could procure a schedule of rates charged by architects? I have seen printed pamphlets, and have been in hopes of receiving one with the *American Architect*, but if it ever was enclosed my agent must have lost it. Yours respectfully, D.

[THE American Institute of Architects prints its schedule of rates as an appendix to its constitution, and some local societies print copies for the use of their members. Vogdes's Pocket-book also contains both the American and English schedules. — EDS. AMERICAN ARCHITECT.]

COST OF THE NEW YORK MASONIC TEMPLE.

24 PARK PLACE, NEW YORK, May 26, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In your issue of the 21st inst., you publish a communication from Gen. M. C. Meigs, purporting to give the comparative cost of a number of public and private buildings prepared "by an experienced surveyor," and trusting to its accuracy, you have made some editorial comments upon it which in justice to buildings named should be qualified.

Comparing the cost of buildings by cubing their contents is a process requiring great care and judgment, and is of practical interest and value to the profession only when the general detail of their construction is at least outlined sufficiently to enable a just comparison to be made.

Cost varies greatly in different localities and at different periods of time: it varies with the materials of construction, with the quality of the finish, and with the complexity of the internal arrangements. It is influenced by the manner of construction, — whether by days' work or by contract.

But your correspondent waives all consideration of detail, and lumps together in one table buildings high and buildings low, buildings first-class and fire-proof, — the new museum at Washington and quartermaster's brick-and-stone sheds, — buildings built in times of great activity, and others built in times of low prices.

What I especially write about is his statement in regard to the cost of the New York Masonic Temple building, — mostly done by days' work and when labor and materials were high. The cubic contents are given by him about correctly, but he has tacked a mild *million* to the cost price!

The actual cost, including my commission, was $923,889; the cubical contents are 1,763,839 feet, which brings the cost per cubic foot 52 $\frac{38}{100}$ cents, or one-half less than has been stated.

Very respectfully, N. LE BRUN, Architect.

NOTES AND CLIPPINGS.

Wood in Kentucky. — The last report of the Kentucky Geological Survey says that about fifty per cent of the area of the State is in primitive forests. In various parts of the State oak, maple, ash, yellow poplar, walnut, hickory, beech, chestnut and red cedar are abundant.

A Question of Transportation. — An ingenious item is in circulation to the effect that $5,000 have been offered for the delivery in New York of a flagstone measuring fifteen by twenty-five feet. Such a stone has been cut at Waterville, but the problem, how to get it to this city, is still unsolved. It is too wide to pass through railroad bridges, and if placed edgewise would be too high. Equally great difficulties are in the way of bringing it on the Erie Canal. The largest flagstone ever cut, it is said, was laid in Chicago before the great fire. It measured sixteen by twenty-five feet, and was twelve inches thick.

Flannery's Statue of Lincoln. — The workmen engaged upon the improvement of the roadway at the intersection of Louisiana and Indiana Avenues and Four and One-Half Street, opposite the City-Hall, Washington, have made an unpleasant discovery in relation to Flannery's statue of Lincoln, around which they are working. In excavating to reduce the grade some three feet, says the Washington *Post*, it was found that rotten timbers projected from under the base of the shaft. Further search revealed the fact that the whole had been built on a frame-work of wood. This would have been safe enough if it had been a submerged foundation, but the dampness had completely decayed the timbers, and unless they are speedily removed, and a superstructure of concrete or rubble inserted, the statue and shaft may be expected soon to bear down the rotten foundation, and probably tilt over to one side or the other.

Monk *vs.* a Murillo. — Of the thirteen Murillos which Marshal Soult managed to collect in Spain, one of them, an "Immaculate Conception," at the Marshal's sale, in May, 1852, was bought by the French Government for $117,000. We have an amusing story of the circumstances under which Soult secured his prize. In his pursuit of Sir John Moore he overtook two Capuchin friars, who turned out to be spies, as he suspected. On hearing that there were some fine Murillos in the convent to which they belonged, he ordered them to show him the way to it. Here he saw the Murillo in question, and offered to purchase it, all to no purpose, till the prior found that the only way to save the lives of his two monks was to come to terms. "But," said the prior, "we have had 100,000 francs offered for the picture." "I will give you 200,000 francs," was the reply, and the bargain was concluded. "You will give me up my two brethren?" asked the prior. "Oh!" said the Marshal, very politely, "If you wish to ransom them, it will give me the greatest pleasure to meet your wishes. The price is 200,000 francs." The poor prior got his monks, and lost his picture. — *Boston Budget.*

Utter Nonsense. — Mrs. Haweis has invented a quite too utter style of writing in *The Queen*. Describing Sir F. Leighton's house at Kensington, she declares that the main staircase "winds like a treble passage out of bass chords." But, strange to say, she does not continue these musical similes, as she surely might have done. What could have been prettier, for instance, than to allude to the front-door mat as an "overture to a delightful domestic symphony," the linoleum in the corridor as "a chromatic fugue dominating a contrapuntal passage," and even the act of walking up the staircase aforesaid as "a pedal performance of marked regularity and 'organic' power with an 'all-toe' accompaniment?" "Culinary airs with variations," might have been wafted from the kitchen; the very beds might have suggested a new arrangement of "Rousseau's Dream;" whilst the annual spring clean itself might have been daintily alluded to as a "Hunting allegro, in the key of B-flat!" — *Figaro.*

Archæological Institute of America. — The annual meeting of the Archæological Institute of America was held on Saturday, May 21, and the following were chosen as honorary Vice-Presidents: President T. D. Woolsey, of New Haven, the Hon. L. H. Morgan, of Rochester, N. Y., Prof. B. S. Gildersleeve, of Baltimore, Major John W. Powell, of Washington. The following were elected as the Executive Committee for the ensuing year: Charles Eliot Norton, President; Martin Brimmer, Vice-President; Francis Parkman, W. W. Goodman, H. W. Haynes, Alexander Agassiz, William R. Ware. At a meeting of the Executive Committee, subsequently held, Henry L. Higginson was chosen Secretary, and E. H. Greenleaf, Treasurer. A vote of thanks was passed to Secretary Blaine for the active interest he had manifested in obtaining firmans in Greece.

A New York Mystery. — There are in Broadway three five-story marble-front buildings which have stood idle for fifteen years. This property should be good for $50,000 a year at the very least. It has not produced a dollar during the long period named. The taxes on it amount probably to $10,000 a year. The interest on the money invested in it must be at least as much more. If it were rented like other property it would have yielded at least $750,000 in the time named. Instead of that it has cost the owners in taxes and interest not less than $300,000. Why is it not rented? Nobody knows. There it stands, year after year, a monument of vacancy and heavy loss. "To let" bills are on it all the time, but it does not let. It is said to belong to a wealthy family in France, who sent money to New York many years ago for investment. They have never seen it, and its control is entirely in the hands of an agent. He watches it closely, and is always polite to persons making inquiry about it; but for some inexplicable reason he never strikes a bargain with any one. A New York gentleman during a visit to France a few years ago tried to see the head of the family that owns it for the purpose of negotiating for it, but the Frenchman, a gruff old count, would not give him an interview. More than this about the estate nobody knows. — *Hartford Post.*

A Genevese Theatre Fire Service. — A correspondent in Geneva, Switzerland, sends to the New York *Evening Post* the following account of the admirable system against fire used in the local opera-house: — The recent fires in Paris and Nice have brought into general notice the protective system used in the new opera-house here. The theatre is divided into three well-separated sections, the auditory, the stage and the large *foyer*. All the doors communicating between these compartments are made of sheet-iron, which would resist the heat for a sufficient length of time to allow every one to get out of the building. The curtain itself is made of a triple layer of metal and is kept in daily use in order that no mechanical difficulties might hinder its working under an emergency. Four supplementary staircases are accessible to the galleries and open on the street. Ordinarily they remain closed, but every officer and employee of the building has a key by which they may be thrown open to the public, and others are hung upon the wall in boxes. But there are other precautions against fire equally admirable in their arrangement. The firemen have at their disposal twenty water-jets scattered throughout the building, five fire-extinguishers, and a portable pump. There is a regular force of firemen in charge, consisting of one officer, one sergeant, two corporals and twelve sappers. Every night the force is obliged to be on hand a half hour before the lifting of the curtain, the overseers stationing themselves in different places, one under the scenes to observe the machinery, others at the right and left exits from the stage, and still others in the lofts. Each of these men has one of the jets at hand, beside an extinguisher, axes, knifed hooks for cutting the ropes or parts of the scenery, and other necessaries. He can also communicate with the headquarters by an electric bell, which will summon immediate aid. Everywhere on the walls of the theatre there are little glass boxes containing telegraphic bells, and in case of danger the public is invited to break the glass and press the knob which communicates with a general indicator at headquarters. In addition to this there is a system of night watches as complete and systematic as that of a safe deposit vault. With such arrangements as these the danger from fire is minimized, but what is of far greater importance, it would without doubt give every individual who knows of the completeness of the system enough assurance to receive an alarm of fire in the theatre with as little trepidation or fright as he would if he were in the open air.

A German Musical Custom. — There is a beautiful custom among the Germans of having chorals played from the church towers at regular hours of the day. It is said they first derived the idea from the Arabs, who at certain hours of the day and night are called to prayers by the long wailing cry of the muezzins from the minarets of the mosques. When I first heard this music in Stuttgart, coming as it appeared to me from the heavens, I was puzzled to know its object and the sources whence it came. I gazed above and around me, but I failed to detect its source. The beautiful melody, softened by distance, was floating in the air. It was like the invisible heavenly choir that enraptured St. Cecilia. A few days afterward, happening to be in the same neighborhood, and at the same hour of the day, I was more fortunate in my discoveries. I again heard the music from above, its pealing notes coming to me from some far distance like the strains of a church organ. Near me was the Stifts Kirche, an old church built in 1308, which has attached to it an immense octagon tower rising up to a height of nearly two hundred feet. Encircling this tower near the top is a balcony on which I at last espied the authors of the strange music. Several men with brass instruments were perched on that giddy height playing sacred music. When they had finished one piece they moved to another position on the balcony and played a different tune. Four selections in all were played, one toward each point of the compass. On making inquiries afterward, I found that this playing from the church tower had been in practice for more than a hundred years. A German lady, "once upon a time," belonging to one of the noble families bequeathed a sum of money, the income of which was ever after to be devoted to paying the expenses of this religious observance. The clause in her will stated that chorals or selections of sacred music were to be played from this church tower twice a day, punctually every morning at the rising of the sun, and also from half-past eleven to twelve at noon. The musicians for their services are paid two marks (fifty cents) a day each, — a mark for the morning and a mark for the noon service, — which, for walking up and down that long flight of steps in addition to playing several pieces of church music, is a small enough remuneration. Chorals are also played from another of the church towers in Stuttgart by a brass band, and also from church towers in Ludwigsburg, Rossenstein, Friederichshafen, near Stuttgart, and in others of the very old German cities and towns. — *Letter to Springfield Republican.*

Disinfectants. — Prof. Beilstein, who has recently studied the various substances used for disinfection, arrives, in a communication made to the St. Petersburg Technical Society, at the following conclusions: — Sulphuric acid would be the best disinfectant if it did not destroy the sides of the tanks; the use of lime and of salts of lime ought to be completely renounced, as they but temporarily destroy bacteria, and under some circumstances may contribute to their development; nor does sulphate of iron, even in a solution of fifteen per cent, ultimately destroy bacteria, as they revive when put into a convenient medium. Therefore, Prof. Beilstein recommends sulphate of aluminum, which is used in paper and printed cotton manufactures. The best means for providing it is to make a mixture of red clay with four per cent of sulphuric acid, and to add to this mixture some carbolic acid for destroying the smell of the matter which is to be disinfected.

Railway Bridge. — An iron deck bridge has just been finished on the "Short Line," between Minneapolis and St. Paul, over the Minnehaha, 1,146 feet in length and 142 feet in height. It was constructed like the high bridge on the Cincinnati Southern: that is, the centre span (324 feet) was built out from the piers without false work for support.

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JUDGE MACKENZIE, of Toronto, has rendered a decision of some importance to the Canadian architects. The local statute allows an extra fee to a certain class of witnesses, but to the argument that architects ought to be included in this class he replied that architecture could not be considered a profession in the Province, inasmuch as architects are not required to pass a government examination, are not organized by law, and are not recognized by statute. He added that he had in a previous case advised the architects to combine and seek incorporation. This advice we can heartily second. Nothing would tend more to confirm and establish the standing of the profession, already honorable in Canada through the character and work of many of its members, than such association as is indicated in Judge Mackenzie's remark. By this means the credit of individual probity and talent would be extended to the whole body, while every member, instead of feeling himself isolated, would be sustained and encouraged in his best efforts by the countenance of his fellows. All architects who have practised in the smaller towns can appreciate this privilege, which not only helps them to resist that tendency to become the slaves of their clients from which they often suffer, but by their relation with their fellows keeps alive that interest in the work of others which is of so much importance in fitting them for a wide range of professional duty. If we are not mistaken, the American Institute of Architects includes Canadian members, but if a similar society should be formed in the Dominion, it will, no doubt, cheerfully give up its claim to represent the whole continent, and will welcome its younger rival with all possible good offices.

A VERY interesting exhibition is to be opened in Paris in August next, which is to comprise only electrical and magnetic apparatus, but an immense and interesting variety of these will be shown. Mr. Edison, whose many real successes in this branch of practical science have been a little obscured by his disappointments in certain attempts, will be a large exhibitor. According to the New York *Evening Post*, the devices contributed by him are divided into no less than ninety groups, many groups containing several objects. Besides his electric-light apparatus, he will exhibit an ingenious machine for extracting iron from the black sand found on the south shore of Long Island. It seems that this sand contains about twenty-six per cent of the finest iron ore known, but its separation by means of the magnet, which seems obvious enough, is interfered with by the presence of particles of a titanite compound of iron, which is nearly as magnetic as the pure iron ore, and injures the quality of the whole. Mr. Edison, however, taking advantage of the slightly different magnetic properties of the two ores, has constructed a separator, consisting of a V-shaped box with a long, narrow opening in the bottom, through which the sand falls in a thin sheet, close beside a delicate partition, situated a little distance below. Beyond the partition is placed a powerful magnet, and by adjusting this to the proper position the iron particles are drawn over the partition, to fall in a box by themselves, while the rest runs to waste. This contrivance is in operation at Quogue, where one machine, managed by a boy, separates twenty tons of pure ore per day, costing one dollar per ton, and selling at six dollars. A somewhat similar application of frictional electricity to the winnowing of middlings will also be shown by another American exhibitor, Mr. Kingsland Smith. Every one knows that hard rubber, excited by friction, will attract paper and similar substances, and Mr. Smith, by passing the product of the mills under rubber rollers, succeeds in attracting all the bran and separating it from the valuable part of the grain, without the loss and risk involved in the use of a blast of air.

THE use of electricity for the lighting of gas-jets is one of the most successful recent applications of this subtle agent. Already the electric gas-lighting apparatus is in use in scores of dwelling-houses and public buildings, and in Massachusetts the system is now being extended to the control of street-lamps. The device by which the alternate lighting and extinguishing of the jet is accomplished, although simple, is very ingenious. Unlike the earlier systems, which required a burner of vitrified non-conducting material, through which, by means of platinum wires imbedded in the substance of the burner, a spark was sent, while the gas was turned on by a separate key or valve, the new contrivance turns on the gas, lights it, and turns it off at will, by a simple pressure of the finger on an ordinary "push-knob," situated at any distance from the burner. This is done by means of two platinum wires, one of which is attached to the burner, just above the orifice, while the other is fixed at the end of a bent lever, in such a way that the movement of the lever causes its wire to pass and repass the other, just over the burner, coming lightly into contact with it at each movement. The two wires are connected with the opposite poles of an induction coil, and on bringing them nearly into contact a considerable spark is obtained, much larger than could be had directly from the battery current. By a ratchet mechanism, the movement of the bent lever turns the key of the burner at the same time that it brings the platinum poles into contact, turning on the gas simultaneously with the passage of the spark which lights it. A second movement of the lever shuts the gas off in the same way. By fixing an electro-magnet at the proper distance from an armature which is attached to the bent lever, the same current that produces the spark is made to turn the gas on or off at pleasure. The convenience of such a contrivance, by which all the street-lamps in a town can be brought under the control of a single superintendent, seated in his arm-chair at the office, is obvious, and the city of Salem, where the system is in great favor for house use, has for some months had the lamps on some six miles of streets lighted and extinguished every night by electric currents, and the wires are soon to be extended to the remaining streets. The saving in money alone by the change is estimated at two thousand dollars a year, while the advantages of convenience and certainty of service should be reckoned at much more. A proposition for introducing the same system in Boston is also now under consideration, and is likely to be acted upon favorably.

A CASE of salutary repentance has been brought to our notice which we are glad to see, and offer the thanks of the profession to the public-spirited architects who were instrumental in bringing it about. It is not long since those architects who read circulars were annoyed by receiving one from the manufacturer of a certain class of goods, who thought to improve his trade by promising a cash "percentage" to those architects who favored him, directly or indirectly, with an order. He was sharply rebuked by at least one of those who received the circular, and seems to have met with still more effectual reproof from others, for in the postscript to a letter just received, in answer to an inquiry for prices, he expresses himself thus: "The prices I have given are low, and net cash. Until this spring I always quoted prices so as to allow the architect a percentage, but they so frequently 'gave me away' (if I may be allowed to use the slang expression) to the principal, that I have given it up, and now quote net. If an architect wants me to quote another price, I shall gladly do it, and 'on the square' too." We doubt very much whether this gentleman's ingenuity in reconciling an attempt to assist an architect to swindle his client with his notions of what is "on the square" will ever need to be exercised, and congratulate him on his conversion to the habit of regarding his principal patrons as being quite as honest as, we doubt not, he is himself. If all the other dealers who think

"long prices," "discounts," "percentages" and bribes necessary to their success would undergo a similar change of heart, we will answer for it that the credit of their goods, and the character of their trade, would be much improved, and architects and their clients would be saved an immense amount of misunderstanding, vexation, time and labor.

A singular request has been made by the Philadelphia & Reading Railroad, which asks permission of the City Government of Philadelphia to place a roof over Ninth Street, from Green to Wallace Streets. The terminus of the road, at the corner of Ninth and Green Streets, is the centre of a very large passenger business, and as the railroad owns the estates on each side of the street which it is proposed to roof over, no resistance is to be anticipated from private interests. There may be some question as to whether a roof on a street is an unalloyed advantage to the public, but in practice, the use of this particular thoroughfare is confined mainly to the railroad passengers, who would certainly find it very convenient to emerge from the station into a covered space, where they could transfer and examine their baggage, choose among street cars and carriages, or bid farewell to their friends, under shelter. It is now customary to attach a very large area of covered driveways, carriage-stands and platforms to country railroad stations, and many of the great city termini might add much to their popularity by adopting a similar arrangement.

An ingenious, but not very pleasant, explanation is given for the sanitary circumstance that the people of the city of Newark do not apparently suffer any very serious ill effects from drinking the water of the Passaic River. It was in evidence before a court not long ago that the water was too foul to be used for certain kinds of manufacturing, and the river certainly receives the sewage of three cities, containing a population of about two hundred thousand persons, before it reaches the point from which the Newark supply is taken, but the ordinary effects of water pollution do not appear very manifest, and Newark's death-rate is not much above that of other places. Still, the people of the city do not wish to have any unnecessary filth added to the liquid, and a few days ago complaint was made that the Messrs. Kingsland, manufacturers of anti-moth paper, were allowing carbolic acid to flow into the stream above the city. On the case being called the counsel for the defence made the rather startling claim that the addition of the carbolic acid to the water, which was not denied, instead of being injurious, purified the stream; that the Passaic was simply a common sewer for the city of Paterson and the other towns above, and that, moreover, the sewage of Newark itself was carried up by the tide to the point at which the supply is taken, so that from all these sources the water was so polluted that the defendants were unable even to use it in their manufacture, and the addition of carbolic acid to it, although it gave the water an unpleasant taste, actually purified it, and made it fit for consumption, the citizens of Newark being thus benefited rather than injured by having to drink the waste from the defendants' mill. This ingenious theory did not meet with the approval of the jury, as it seems, but if it should be confirmed by evidence, we hope that Philadelphia, at least, will hasten to provide for a daily supply of carbolic acid to the Schuylkill.

With singular unanimity, the newspapers of the great iron manufacturing centres attribute the strike now in progress in the trade in Cincinnati to the selfish treachery of the President of the Pittsburgh Amalgamated Iron and Steel Workers' Union, who is accused of having private ends to serve in promoting labor troubles in rival cities while Pittsburgh industries go on harmoniously. According to the Chattanooga *Times*, the wages paid in Cincinnati up to the time of the strike were, both for skilled and common labor, five per cent higher than those provided in the schedule just adopted in Pittsburgh for the ensuing year. As the cost of living is lower in Cincinnati than in Pittsburgh, and the price of manufactured iron is falling rather than rising, it would seem the part of wisdom for the men to remain quiet until a better market should warrant them in demanding a higher price for their labor. Nevertheless, the Pittsburgh union, although it had itself, by means of the admirable machinery for determining the value of labor which is now in use there, succeeded in making an amicable arrangement with the masters for the next year without any disturbance of the trade, is said to have exerted its influence over the Cincinnati union to demand an advance of twenty per cent, and to strike if it was refused, as it was certain to be. As the men in Chicago, New Albany, Indiana, and Springfield, Illinois, are now at work on the new Pittsburgh scale, it is unquestionably difficult to understand why the Cincinnati operatives should expect higher rates than their neighbors on all sides, and the suggestion that the movement was concerted expressly to destroy the Cincinnati business, and throw the trade of its six rolling mills for the present into the hands of Pittsburgh manufacturers, seems only too plausible. It is hard to believe in such cold-blooded treachery, but the self-constituted "organizers of labor" have never been famous as a class for their disinterestedness.

The Thirteenth Annual Convention of the American Society of Civil Engineers is to be held at Montreal, commencing Wednesday, June 15, at half-past ten, A.M. With the exception of one business session, the time of the Convention will be occupied with discussions upon professional topics. Special papers will be presented upon the Renewal of the Niagara Suspension Bridge, on Tunnels in River Silt, Repairs of Masonry, Strength of Wrought-Iron Columns, Weights and Measures, and the Comparative Economy of Light and Heavy Rails; and besides these, discussion is invited upon the various papers published in the Transactions of the Society during the year. Many of these treatises are familiar to our readers, and some, particularly those on the resistance of wrought-iron columns, and the testing of cements, are of quite as much interest to architects as to engineers. No doubt, the courtesies of the Society would be cordially extended to those of the sister profession who would like to hear and join in the proceedings of the Convention, and we hope there may be many who will take advantage of the opportunity.

Bids were some time ago invited for the purchase of the great Main Building at Fairmount Park, lately occupied by the Permanent Exhibition, but on the day set for opening them only two or three were received, and those, it is said, were so unsatisfactory that the directors voted to postpone action upon them for a few days, and then decide whether to accept the highest, or to sell the property at auction. In view of the probability that the World's Fair of 1885 will actually be held in Boston, it seems almost a pity that the action of the Permanent Exhibition Company could not be deferred for a few days, in the hope that the structure might be utilized there. Its cost in Philadelphia was nearly two million dollars, and if, as is probable, it could be bought for one-tenth that sum, it is only prudent to try to save it. The trusses, posts, flooring and framing could easily be shipped to Boston, and it should be borne in mind that any accomplished architect could with these materials construct a building very different in appearance from that so familiar to our eyes at the Centennial. The same trusses and frame would lend themselves equally well to a cruciform plan, or one with double transepts, or even a square, so that the power of the designer could be exercised as effectively, and with a result as interesting, as if new materials were to be used throughout.

M. de Lesseps has undertaken a new project, which has a romantic, as well as an engineering, interest. The Isthmus of Corinth, connecting the mainland of Greece with the Peloponnesus, the stem of the topographical bay-leaf to which the ancients likened the peninsula, is to be severed, and ships are to pass to and fro between the Gulf of Corinth and the Ægean Sea, across the highway by which Pelasgians, Dorians, Ionians, Romans, barbarians and Turks have by turns passed and repassed for so many centuries. The isthmus is only five miles wide, but is rocky and mountainous: no doubt our readers will remember that the robber Sciron, when he practised his profession in that vicinity, found no difficulty in kicking his victims, as they were washing his feet by the roadside after supper, over the cliffs into the sea; so that the work of excavation will be costly; but M. de Lesseps is said to have entered into a definite contract for its completion, and with the help of modern explosives he can count with certainty on accomplishing a task which baffled Nero and his industrious légions. Excavation is to begin next year, and the contract demands the opening of the canal to navigation in 1885. The real gain to the seafaring population of Greece will be very great, since the journey around Cape Tænarus is not only long, but dangerous for coasting-craft in the uncertain weather of the Ægean.

CIVIC MONUMENTS IN NEW ENGLAND.[1] — I.

WHATEVER one's own opinion may be in the matter, he is forced to recognize the fact that the erection of the Adams and Winthrop statues has apparently capped the climax of public disapprobation of Boston statuary. Before this time it had been hoped that future statues would bring indications of progress, thus permitting the disappointments of the past to slide into easy forgetfulness. The marble originals of these works were contributed by the State of Massachusetts to the national Hall of Sculpture at Washington. They have not met a warm or a general public approval. When their authors received the commissions to duplicate them in bronze for the city of Boston there was no positive dissent expressed, and they thus received an authoritative recognition of their sufficient merit as works of sculptured portraiture. It was thought by many, however, that the artists would embrace the opportunity to improve the original models, and thereby answer the demand for progress, gratify general desire for it, and confirm public confidence in the judgment of committees in such important matters. The improvement, if any was made, is not apparent, and ridicule with surprising unanimity has concentrated its shafts upon these well-placed bronzes. To the sober thought of the community they accentuate the significance of the questions whether the monuments and statues of Boston represent its intelligence and art capacity, and what the prospects are for the future.

To answer these questions it is necessary to examine the various statues and monuments, the circumstances connected with their production, and the present and probable possibilities of progress. Several difficulties arise at the beginning of the undertaking. First, we have in this matter no accepted standard of judgment. Second, there are at hand no specimens of modern portrait or decorative sculpture of unquestioned merit with which comparisons can be made. Third, we have not recognized the essential fact that a monument or statue means, and is, something more than the conventional resemblance of an individual, or the adaptation of certain forms of architecture to commemorate a historic event. Had we ever felt that monuments and statues have a separate identity as works of art, and only serve their historical purpose when they are such, the subject would be easier to approach, and pleasanter to treat. One representative modern statue by an acknowledged master would do more good in this and in every other city of the country than all the writing and talking of a century. It would illustrate in the best way what a portrait statue means as a work of art and as a part of history. In art matters it is art, not words, that works.

There is another difficulty. We have accustomed ourselves to regard a public work of art and the personality of the author as identical. To speak of the former but in the way of praise is regarded as abuse of the latter.

BOSTON PORTRAIT STATUES AND MONUMENTS.

Within the limits of the city there are five public monuments, decorated with sixteen figures, one equestrian statue, two groups, and fifteen single portrait statues. Two of the statues are in the State-House, two in the Athenæum, and one in Music Hall. This work represents thirteen sculptors, two of them women. Boston is also represented at Mount Auburn by six portrait statues, at Hingham by one, and at Plymouth by the national monument to the Forefathers, adding five more sculptors to the list.

The marble statue of Washington (Fig. 1), by Sir Francis Chantrey, was presented to the State by the Washington Monument Association in 1827. It stands in the State-House, in a room fitted up expressly for it by the Association, in the rear of Doric Hall. The conditions upon which it was given and accepted were that "the hall should never be appropriated to any other use, or the exhibition of any other monument or work of art than the statue of Washington;" and that "it should be seen by the public at all times, with the exception of Sundays, Thanksgiving and Fast Days, on which days the House was closed, in obedience to an order of the General Court." Since 1865 the hall in which the statue stands has contained a large number of the State battle-flags, necessitating the closing of the hall with glass, so that the statue is absolutely shut out from public view or examination except by looking through the glass. By the kindness of the Sergeant-at-Arms the writer was permitted to enter this glass case by first climbing over an iron railing, and then through a door three feet high and twenty-two inches wide. In this way the curious student is forced to crawl into the presence of Chantrey's Washington. Once in, other difficulties present themselves, and prevent a satisfactory view of the statue, for the flags fill the spaces on the sides, and the short distance in front is occupied by copies of two of the memorial tablets of the Washington family in England, embedded in the pavement, so that the desire to see "the noble statue, the work of the first artist in Europe," must be alloyed with the desecration of treading upon the gravestones of the ancestors of the "Father of his Country."

[1] It has been found desirable to enlarge and develop the scheme upon which these articles were based. Intended originally to treat only of Boston statues, it has been extended so as to take in some of the more important monuments in the neighborhood of that city. Moreover, it has been found desirable to supplement the illustrations of these statues and monuments by others which serve to show what the master-hands of foreign artists have done when striving to embody similar ideas and sentiments: they may be considered, in fact, the writer's strongest support in the criticism and analysis he has undertaken to make. — EDS. AMERICAN ARCHITECT.

The hall, the statue, the flags, and the ancient tablets form an unique and impressive composition. But the statue, a work of art expressly made for the benefit of the public, serves none of its designed purposes. The writer has been unable to learn anything about the detailed transactions of the Washington Monument Association during its existence from 1811, the year of its organization, to the time of the presentation of the statue to the State. It was at first intended to erect an equestrian statue, but the amount of money raised, between eight and nine thousand dollars,

Fig. 1. George Washington. By Sir Francis Chantrey. In the State-House, Boston.

did not warrant the pursuance of such an undertaking. From the time that this sum was raised until the statue was completed it had increased by wise investments to over sixteen thousand dollars, an amount more than sufficient to pay for the statue, the building of the hall and pedestal, and other attendant expenses.

It would be interesting to know why Chantrey was selected to execute this work, and what materials were furnished him; whether the mask and other data that Houdon obtained in 1785 were at the disposal of the English sculptor; whether he followed his own conception of the statue, or was guided by suggestions of the committee who had the matter in hand. What significance there was in the fact that many of the gentlemen composing the association were well acquainted with "the man whose life was among the greatest of his country's blessings, and whose fame is her proudest inheritance," it is difficult to ascertain. "It is said that many who have often seen Washington," remarks a journal of the time of the erection of the statue, "at various periods from the commencement of the war of the Revolution to his retirement from the presidency, and who have carefully examined the statue, are unanimous in their opinion of its strong resemblance to the great original, particularly at the period of time which the statue is intended to commemorate." Whether this opinion refers to the entire figure, or to the head alone, is a matter of conjecture.

The figure is almost entirely covered with a cloak gathered together below the breast by the left hand. The right arm hangs down straight by the side, the hand holding an open manuscript upon which is written, "Washington, United States." It is what is termed

a composed statue; that is, it does not represent the subject in a characteristic or illustrative position, or performing any definite or personal function. Take off the head, and it would be valueless as a representation of any personage, intelligible purpose, or historical fact, although still interesting as a piece of sculpture. Of this style of statue it is a fine example, and produces as a whole an imposing effect. It expresses the composure and pleasing dignity of a noble man. This is evidently the only purpose of the statue. If the famous statue of Voltaire, by Houdon (Fig. 2), could be placed beside the Washington, no more striking contrast between portrait statues

Fig. 2. Voltaire. By Houdon.
In the *foyer* of the Theatre Francais, Paris.

could be presented. The former is the result of a profound intuitive artistic understanding of the mental and physical character of the subject; the latter, the result of a scholarly and skilful use of material means. The Voltaire is intense in its personality, in every action, and in every part. The Washington has no relation to a particular human being except in the head. One is a portrait statue in its full sense. The other is an arrangement. The Voltaire serves a purpose outside of itself as a portrait. It is a work of art.

The Washington sets forth an elegant and adroit handling of material for itself. After the first impression, and when the Washington is regarded in detail, the drapery in front is troubled. The study of the sculptor in preserving the forms of the figure by skilfully arranging the drapery shows a fine sense of fact rather than a calm

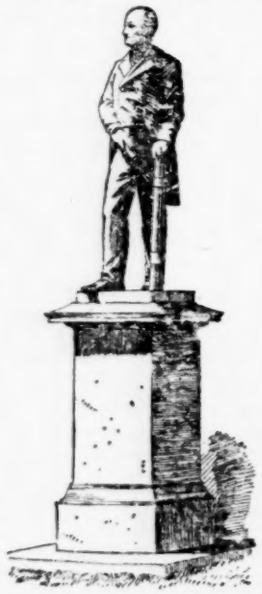


Fig. 3. Daniel Webster. By Powers.
In the State-House Grounds, Boston.

Fig. 4. Monge. By Rude.
In Beaune, France.

sense of sculpture. The left-front side, where the drapery is held up by the hand, is one of the difficult problems which sculptors are often obliged to solve. Chantrey solved it by preserving the general form and outline of the figure, and at the expense of a simple effect of drapery. Although the Washington is imposing in general effect, it is yet without that subtle movement of a figure in that position. The spectator who is exacting in the balance of a statue will observe that this one inclines to the right, and he would hasten to place some supporting form of drapery, or some accessory, on the plinth outside of the right leg. The absence of this perception of the balance of a statue is one of the proofs of the difference between an artist who feels, and a workman who makes, his work. The necessity of accenting the supporting purpose of the right leg was seen in a degree by the sculptor when he detached the drapery from the inside ankle, and produced a narrow, vigorous shadow. The hands, feet, and legs are elegantly executed. The head is like, though not a copy of, the Houdon cast. Its execution is rich, full, and large. As a whole it is an ample specimen of what a great workman, almost a great sculptor, can do.

Thomas Ball's marble statue of Governor Andrew stands in a niche in Doric Hall, a few feet from the Washington. Its intent is evidently to represent Andrew as he appeared to the world, a short, full-favored man, wearing a cloak. It may answer its intention during the lives of those who knew the Governor, but when another generation asks for an impression of Massachusetts men of a great epoch, and for some slight indication of the existence of their representation in sculpture, we fear that Ball's Andrew will not fully answer.

In front of the State-House, on the terrace, is placed Powers's bronze of Daniel Webster (Fig. 3). It has become notorious for many reasons. Disappointment received and ridicule has persistently followed it. The idea of the statue is to represent the statesman and orator in the act of expounding the Constitution, and emphasizing the principle that union is strength, and this is expressed by placing the left hand upon a bundle of sticks, representing *fasces*, while the

Fig 5. Demosthenes.
Greek work, in Rome.

Fig. 6. Horace Mann. By Miss Emma Stebbins.
In the State-House Grounds, Boston.

right points with an unrolled manuscript to this symbol. It is an illustrative statue in its fullest and nearly its flattest sense. In style, compare it with Chantrey's Washington; in its intellectual and artistic comprehension of the subject, with the Demosthenes (Fig. 5). The Webster is as near a work of art as brónze can make it. As a piece of workmanship, the right leg shows indications of study. Nothing can equal the hideous appearance of the back. The plinth is hardly large enough for a tin soldier, while the pedestal is common enough for all that it supports.

The bronze statue of Horace Mann (Fig. 6), by Miss Emma Stebbins also stands on the terrace in front of the State-House. Its history will always be delightful because it was paid for by the contributions of the school teachers and children of the State. That it was made by a woman gives it an unusual interest. The great educator is represented as addressing an audience. While it could not be said that this idea is clear, simple and free in its expression, nor that the figure stands firmly upon its feet, yet there is a great deal of earnest thought and work in the execution. The difficulties of arranging the drapery were evidently very serious, and not always as successfully overcome as they would have been by a great sculptor, but it is easy to see that they were attacked with courage in the aim for a good result. The purpose of the statue — as speaking — was intelligently selected, and the attempt made to carry it out in the statue itself, without the help of frivolous illustrative symbols. Miss Stebbins's idea is more sculpturesque and intelligent than that of Powers in his Webster. He belittled a rich subject. She aspired to be guided by a fine one. The statue was made many years ago, when women sculptors were novelties, and the difficulties surrounding them were enormous. They have not all disappeared yet.

The plaster copy of the Bowditch statue (Fig. 7), by Ball Hughes, in the Athenæum, is evidently made to represent the subject in some

characteristic attitude. There is a familiar personality in the impression it makes upon the observer that quite distinguishes it from any other statue in Boston. It is sensibly considered and

Fig. 7. Nathaniel Bowditch. By Ball Hughes.
In the Vestibule of the Boston Athenæum.
(*The original at Mt. Auburn Cemetery.*)

well executed, honest, unpretentious and pleasing, quite barren of stone-cutters' tricks, of laborious respect for cloth as a material, or of any desire on the part of the sculptor to exhibit himself.

Fig. 8. Chief-Justice Taney. By Rhinehart.
In Annapolis, Md.

If it does not appear like the statue of a great man, it at least looks the scholarly gentleman.

A plaster copy of Houdon's Washington stands opposite the Bowditch. The original in marble is said to exist in Richmond, Va. The general feeling regarding this plaster copy is one of disappointment. Having in mind the most remarkable work of the great French sculptor, taking into consideration the pains and annoyances he endured in obtaining the material to make this statue, it has always seemed astonishing that a greater success was not attained. It will be remembered that Houdon came to this country in 1785 to study Washington, and make casts of his entire body, sketches and other memoranda with which to execute the important commission. For Houdon to break up the pleasing tranquillity of his life, work, and thought, by a sea voyage of more than three thousand miles sufficiently indicates the great importance the sculptor attached to his project, which in those days was anything but agreeable. What motive guided him in treating the subject as represented in this statue seems past finding out. The problem is still more difficult to solve when it is considered that Houdon was a most remarkable sculptor, subtle to an unusual degree, of fine perceptions, and having a most loyal sense of the relation between nature and its sculptured representation. If the statues of Michael Angelo define and explain epochs, that of Voltaire by Houdon represents a man, a time, and a nation. Various surmises have been made regarding the conception, composition and almost commonplace presence of this statue. The sculptor does not show that he had either the inspiration of a race, nation or man as a motive. He was apparently content to stand up his subject in a statue as he would any man out of whom he could get no guiding thought, positive purpose, or mental relationship. That the original marble is vastly superior may be safely asserted, when it is remembered that the art of the plaster-mould maker in this country could scarcely be worse than it is. It needs little effort to

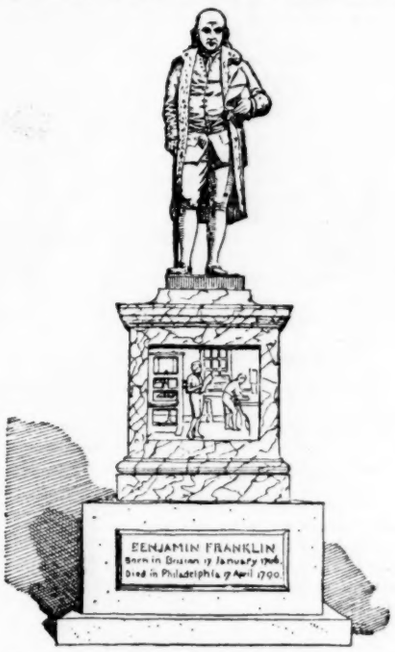


Fig. 9. Benjamin Franklin. By Richard S. Greenough.
In front of City-Hall, Boston.

represent the finest piece of sculpture as an indifferent mass of painted plaster, and the statue at the Athenæum has suffered in consequence. At the same time it has an impression of naturalness. It looks as though it were a portrait statue. There are dim indications in its execution and general aspect of a skill and simplicity not characteristic of the average statue.

The bronze Franklin (Fig. 9), by Richard S. Greenough, in front of the City-Hall, would be called, we think, by common consent, the most pleasing statue in the city. The pose is happy, human and effective; the costume appeals to the respect and admiration. The

Fig. 10. Josiah Quincy. By Thomas Ball.
In front of City-Hall, Boston.

statue looks like a fine, full-bodied old gentleman of another time. Its whole sentiment is refined. If it does not show the nerve, freedom of treatment, and knowledge of the human form that are found in

famous statues, it neither shocks by vulgar pretence, careless workmanship, or want of study. The historic halo that increasingly surrounds the name of Franklin will not be diminished by Greenough's tribute. The interesting scenes that the bas-reliefs on the pedestal depict will preserve them in public regard, though they are not quite as picturesque as the subjects would warrant.

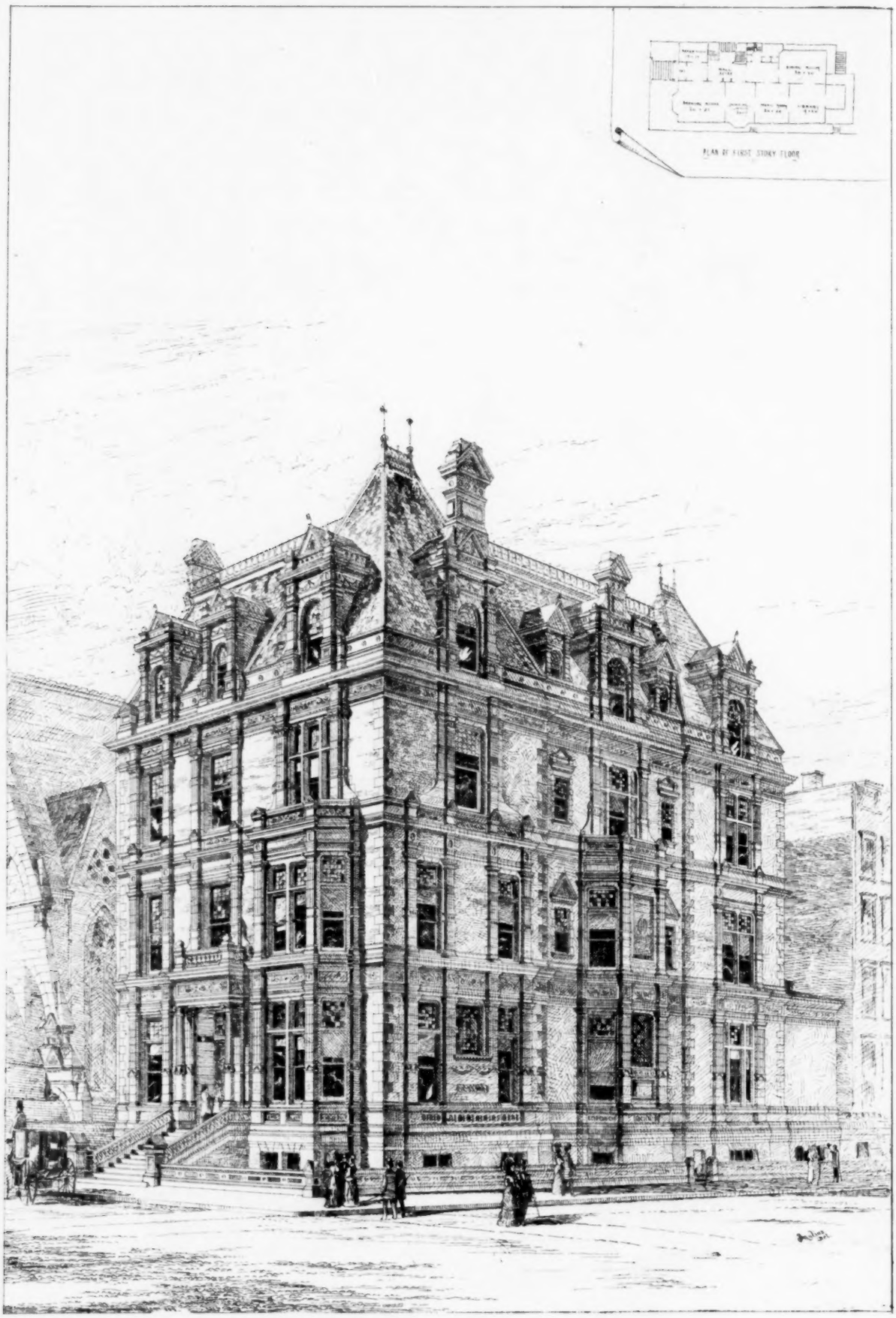
The bronze statue of Josiah Quincy (Fig. 10), by Thomas Ball, also stands in front of City-Hall. It is another illustration of a composed statue. It is not claimed that it represents Quincy, except in the head. The vital quality of the personality of the subject is wanting. When a portrait statue has not this quality, in order that it may command public admiration it is necessary that it possess in a sufficient degree a great *presence*. One of the unfortunate circumstances in the way of our sculptors has been that they were expected to make interesting statues of persons with whom they were not familiar. When the physical presence of a personage is either not known by the sculptor, or, as in the case of the Medici statues, it is not desirable to reproduce it, the sense of art is that the guiding motive of his life shall be embodied, or some distinguished action illustrated; as in the statue of Samuel Adams. It is only a very strong sculptor who can make a fine portrait statue with simply the head to identify it. The great statues of the world have for their motive some well-defined and important idea, principle, fact or sentiment. The absence of an object like any of these reduces the interest and value of a statue to that of the material of which it is made, or of its skilful manipulation. The latter quality is not regarded as sufficient for the dignity of sculpture; the former is subject to the demands of trade.

T. H. Bartlett.

ARCHITECTURE AT THE ROYAL ACADEMY. — II.

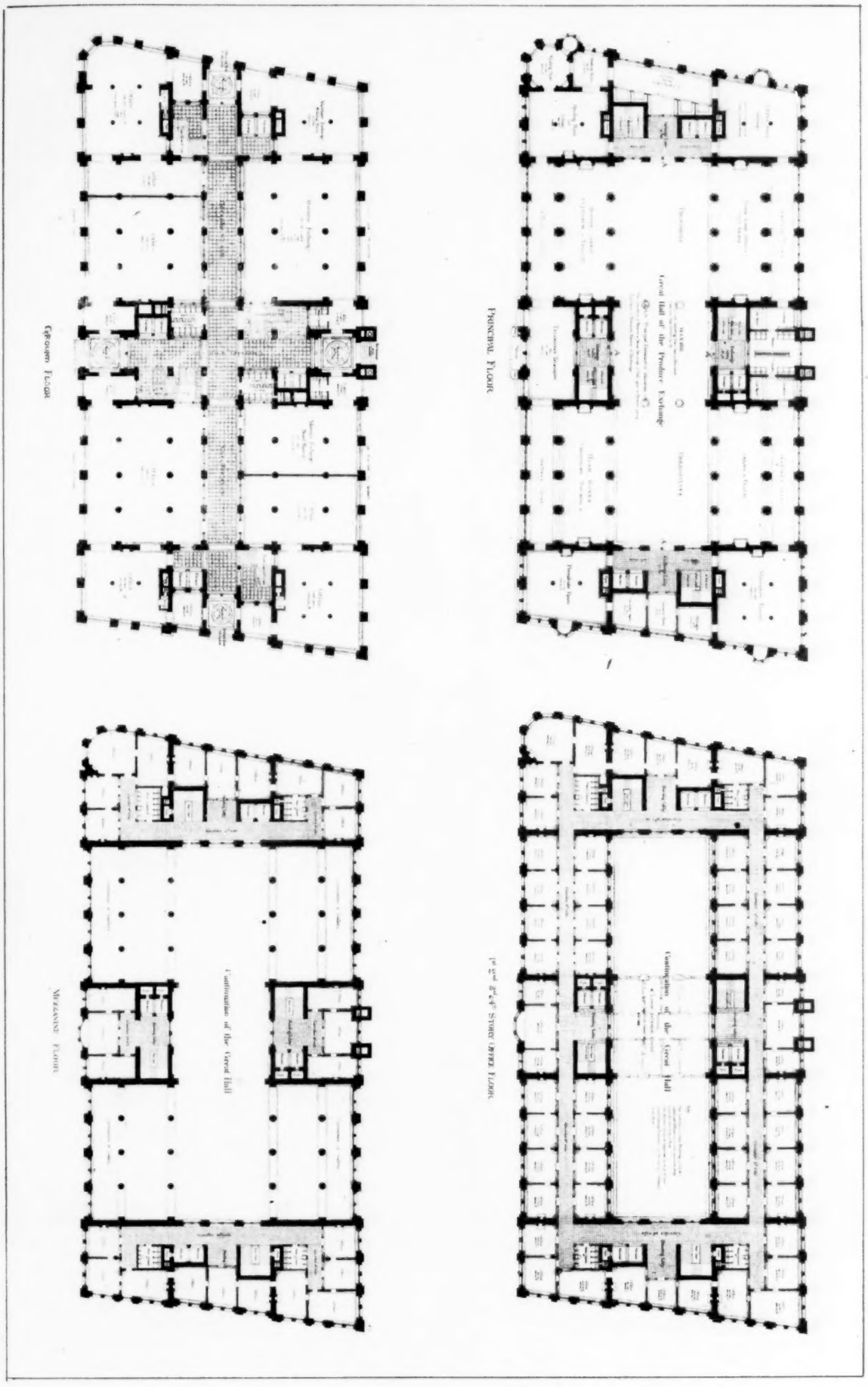
London, 7th May, 1881.

Resuming our review of the works at the point we left off in the previous article, we have to notice first some new buildings at the Royal Albert Docks, by Messrs. Vigers & Wagstaffe: No. 1080, The Dockmaster's House, and No. 1104, The Tavern at the Docks, both picturesque works, quite a relief from the usual humdrum style of commercial buildings generally. Indeed, the "Tavern" is most capitally designed, full of quaint "bits" and interesting features. We suppose it must be called Queen Anne in style, though there is a good deal of half-timbered work about it. The front of the Tavern has three bay-windows with circular corners; over them projecting gables, the upper parts of which are filled with carved figure-subjects representing "Commerce," etc. The Tavern sign is "ye ship," and a ship does duty for a vane on another of the features, while the side windows of the bar have their mullions finished with carved half-length figures very much after the ship-carving manner of days gone by. No. 1081 is the new church near Rotherham, by Mr. E. F. C. Clarke, an effective church, but with not much of the Yorkshire type about it. No. 1082, The Coffee Tavern and Hostelry, at Newark-on-Trent, is the only contribution by Messrs. George & Peto, and is drawn in Mr. George's well-known artistic manner, but it is hung so high it cannot be seen to advantage. It would have been more to the purpose if one of the so-called decorative works hung on the line or about it had been sent up in its place, the exchange would have been to the advantage of both, as the Coffee Tavern is most artistically designed like most of its authors' works. No. 1085, New Stables, Park Lane, by Mr. James Brooks, is remarkable as being another Queen Anne design by a much more severe Goth than Mr. Waterhouse. Both the "perversions" or "conversions" — which is it? — hang together. The idea of the designer of the painfully severe Mission Church at Lewisham (noticed in our former article) following the vagaries of the fashionable Queen as seen in this picturesque stable-yard is amusing as well as instructive. Is even Mr. Brooks beginning to lose faith in the thirteenth century, that he takes such a header as this into the eighteenth? — though the result, as in Mr. Waterhouse's case, is so successful as to make one wish they would do it again, Mr. Brooks's stables looking what they really are, honest, serviceable, English-looking buildings, and not a part of some middle-aged convent, as at one time in his history they might have done, but for the so-called new "revival." Just about this part of the gallery are grouped together several church designs of more or less merit, which show that there is small chance of Gothic dying out amongst us yet. There is No. 1089, St. Nicholas Church, Wells-next-the-Sea, Norfolk, by Mr. Herbert Green, — a very good interior indeed, in late Gothic, very like the Norfolk churches, and very English in style, a little hard in drawing, perhaps, but the detail is good and well expressed; another interior, No. 1092, the Raikes Memorial Church, Gloucester, by Mr. Capel Tripp, of a much earlier type than the preceding one, but a spacious-looking church, also well drawn, and with a good deal of care taken in the detail; still another interior, No. 1097, the Parish Church of St. Hilda, Leeds, by Mr. Micklethwaite, in late Gothic again, the principal feature being an elaborate chancel-screen, with rood-loft and rood all complete, of a very pronounced type for an English parish church; then passing still another interior, the church at Kingston by Mr. Street, noticed before, we have the exterior view of the proposed new church at Woodford, Essex, by Mr. Edwin Cronk (No. 1190), an Early English church of the ordinary type, but with a good, massive tower and spire; an interior, again, in No. 1105, St. Cuthbert's Church, Ushaw College, by Messrs. Dunn & Hansom, a large and important design arranged like a college chapel, with elaborate stalls and other fittings; No. 1108, another view (from the east) of the Church of the Sacred Heart, by Messrs. Ware & Stokes, the two former views of which have been already noticed, — it has a good apsidal end, and the tower again tells effectively; then a charming village church by Mr. James Brooks, The Chapel of St. Mary, Caynham, Ludlow (No. 1111), which shows his Gothic hand has not forgot its cunning in spite of the Queen Anne stables, — the porch is a little bald, but the chancel is very well designed, and the tower, with its timber-framed belfry-stage and slated broach spire, is a most picturesque feature, and all admirably drawn; to finish the group we have The Holy Trinity Church, Burton-on-Trent (No. 1115), by Mr. John O. Scott: this is an exterior view of a very fine church in fourteenth-century Gothic, decidedly the author's best contribution to the exhibition. There is considerable originality in the treatment of the body of the church, and a noble tower and spire at the north-west angle; the detail of the tracery of the windows and of several other features is very well drawn, and the design is admirably illustrated, we should think by its author's own hand. And while speaking of Mr. Scott's work, we might go on a little farther, and notice his two large drawings of the Cathedral for Lahore (Nos. 1127 and 1131). The first is a longitudinal section, looking south, with a plan to a smaller scale; the other is an elevation of the west front. The plan is well arranged, and consists of a nave, and aisles of five bays, wide transepts, and apsidal choir with the aisles running all round. The chapter house is an oblong apartment on the south side of choir. It has two western towers, and open porches to protect the three entrances (at the west and transept doors) from the glare of the sun. The windows, also, are in narrow lights for the same reason, to subdue the great heat and glare; and in general size it is about 180 feet from east to west, by about 65 feet wide across the nave and aisles. But we must confess to some feeling of disappointment with the architecture; it is early Gothic in style, but very far inferior in spirit to his church just noticed. It is to be executed in brick, with stone dressings, piers, shafts, etc., and is vaulted throughout, which will help to keep it cool; but the work somehow is not happy, and the detail none of the best. Is it that an Englishman doing Indian work feels hampered by the style, or feels oppressed with the idea that he must get some Indian feeling into the detail, or what? Very little of our Gothic work in the East seems at all successful, and this cathedral is neither what it ought to be, nor what we have a right to expect from Mr. John Scott, who can certainly do much better work than this. In the colored perspective of this important work exhibited last year it seemed to look better, and its various features to group very well; but here in these large-scale drawings it looks poor and thin, the proportions queer, and the detail mixed and unsatisfactory. The two western towers lack importance; they have fairly good belfry-stages, and have saddle-backed roofs, with a spirelet on each, and there is a *flèche* over the crossing. These spirelets and the *flèche* are in timber, but the latter again is not important enough. It seems a pity that an opportunity like this at Lahore was not made more of, as we feel sure its author could have done. There is as yet in India little to tell, in the way of great churches, of the Englishman's faith in the religion of Christ; while the mighty temples and shrines of its former rulers sink into comparative insignificance all the art of its most recent, and yet most enlightened, conquerors. When the history of the art of the English in India comes to be written, it will need some much more brilliant chapters than the Gothic of the nineteenth century, so far as it has gone, if it hopes to become memorable amongst the achievements of the world. To return somewhat in our list, to take up some works passed over in speaking of the above churches, we must notice three schools, each very good in its degree. No. 1094, Congregational Schools, Lewisham, by Mr. Geo. Sherrin, is a most creditable design in late Gothic, full of good detail excellently worked out, and is shown in a capital drawing; No. 1095, St. Oswald's College, Ellesmere, by Messrs. Carpenter & Ingelow, is a large and important building of collegiate character in middle-pointed Gothic. Two sides of a quadrangle are shown in the perspective, in one of which the same type of window is repeated throughout (probably students' rooms). This repetition gives a quiet simplicity and dignity to the design which is very attractive, while the type of the work is very English in its character, like most of Mr. Carpenter's work. Another school, The Wellingborough Grammar School, by Mr. Talbot Brown (1102), is also very good in design, but in Queen Anne this time, looks extremely like its purpose and is both well detailed and well drawn. Of a very different stamp, however, is St. Paul's Choir Schools, by Mr. Penrose, the surveyor to the cathedral (1116). It is fussy, nondescript kind of classic, badly drawn and badly colored. What would poor Wren have said to this queer appanage of his noble cathedral, the dome of which appears in the background of the drawing in silent protest against this latest effort of his successor? No. 1118, Eastgate House, Rochester, is a very effective drawing of a charming bit of old work, a timber and plaster street front. No. 1120 is an important work, — the new National Hospital for the Deformed, Great Portland Street, by Mr. Geo. Vigers. It is in somewhat pretentious Queen Anne, with frontages to Great Portland Street and Bolsover Street. Considerable ingenuity has been shown in the planning to secure light and ventilation on such a confined site; but the architecture, especially in the upper stories, is restless, and the detail of the heavy bulbous type. Ionic pilasters decorate both fronts, but they are of the squat bulging order, sometimes thought more picturesque in work of this kind than the more classic propor-



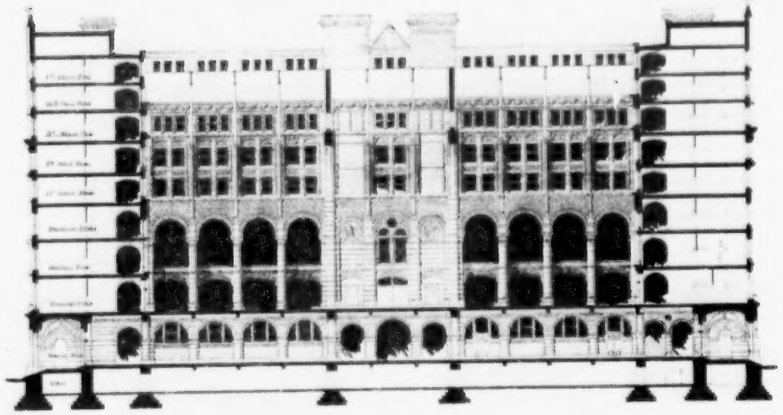
House for O. Goelet Esq, Fifth Ave. New York.
E.H. Kendall, Arch't.

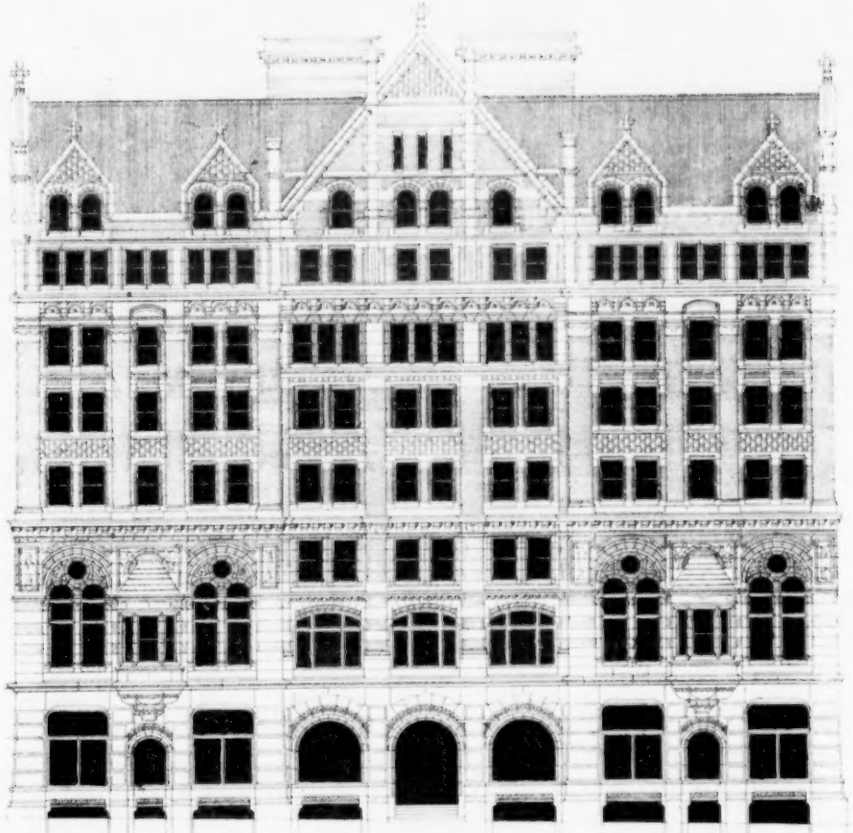
Competitive Design for the New York Produce Exchange Building.
C.B. Atwood, Archt.

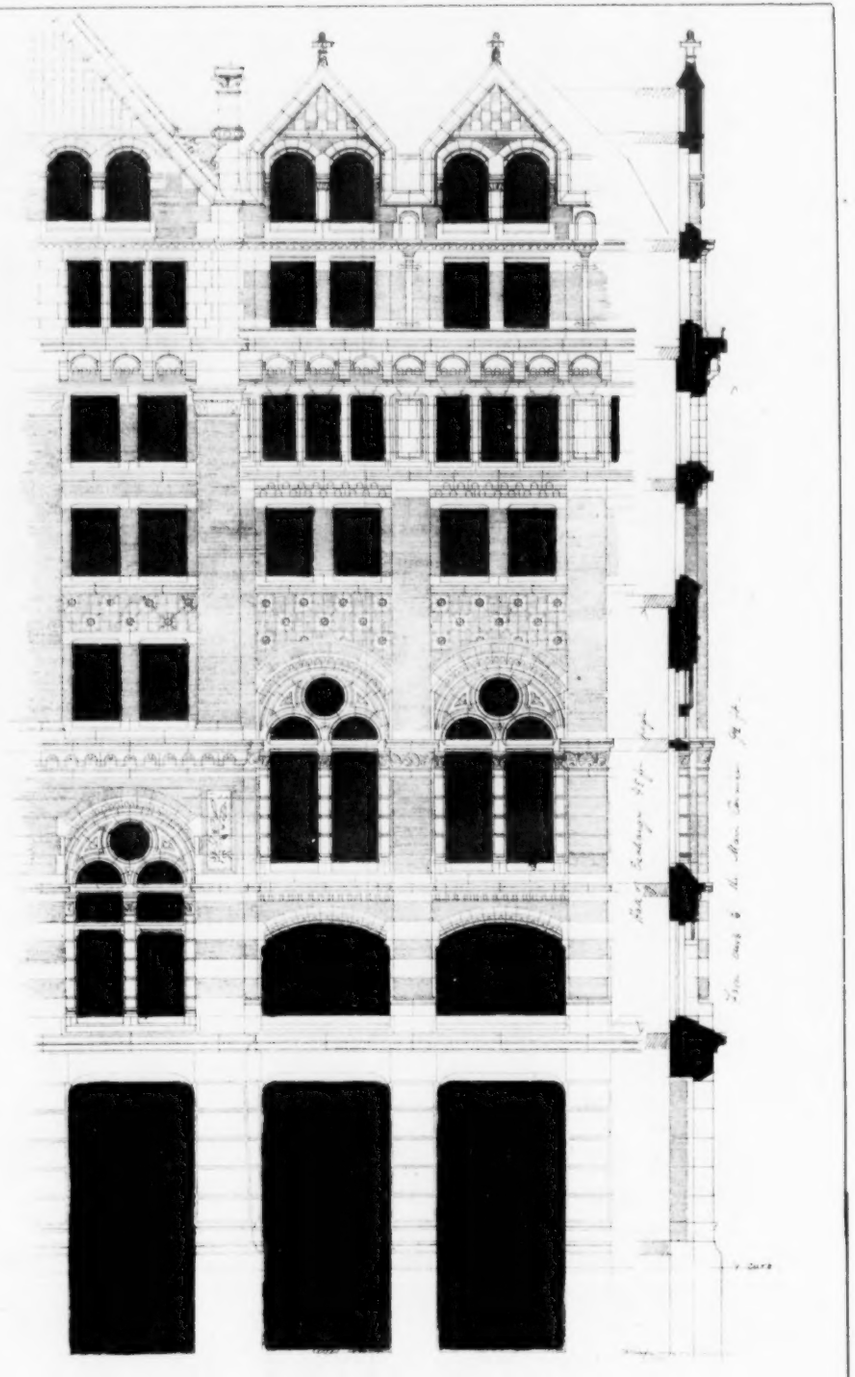


Competitive Design for the New York Produce Exchange Building.

C. B. Atwood, Archt.

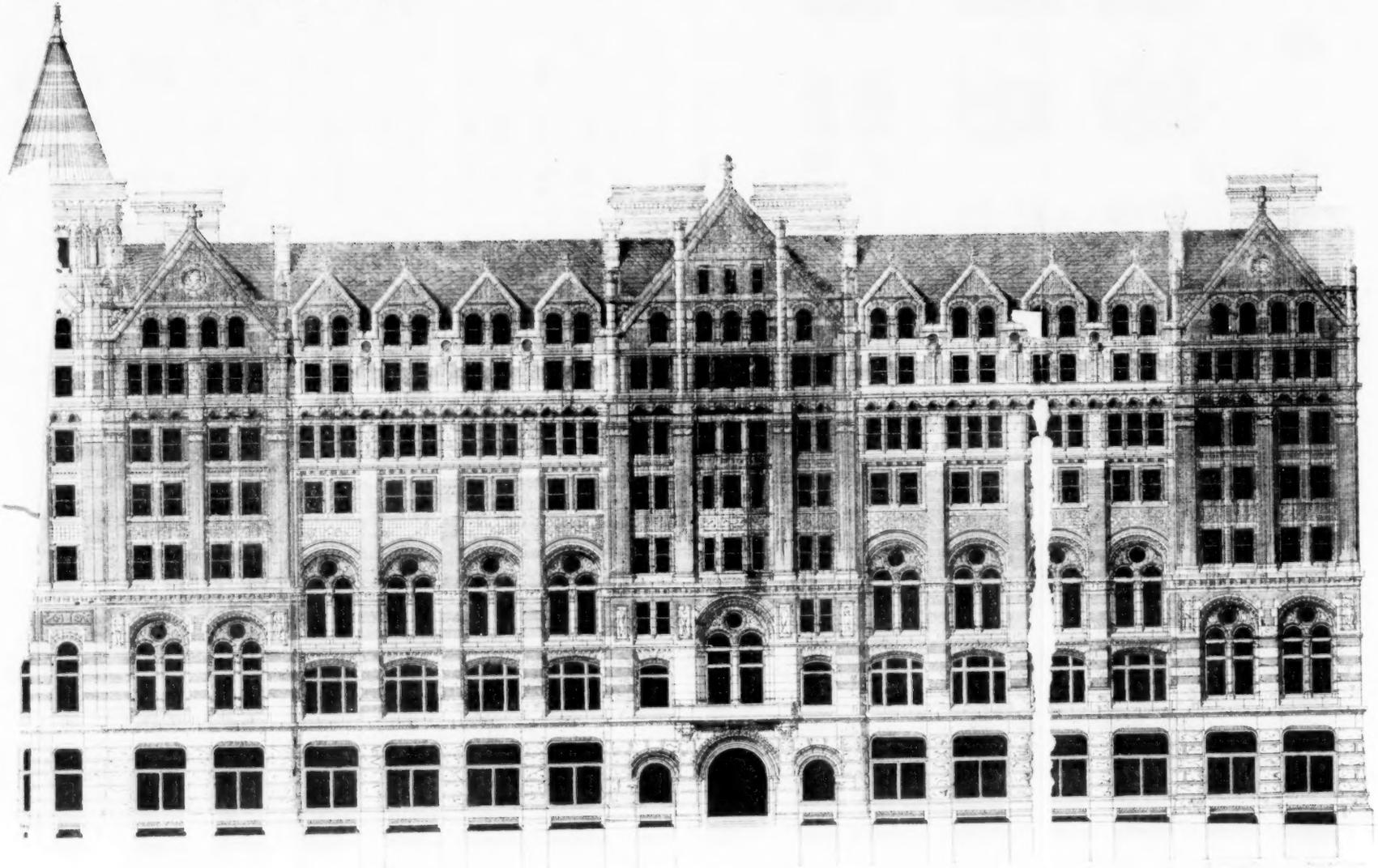






ELEVATION on STONE STR.

Detail & Section of Walls



ELEVATION on BROADWAY

Competitive Design for the New York Produce Exchange Building.
C.B. Atwood, Archt.

tions. It seems to us this is trying to do the work clumsily for clumsiness sake, which is surely not a very high aim to keep in view. The best of our new Queen Anne work is always exceedingly well detailed. Mr. Vigers might revise both these fronts with advantage in this respect. As the old adage has it: What is worth doing at all is worth doing well. There seem to be only two designs from any of the recent competitions. One is No. 1126, a detail of the west front of Mr. Bernard Smith's design for the Church of St. Philip, the Roman Catholic church at Brompton, we presume. It is a colored drawing of a careful but free treatment of classic. The other is also a classic work, Nos. 1134 and 1145, being two relevations of Mr. Wm. Young's design for the Glasgow Municipal Offices, evidently alternative treatments of the same design, though neither of them call for any special remark, as they present only the ordinary features of every-day examples of the style. We prefer the design with the dome; though the latter may perhaps look like a small edition of St. Paul's, still it will always look well and form a prominent feature in any city. No. 1130, St. Mary's Church, Hammersmith, by Mr. Arthur Baker, is a large and important church in brick, of an early Gothic type in style. It has a spacious nave, the aisles being reduced to mere passages, wide transepts, and a good chancel; a gallery also evidently crosses the west end of the nave. It should be a splendid congregational church, and is treated throughout with considerable breadth and dignity. The spirelet of wood and slates, however, over the crossing fails in importance, and looks more suitable for a village church than a structure like this. It may be picturesque, but it is the weak point of the design.

There is quite a cluster of designs for painted windows just at this part of the gallery, but none of them seem to call for any special notice; they are the ordinary thing. No. 1139 is a clever student's Design for a College, shown in a bird's-eye view by Mr. Walter Millard, the most striking features being the entrance gable with the flanking octagonal turrets and the main tower, in which there is some nice detail. It is in late Gothic. Next it, in No. 1140, we have a most charming bit of work by Mr. Robert W. Edis, in the Additions to the Library of the Inner Temple, one of the best of Mr. Edis's designs we have recently seen, and shown in a most effective and deliciously colored drawing. The principal features are two large corbelled-out bay-windows on the first floor, and the octagonal turret dividing this new work from the older portion. It is late Gothic in style, in red brick and stone dressings, quiet, artistic and refined, — just what it should be in the temple precincts. One feels glad the place has got into such good hands. When one looks at the little portion of the adjoining work the difference is striking. Mr. Edis's other contribution (No. 1144) is a block of mansions in Victoria Street, an effective street building in white brick. On the ground floor are the offices of the Imperial Bank. The general design is a free treatment of classic of good character, but it pales in artistic power beside the Inner Temple Library. There are a number of smaller works of more or less merit, some of which are hung too high to see them properly. But we cannot conclude these notes more worthily than by finishing with Messrs. Bodley & Garner's splendid Church of St. Michael, Camden Town (No. 1141). This is in all respects a noble church, and when finished will become a most noteworthy addition to the London churches. Last year we had a view of the interior; since then the nave and aisles have been built, and in the present drawing we have a view of the west end with the proposed tower. The church is late fourteenth-century Gothic in style, is built within and without of stock bricks with stone dressings, — piers, arches, tracery, etc., — and is vaulted throughout, the roof being covered with red tiles. All the detail and the tracery is most carefully and thoughtfully worked out, the range of clerestory windows being particularly effective; the west window is also very good, and the proposed tower as shown here is one of the strongest and most artistic designs Mr. Bodley has yet done. It is quite like an English tower, and this eminently English spirit seen everywhere throughout is one of the chief charms of the work. One feels this is thoroughly good English Gothic, and in saying that one gives it the highest praise, though not more than it deserves. It is to be hoped this fine tower will soon be built. The entrance doorway and the belfry-stage are perfect studies, and are well worth the earnest attention of all interested in the progress of architecture as a fine art. If this and other recent work by Mr. Bodley does not secure for him the vacant architectural A. R. A.-ship, it will be hard to find one more deserving of the honor, or who could bring to the Academy more artistic power.

One cannot leave the exhibition without noticing the favor in which late Gothic seems now to be held, this year shown more so than ever, and the many works which display a more than average knowledge of the style. It has certainly the merit of giving many of our churches and other Gothic buildings a much more English look than they had some years ago. The type of Gothic prevalent in our country during the fourteenth and fifteenth centuries was probably more characteristically English than at any other time, especially so during the latter period, and we look upon the more recent development of the revival in that direction as a strong evidence on the part of our most thoughtful designers of a wish to preserve these characteristics and maintain this English spirit, and certainly it does seem much more appropriate to our towns and villages than the French and Italian leanings of the revival's earlier days. Nobody, for instance, we feel sure, could hesitate long between Mr. Bodley's Church of St. Michael at Brighton and his Church of St. Michael in London, as to which is the nobler type for an English church, or more in keeping with the traditions of the English people, and in this tendency to late work we may also perhaps discover some drawing nearer of the opposing schools of classic and Gothic, arising, it may be, from the freer treatment lately to be seen in both; and without going the length of saying that Mr. Shaw's Church of St. Michael, at Bedford Park, in any way foreshadows the style of the church of the future, there is no doubt but that these late Gothic churches are certainly more in harmony with their Queen Anne surroundings and with the tendency of domestic architecture generally than ever their earlier and more severe predecessors could hope to be. The future of the movement is full of interest, even though one may feel some anxiety as to the result. Looked at in this light, the display of architecture at the Royal Academy this year is not without its lessons.

ON THE VENTILATION OF HALLS OF AUDIENCE.[1]—III.

THE writer of this paper became connected with Mr. Nason in 1848, when he was employed to superintend the construction of tube works at Malden, near Boston, for Messrs. Walworth & Nason, and from that time until now he feels able to claim some standing in advancing the industry of steam heating. It will have been noticed by most who have to do with construction, that the form and shape of valves, elbows, tees, and of details generally employed or made any where in the country, are strikingly similar. In fact they are universally copies, following exactly the designs and proportions, as to sizes and thicknesses, which the writer established and published in the catalogues of the Pascal Iron Works, nearly twenty years since.

From this general acceptance of the types of steam-heating apparatus and its component parts, any one is at liberty to specify a definite construction of coils and mains, with a correspondence of detail. He can measure and plan to use any arrangement of standard articles, selected from any trade catalogue of a steam-heating establishment or firm, and feel sure that the work will have been so arranged that it can be bid for in open competition, and that he is getting the best work, or details of work, to effect his purpose in his own way. More than this, it may be regarded as tolerably sure that any patented improvement of detail or method is inferior to what can be procured and supplied from regular traders.

In the arrangement of ventilating and heating apparatus for halls of audience upon the foregoing type, a few figures of proportions required may here be stated: —

It having been accepted what number of people are to occupy a certain hall, — taking the maximum number, — the total quantity of air needed each minute will be derived by a simple multiplication of this number by the quantity per person, per minute, which the occupancy of the hall demands; that is, for a hall occupied by occasional sessions of one or one and a half hours, say ten feet, while for a legislative hall for frequent long sessions, thirty feet may not be too large, while proper judgment should determine intermediate values for other conditions of occupancy. The figures of total quantity of air needed each minute being determined, the sectional area of the duct, near the fan, is got by dividing this figure by 600.[2] Now, this area is simply that of the periphery of the fan multiplied by its width, and as the width of the single fan at the periphery is = one-tenth diameter, it follows that the area of outlet is $= \pi D$ (= circumference), multiplied by $\frac{1}{10} D$ (= width) $= \pi D^2$ divided by ten. Taking the value of π (= ratio of circumference to diameter); making the division, and extracting the square root from the figures given, it follows that D (= the diameter of the proposed fan) = 0.073 times the square root of the number of feet of air to be moved each minute. This rule can be expressed more simply in algebraic characters, as follows: —

$$N q = Q; \quad \frac{Q}{600} = \frac{\pi D^2}{10}$$

Where N = maximum number of persons to be supplied with air for ventilation.

" q = least quantity of air per person, per minute, in cubic feet.

" Q = total quantity of air to be supplied, or the least quantity in cold weather, also in cubic feet.

" $\frac{Q}{600}$ = sectional area of duct near fan, in square feet.

" D = diameter of single fan, that is of a fan which carries its blades and receives its air on one side only, in lineal feet.

" π = ratio of circumference to diameter.

Reducing the above equation to give the value of D, then:

$$D = 0.073 \sqrt{Q}, \text{ nearly;}$$

and for a double fan or one receiving its air on both sides, then:

$$\mathfrak{D} = 0.053 \sqrt{Q}, \text{ nearly;}$$

When $\mathfrak{D}$ = diameter of double fan, or of one carrying blades and receiving air on both sides of the disks, in lineal feet.

The inlet or suction air duct or passage to a fan should have, as an absolute necessity to supply the air, 1.4 times the area of the outlet or distributing duct. To compensate for resistance of air in passage along the ducts and yet to preserve

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

[2] 600 feet having been stated previously as the desirable rate of flow of a forced current in a duct per minute.

the smallest efficient areas of distributing ducts and branches, the sectional area of such distributing ducts or branches, at any given distance from the fan, should be increased over what is derived from $\frac{Q}{600}$, by adding 0.0025 times ($\frac{1}{400}$) for each foot of distance, and there is required a constant addition of 0.25 ($\frac{1}{4}$) a square foot, which becomes a necessity to meet the great resistance of small passages. The area of a main duct at any given distance from the fan should be formed by computing after this method, — the area of *each* branch, which may be considered as *trumpet shaped or expanding from* the fan to the point of bifurcation (from which point the *branch* may be deemed parallel), and this area is to be used when summing up an aggregate of total area of cross sections at such distance.

It may be needful to call attention of those who may plan a ventilating apparatus, that the air-ducts must be exclusively devoted to their purposes, and should not be used, or even made so as to be available, for passages. They may be employed for the lines of supply or return mains or distributing pipes, but the ducts should not be encroached upon by coil chambers constructed within them. Clear, unobstructed, smooth passages, with all angles rounded and all corners filled in, and all enlargements avoided, should present the least of resistance to the flow of air.

The foregoing formidable array of rules and data have been presented of necessity, for guidance in construction. They represent absolute and unalterable conditions in forced ventilation, and will enable any one to design, without mistake, when engaged in making original plans. It may be objected that the dimensions of ducts obtained by these rules are excessive, nearly to the point of impracticability, but in reply to this it must be stated that they (the dimensions) are less *by one-half* than can be employed for ventilating by heated currents alone (which is cold weather ventilation only), or for ventilating by exhaust shafts, heated in same way to induce currents (which is closed window ventilation). The frequent assertion of success of self-acting (as they are called) ventilating apparatus often confutes itself, when the incompatibility of size of ducts is investigated.

As to the methods of distribution of currents from the branch ducts within a hall, and amongst an audience, the subject would call for longer discussion than there is room now to consider. It will only be said that at the mouth of discharge of each branch, baffling boxes must be arranged and provided, so that the afflux shall take place from an extended surface, at a not greater velocity, within one foot of the surface, than two feet per second, — a condition which calls for the area of surface to be ten times as great as the sectional area of the branches. And it is further required that the direction of afflux should be *upward* in general, or when horizontal it should meet some other current of afflux near by, and be directed upwards. The augmented current of afflux in horizontal directions, as in the risers of the seats or steps of an amphitheatre, is sure to engender local currents of much greater intensity than the original ones, and to become seriously objectionable to an audience.

Whatever be the dimensions given to the supply ducts and passages, it must be remembered that those for removal of air must have adequate size, and if economy in the impelling force be studied, must be at least of equal dimension. In cold weather, with a high building, — and all buildings are more or less high, — the labor to be performed by any ventilating appliance in inducing a flow of air is materially reduced by the ascensive force of the columns of hot air in the building. As the weather becomes warmer, more and more motive power is demanded to impel the current, but whatever motive power be expended, the movement of any quantity of air will cost in motive power as the square of the velocity. The supposition of any change in sectional areas (omitting some frictional considerations), which shall reduce them below the area accepted as the least at the fan, admits of a reduction of the fan itself to conform.

A thoroughly arranged ventilating apparatus calls for distributed removal of air as positively as it does for distributed supply, and for complete efficiency all flues and branches of efflux should have, after providing the branches, similar baffling mouths to those described at mouth of entry, 1.4 times the area of the supply flues and branches.

With a forced ventilation, these flues should not have that compensation in reduced area, as they become high, which is essential to self-acting hot-air shafts. The condition of ventilation assumed supposes the expulsion of larger quantities of air, as the relative temperature inside and out becomes more equal, and at the point of equality the value of the height of the building as a shaft becomes nothing.

This large size of flues of efflux opens another source of trouble. It is almost indispensable that all the eduction flues shall be gathered into one single main flue, with judicious arrangement of the branches at their points of junction, so that they shall *direct* themselves into the general current of effluent air, and entirely and completely fill the great flue or shaft, thus preventing any eddies or back currents from establishing themselves, from room to room, from one part of a room to another, or worse yet, from the outer air down one side of a main shaft and up the other. With numerous ventilating flues or chimneys to open fireplaces in any one building, whether supplied with air by forced ventilation, or by any other ventilation, or if unsupplied with air altogether, but merely furnished with *ventilating flues*, or yet again, where numerous chimneys only exist, *the chance for a down draught* for some of them goes beyond the theory of chances, and becomes a certainty.

At all events, for a hall, the ventilating branches must be gathered into one general eduction shaft, while it may be possible for separate rooms to have separate, independent ventilating flues, with a little possibility of most of them working the right way, if the weather is not very cold.

A few figures of the proportions of steam-heating apparatus, in combination with ventilating, may be given. In most buildings to be ventilated, as halls, there will be found rooms and passages whose requirements in occupancy will demand a much less liberal supply of air than the halls or session-rooms themselves.

The quantity of air-supply to such buildings will be derived from two systems, whilst additional heating capability will be required from a third system. The system dependent upon ventilation of session, audience or largely occupied rooms has been discussed already, but the least quantity for occasionally occupied rooms is much in excess of what is needed, where the heated air is made merely the vehicle for transporting heat to a room to be warmed. The temperature of currents for ventilation solely can scarcely exceed 70 to 80 degrees in the coldest weather in the most exposed hall, while rooms warmed more economically with smaller quantities of air, may have hot-air currents of perhaps 110 degrees from steam-heated surfaces. In the second case, the volume of air requisite will be found by deciding on the extent of heating surface for a given room of given exposure of outer wall, and position in the building. This extent of heating surface may vary from one square foot to 40 cubic feet of space in the room, to one square foot to 120 cubic feet of space in the room: the latter value representing a room of ordinary living size, with the least usual wall or window surface, sheltered from cold winds, and in the second story of a warmed building; while the former value is that of the exceptional case of great exposure, or of situation on the ground floor of the building. When an allowance for these circumstances has been made, and the quantity of heating surface needed for heating any room by indirect heating (as it is termed) has been reached, it may be accepted that three cubic feet of air per minute must be given to each square foot of heating surface, as the greatest quantity when the thermometer is at zero, at such time as the least supply for ventilation is supposed. A square foot of steam-heating surface, with steam at 30 to 40 pounds pressure may be taken, *if well exposed*, to be capable of heating three cubic feet of air from zero to 100 degrees, or five cubic feet of air from 50 degrees to 70 degrees (or 80 degrees) in a minute.

It will be noticed that the heating capabilities of surfaces is referred to the cubic space in the building. The great loss or transfer of heat in any building takes place at the windows, so great that the computation might almost be confined to their surface as a unit to estimate on, and the surface of the walls or the cubic contents of the rooms be neglected. But, on the other hand, it is the *exposure* of the window which becomes of most account, and that has to be allowed for by judgment, and not by estimate, and with *exposure* a wall may become, if thin or thick, a material element in consideration.

Finally, the windows do bear a definite proportion to cubic space, or, if they do not bear the usual proportion, they may be *allowed* for, until the skill in guessing comes back to a guess based on cubic contents, as equally valid with one based on window surface.

The third system of steam heating which finds examples in all large buildings — in passages, at or near doorways, or invariably somewhere — is direct heating by coils placed in the rooms to be heated. For this method there is demanded one square foot of heating surface for each 80 cubic feet of space within the walls of an exposed room, or of a room where the heating is demanded at short notice, — as in an office which is allowed to become cold at night, — while one square foot of direct heating surface is ample to warm 200 cubic feet of space continuously, without intermission day or night. Special demands to heat doorways and open passages must be estimated on special grounds.

For heating in chambers with indirect heating (ventilation) box coils, as they are denominated, are best, while for office heating, vertical coils are decidedly preferable, although their surface is not so effective as that of horizontal pipe coils by about 20 per cent.

The main pipes for steam and return connections, by branch or direct mains to each cluster, coil or radiator, should have the equivalent of one circular inch of sectional area for steam (or flow) connections (equal to one-inch steam-pipe nearly) for every 500 square feet of effective steam surface, augmented or enlarged 0.0025 ($\frac{1}{400}$) times for each foot from the point of first distribution or branch from the main. The condense water or return connection will follow the same rule, with the equivalent of one-half a circular inch for the same surface (equal to a $\frac{3}{4}$-inch pipe nearly). The aggregated area of great mains need not be so large as would follow from aggregating the branches, but should be increased in size up to the point of any branch, as if the enlargement of that branch, for instance, occurred at the point of branching, and not at the coil or heating surface. This rule will, if carefully read, prove easy to apply.

Flow mains should rise to some point (where they can be trapped or drained), vertically, and then have a descent of a $\frac{1}{2}$-inch in 10 feet, regularly, to the end. If circumstances do not allow this, steps of vertical rises, well trapped, should be succeeded by lines of descending grade. The return main should have a corresponding fall toward the boiler, or other condense water recipient.

Boilers of the common tubular form require about one square foot of

boiler surface (reckoning all the surface, of whatever kind, exposed to the fire or to the gases of combustion, between the grate and the boiler chimney) to each 9 square feet of heating surface in coils or radiators.

The grates of such boilers should have one square foot of surface to about 30 square feet of boiler-heating surface. These ratios give one square foot of grate to 270 of radiating surface.

The chimney flues for the boilers (the stack) demand a sectional area from one-tenth of the grate surface, for chimneys of 50 feet high, to one-twelfth of the grate surface for chimneys of 100 feet high. These last dimensions are smaller than customary, but sufficiently large if no further requirement will ever be put on the apparatus.

The maximum quantity of coal to be consumed on these grates will not exceed 8 pounds per square foot of grate per hour, while the average quantity will not be over 20 to 30 pounds of coal per square foot of grate in 24 hours for 6 months of a year. A fan delivering 20,000 to 40,000 cubic feet of air per minute, will demand from 20 to 60 pounds of coal per hour to supply steam, as a rough estimate.

In planning boilers, it is usual to allow one extra boiler for contingencies. There is no necessity to estimate on the supply of steam for the power needed to impel the fan, where buildings are warmed and ventilated, as the exhaust steam of the engine should be utilized for heating purposes, and little extra steam is demanded for the purpose of driving the fan, so little, that the quantity may be neglected, in the total of allowances for successful warming.

Further discussion might be had into the mechanical details, constructively, or as to either their ratios to the great units of individuals to be supplied with air for ventilation, or of cubic space in buildings, of some possible interest to the construction of apparatus; but my purpose has been only to give such figures and data as are indispensable for arranging the ventilation of halls of audience. Every word of superfluous description, and each extra figure, has been carefully eliminated with the sole view of making this information complete in its ostensible direction. The paper, however, cannot properly be concluded except by calling attention to some requirements that seem not to have heretofore been adverted to by other writers, but which really control the working of any apparatus, for either warming or ventilating, or both, and which call for modifications in arrangement and construction, almost amounting to a novel system.

The temperature of steam-heated surfaces, for steam of such pressure as is usually carried in heating apparatuses, where the boilers furnish steam for running the fan engine, that is, at 40 to 60 pounds pressure, will run from 290 degrees to 310 degrees; and these temperatures are practically uncontrollable whenever the steam is admitted to any coil or radiator; so that the external surface of the coil or radiator in air is sensibly the same, 290 degrees to 310 degrees. Some slight but unreliable reduction of temperature in the steam may be had by throttling the supply-pipe, but this method becomes especially unreliable when the condense water is returned, without trapping, at the same pressure, to the boiler. Coils give off heat determinately until the last moment of being shut off. They fill with water, and become very noisy with water hammers, when a small volume of steam in some way is interposed between two columns of cooled water that instantaneously condenses it and forms a vacuum, bringing such columns into solid contact with each other. In exposed places throttled coils freeze up. The nicest adjustment may secure the end of lower temperatures of surfaces, and corresponding lower temperatures of air currrents passing them; or of desired constant temperature of air current, obtained by giving less heat to a warmer entering air; but the least change of boiler pressure disturbs it all; in a moment the coil is virulently active with heat, or obstinately passive by water clogging.

There are two methods of meeting this difficulty. The first is the division of a coil into sections, so that one or more of the sections can be employed in heating, or be shut off at will.[1] Some person in control of the apparatus, or at least of the coil for heating, will thus have the means at his disposal to produce any wished for temperature, down to the temperature of the outer air. The second method is found in passing around the coil, unwarmed, such part of the current of entering air as will reduce or temper down that remainder of the current which is permitted to pass through the coil, and is heated by contact with the heated surfaces. A comparatively simple arrangement of the casing of the coil, with register or louvre (blind) valves, and some baffling contrivance to secure the admixture of the two currents, is the mechanism of this method, which, as a method, is nearly as efficient as the former one.[2] In one essential regard it is more efficient, that is, the by-passing method gives an instantaneous change of temperature of the air delivered in the rooms, while the sectional method calls for time to elapse until the closed-off sections shall have lost their heat, or the newly opened ones increased in temperature, before any effect is produced on the temperature of the air.

[1] In the heating apparatus constructed at the United States Capitol in 1855-56, this method was introduced by Mr. Nason, and the complete control of temperature, in cold weather, for any given supply of air in every room in the building, was given to the engineer or his assistants.

[2] This arrangement, which was suggested by Mr. Faber du Faur, was introduced in one instance at the United States Capitol in 1858, and was entirely successful in the attainment of its purpose.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE PRODUCE EXCHANGE, NEW YORK, N. Y. MR. C. B. ATWOOD, ARCHITECT, NEW YORK N. Y.

HOUSE FOR MR. OGDEN GOELET, CORNER FIFTH AVENUE AND FORTY-NINTH STREET, NEW YORK, N. Y. MR. E. H. KENDALL, ARCHITECT, NEW YORK, N. Y.

LETTER FROM NEW YORK.

THE EXHIBITION OF COMPETITIVE EMBROIDERIES.

NEW YORK, May 30, 1881.

AN exhibition of embroideries submitted in competition for prizes offered by the Decorative Art Society of New York has recently been held at the American Art Gallery. One large room was filled with the competitive work and with other examples of home art produced under the direction of the Society itself, and not included, therefore, in the competition. Another room was crowded with old embroideries of many sorts, loaned by various owners. In attempting to give some slight description of the clever work produced by our own artists, it must not be forgotten that I criticise only the decorative effect, the element that appeals to lovers of art in general. Into any discussion of the techniques of needlework I am quite incompetent to enter. Harmony of color, grace of line and motive, may be appreciated by all who care for such things in any shape. Stitches and methods and materials, however, must here be left to the imagination of such among my readers as are qualified to form trustworthy imaginings upon the subject.

Two prizes — of $500 and of $100 respectively — were offered for the best designs for *portières* or hangings of any sort; two — of $200 and of $50 — for the best designs for screens of not less than three panels; and a number of minor ones for the best needlework of various kinds and for color treatment. It was only required that colored drawings with details and sufficient directions for working should be submitted, though the committee desired, in order that the exhibition might be more attractive, that these should be accompanied if possible by completed work. In many cases this wish had been complied with, and the finished hangings sent in were, of course, a far more attractive feature in the eyes of the public than mere unexecuted designs, the beauty of which was chiefly potential.

The first prize for *portières* was awarded to Miss Caroline Townsend, of Albany. Her curtain was certainly one of the most striking things in the room, the only rivals that could in any way compete with it being some that were not included in the competition. It showed a panel of cream-colored satin on which was a vase formed by an applied piece of Oriental brocade. From this vase sprang an immense bouquet of roses of natural size and showing their natural colors, — unconventionalized in any way. The border was formed of fawn-colored plush applied in panels of various shapes. Upon the band which formed the top of the curtain were conventional "rose patterns" of colored plushes which repeated the tints of the embroidered flowers themselves. The only fault in the curtain, it seemed to me, was that the relative areas of the satin and the plush did not seem to have been quite nicely calculated. The satin panel was too small to take its place as the main fabric, and yet too large to subordinate itself to the plush as a surface "reserved" — if I may quote a term from ceramic decoration — to receive the decoration. If the panel had been made a little more important, and the plush bands at the bottom of the curtain had been treated with a little more simplicity, there could, it seems to me, have been little fault found with what was — with all possible criticisms taken into account — a most beautiful and most artistic piece of work, thoroughly original and remarkably successful in every way, especially when compared with what was possible to our designers and workwomen but a few years back. It is important to note that Miss Townsend combines both faculties, the creative and the executive, preparing her work after her own designs, and embroidering her flowers after water-color sketches made from nature. It was upon the execution of these flowers that the main interest of her curtain depended. Some found fault with them and with the way in which they had been placed in the design as being too naturalistic for "decorative" purposes. To me this does not seem a valid objection in very many cases where, in accordance with current theories, one hears it made. It certainly did not seem to me to be valid as applied to Miss Townsend's work. Her sense of color is very delicate and true, the soft crimsons and pinks and yellows and whites of the roses being harmonized with wonderful taste. The needlework proper, if I may express an opinion, was sufficiently bold and free to seem individual and artistic, yet it was by no means open to such objections on the score of usefulness and propriety as were brought against the work of Mrs. Holmes, — in what manner my readers will doubtless recollect.

The second prize for *portières* was bestowed upon a design submitted, without the completed work, by Mrs. L. F. Warren, — quite conventional in scheme and color, — not original at all but sufficiently agreeable in every way. The first reward for screens fell to the lot of Mr. George W. Maynard, the well-known artist. Here again there was no embroidered work to show the full effectiveness of the design. There were four panels, representing the Seasons, all cleverly drawn, of course, and showing a hint of what may be worked up into pretty color. It did not seem, however, as though the artist had infused any originality into his well-worn theme. The second

prize in this class was awarded to what was probably the worst specimen of taste and of needlework in the room, executed by Mrs. W. S. Hoyt. The announcement of its success was qualified, however, by the statement that the judges did not "indorse the *treatment* of the design," but should require the competitor to furnish drawings from which the motive might be executed in another manner. It was hard to see, even with this reservation borne in mind, why this screen had been rewarded, for the design in itself showed little beauty and no originality, being a rather "scrappy" and scattered adaptation of Japanese ideas. The treatment need not be described in detail, — even if any description could convey an idea of its bizarre and tawdry effect. I need only say that the vines and flowers of the pattern were in most places worked in a relief which was obtained by the application of stuffed birds and artificial blossoms. One would not take the trouble to condemn such a production were it not for the sad proof afforded thereby that in spite of all the missionary work attempted by our decorative art societies, there is still much that remains to be done by their means or in other ways. Many other designs were commended, or "highly commended," for color or design, or for both, — now with much reason and again with little. Those that were commended for "color treatment" — and this was especially the case with a drawing that took a special minor prize of $25 for excellence in this respect — had been kept within such modest limits of effort that failure had been hardly possible. A *portière* shown in its completed state by Miss Fenety seemed to many, however, to have deserved the second prize instead of the "high commendation" it received. It was in steel-gray plush decorated with a slender outline pattern in gold thread, and with broad bands of amber-colored stuff showing a Renaissance pattern in dull pinks and blues. It seemed to me one of the best things in the room, in color, in design, and in execution; and it was remarkable especially for one excellence, the absence of which gave an "amateurish," untrained look to so much of the work exhibited; that is, the design was not only well imagined but was good in line as used, — was well-balanced and "restful," so to say, in appearance. A large *portière* with Indian corn, very well imagined, suffered from the lack of these good line-effects in the composition. Two prizes for the best designs for bands or friezes fell respectively to Mrs. E. A. Carter and Mrs. Hasbrouck for work that was clever and capable if not very original or striking. Many of the drawings that were unrewarded showed very good points, though there were few that could have been considered quite successful in all ways. The prizes that were given for skill in needlework proper seemed to have been very well merited, especially in the case of an embroidered figure on satin executed by Miss Blackwell. The design was charming and the execution in accordance with the strictest canons of the embroiderer's art.

A large *portière*, also the handiwork of Mrs. W. S. Hoyt, attracted much attention. It was an imitation of old tapestry, with an elaborate background showing a landscape and a castle, and with figures more than half the size of life. The material had been first painted over and the design then emphasized by needlework. The color scheme was good and the general effect at a distance was nice, but seen near at hand the way the stitching had been introduced was disagreeable to the eye, and the figure drawing was always seen to be very bad indeed.

As I have said, some of the most beautiful embroideries in the room were not entered for competition, having been executed in the rooms of the Decorative Art Society itself. Those from designs by Mr. Samuel Colman were very fine. One was in yellow of various shades, the pattern being an elaborate adaptation of a Persian motive. Beautiful as were these pieces, however, they lacked one element of interest that was present in Miss Townsend's curtain, — the designing and the executing hand had not been the same.

The Loan Collection of antique embroideries included more than a hundred numbers, many of the pieces being of the greatest beauty and interest. The oldest piece was a bit of Italian work on linen dating from the fifteenth century. The eighteenth century was especially well represented by handiwork of very many sorts. Interesting and instructive as must have been these beautiful works to students in the same art, they were scarcely less interesting and instructive to the general observer. They showed how in artistic generations, if I may so express myself, the gift for appropriate and beautiful decoration displayed itself in every kind of handiwork. For these beautiful things were not selected specimens that had been called forth by competitions, or preserved on account of rare excellence. They were simply such articles of use — table-covers, towels, bed-spreads, and ecclesiastical vestments — as had happened to survive from amid the multitudinous similar productions of the years that gave them birth.

M. G. van Rensselaer.

ST. JOHN'S TOWER, CHESTER.

The following account of this tower has been furnished by Mr. Cooper Scott to the local papers: —

The tower, which now presents such a touching and melancholy sight, appears to have been built about the beginning of the sixteenth century, and to have been unfortunate from its commencement, for it is recorded that in the year 1572, a great portion of the steeple fell in, and in 1574 two-fourths of the whole steeple from top to bottom fell upon the west end of the church and broke down a great part of it. These two sides were rebuilt, and are the two which now remain standing. The crack on the east side, so well known to all who are familiar with the tower, was probably of very ancient date, and little change had taken place in it for many years. The parish books contain an account of money to the amount of £800 or £900, spent upon the tower at the end of the last century; it was then that the new masonry was added to the top of it.

From some records which I have kept, I find that in December last, several large stones fell from one of the south-west buttresses upon the path which leads down to the Groves. This warning determined the churchwardens to take some steps for the preservation of life, and, if possible, for the preservation of the tower, and they accordingly sanctioned the employment of Mr. John L. Pearson, of London, who agreed to come down and examine and report upon the tower; he requested to be furnished with measurements and to have the foundations examined. Meantime, however, the bitter frost which we experienced in January had set in, and nothing could be done until some change in the weather took place; there can be little doubt but that to this frost we must attribute the final disturbing causes which have brought such a lamentable fall. Mr. Pearson paid his visit in February, but the measurements he required took some time to procure, and it was not until April 7 that his report was received. He directed, however, that in the mean time all loose stones should be removed from the face of the tower, or be secured with cement. This work was entrusted to Mr. Hughes, of Aldford, who, from a previous examination of the tower, made in 1871, was well acquainted with its features and character. The men, who were hoisted up in a cage whenever the weather permitted, examined almost every stone of the tower; some of them were removed, and many more were rendered secure with cement. They reported that the condition of the masonry was deplorable in the extreme, and that satisfactory repair seemed almost impossible.

It was not, however, until about six weeks ago that symptoms of an alarming nature began to manifest themselves; even to casual observers the crack on the east side appeared to widen, but the mischief was in reality going on in the buttresses at the north-east corner; the bottom of one of these began to fall away as soon as the frost disappeared, and as the support of the buttress failed its weight was thrown on to the tower. It was well tied in about half-way up, and it hung with a dead weight upon the north wall of the tower, and gradually pulled it out. Nothing could be done to stop this work of destruction: to prop the buttress up was dangerous, and might have brought about its immediate downfall; to raise a scaffold with a view to its removal was equally dangerous, so that we could only wait and hope that no serious accident might occur. On April 1, I accompanied one of the masons on his journey up the tower in the cage; he showed me some little cracks on the north wall about a sixteenth of an inch wide, and these he told me were the real causes of anxiety, as they were gradually widening. The buttress itself was so eaten away by the weather that light could be seen through it in some places, and large cavities extended behind it deep into the tower.

The apparently trifling cracks, which were in reality the symptoms of impending disaster, were carefully watched by Mr. Hughes, and on Thursday last he called on the churchwardens and warned them that it was not safe for people to pass through the porch. This was at once boarded off, and notices printed that for the present the congregation would enter by the south and transept doors. At ten o'clock that night the tower fell. I can describe the noise made by it only in this way: it was as though a metal wagon of enormous weight, with loose wheels, was being dragged at a tremendous rate over a rough granite pavement; I gather that this noise was caused by the fall of the stone upon the roof of the porch, which is, alas! wholly destroyed — an irreparable loss. I understand that by some a sullen clangor of the bells was also heard.

At this time a considerable portion of the belfry windows on the ruined side remained, and the roof had not fallen in, but at four o'clock on the morning of Good Friday a further fall took place, and the ruin now remains as this fall left it.

I need not say that we feel the loss of this noble tower as a national one, but I trust that we shall be able to rear it again in much of its former beauty, and in much more than its former strength.

It was in 1581, just three hundred years ago, that the parishioners of St. John's, having obtained a grant of the church from Queen Elizabeth, repaired and preserved the portion which now remains to us, and which was restored about twenty years ago. I hope that the spirit which marked that time is not dead nor lacking now.

Of course we must look for help from the city and county, and even from the country. There are few who have ever visited Chester who would not be willing to help in restoring a feature which has ever been one of the greatest interest.

We cannot be sufficiently thankful that our beautiful church has been spared; not even a slate is broken. This, together with the fact that no lives have been lost, is a source of the greatest comfort. The bells yet remain suspended in the belfry, and may possibly be rescued.

The following extract from the architect's report may be of interest to some readers: — "The failures all over the tower, apart from the mere decay of the surface of the masonry, can, I fear, be attributed only to the yielding of the core of the walls. The inside surface of the walls appears to be in a very perfect state, the masonry being in regular courses; but I am more than inclined to believe that the space between the inside and outside surfaces is composed of loose rubble-stones put in at random with no bond, and probably with no proper mortar, and if such be the case there can be no doubt, when

the external surfaces of the walls became seriously decayed, and the joints were washed out, that rain and snow penetrated far into these walls; and it is not difficult to understand that, under such circumstances, the soft and soily mortar would give way, and that then the rubble-work would compress, and in doing so would exert a very considerable pressure upon the outer masonry, and cause it to crack and bulge out in the way we now see it. The failure of the north-east buttress — which at the present moment is alarming — appears to be entirely due to this cause. The severe winter we have had has done much to hasten the movement, which, I doubt not, has been going on for many years."

WALL ANCHORS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I venture heartily to commend to young architects and to draughtsmen your excellent papers on Building Superintendence. Men older in the profession may also read them, sometimes with profit to themselves, and sometimes, if they care to make public their comments or objections, with advantage to the profession in general. Thus, I observe that the paper printed in your last number carefully provides for the protection of the bearing-walls against the leverage exercised by falling joists in case of fire by the usual bevelling of the ends of the joists; but afterwards, in instructing the young superintendent as to the use and application of wall anchors, the paper requires him to spike the iron to the top of the joist, and to build into the masonry its outer end, properly turned up for the purpose. Such a method of construction would apparently endanger the walls in the case of the falling of the floor, nearly as much as the neglect to bevel the wall-end of the joist. I was taught not to spike the anchor-iron to the joist, but to turn its inner end a couple of inches down into the joist. The nailing of the flooring over the iron sufficiently secures it to its position. In case of the falling of the floor the timber can drop down from its anchorage, leaving the iron in the wall. I would add that, except in case of thick walls, it is better to carry the iron quite through the masonry, and finish it with a visible anchor on the outside face, thus taking its due and honorable part in the architectural effect of the building.

Respectfully yours, H. V. B.

[H. V. B.'s criticism is a just one, although the effect of the falling of a floor in which every fifth beam is anchored, tending to draw the wall *inward*, is very different from that caused by the fall of a whole tier of powerful levers, acting to throw it outward. Perhaps a desire to insist upon the necessity of anchoring the wall and floor thoroughly together by some means may have led us to overlook the improvements on the ordinary way, of which H. V. B.'s device is certainly one. In New York, the law requires that wall anchors shall be spiked to the *sides* of the beams, which is better than to nail them on top. The best mode of all, however, is that used in mill-building, and described by Mr. Edward Atkinson in various papers in this journal, by which the anchor lies *beneath* the beam, turning up into a notch cut in the under side close to the wall. It cannot lose its grasp by shrinkage or settlement in this position, and if burned off by fire, the beam simply rolls out of its place without even a jar. — THE WRITER OF "BUILDING SUPERINTENDENCE."]

THE TEXAS STATE-HOUSE.

NEW YORK, 6 June, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Mr. Le Brun's correction in your last issue of an error in regard to the cost of one of the public buildings of which he was the architect reminds me that I ought before this to have given you a piece of information which came to me ten or twelve days ago, and which will probably be interesting to most of your readers.

Mr. Le Brun has lately returned from Texas, his services as expert and adviser in the examination and selection of the various designs sent in competition for the proposed state-house at Austin, the seat of government of that State, having been engaged by the Governor of the State and the Board of Capitol Commissioners.

Herein we find the authorities of the Lone Star State evincing practical wisdom of a higher type than that hitherto found in those of sister States, boasting much older acquisitions in art and much ampler means eligible for securing them (except perhaps in one or two cases similarly involving architectural design, and even then the thing was managed, if I remember rightly, in a somewhat half-hearted and unsatisfactory manner). These modest and sensible men of affairs, who evidently realize that the activities and successes of political and commercial life are not apt to leave leisure for the prolonged or appreciative study of mechanical science and artistic design, as applied to building operations, set an example which the building committees of other important structures in contemplation may well follow with comfort to themselves and very great advantage to the community. Architects of long practice and experience, versed alike in statical science and artistic knowledge, are not now as scarce as they were; while the younger generation is growing up with ever-increasing advantages of architectural training, and in matters pertaining to our pursuit, as in all others, wisdom is justified of her children. Yours truly, A. J. BLOOR.

INSURANCE AGAINST TORNADOES. — During the last session of the Illinois Legislature, Mr. Sumner introduced a bill which became a law, amending the act in regard to the incorporation of fire, marine, and inland-navigation insurance companies by authorizing such corporations to insure against loss by tornadoes, in addition to loss by fire, lightning, or either or any of said causes.

NOTES AND CLIPPINGS.

FAURE'S SECONDARY BATTERY. — Considerable interest has lately been aroused by the announcement that a Paris electrician has discovered a new method of storing electricity. The invention is really a new secondary battery, or, rather, an improvement on the well-known secondary battery of M. Planté. A secondary battery, it is hardly needful to say, is one which is charged by the action of a battery, or machine, and then gives out this charge as required. In the Planté battery the electrodes are of lead, and they are immersed in acidulated water. In M. Faure's battery the two lead plates of the couple are each covered with minium (red lead) or another insoluble oxide of lead, then enclosed in felt, kept in place by lead rivets. These two electrodes are then put side by side in a vessel of acidulated water. If they are very long, they are rolled up like those of M. Planté. Thus constructed, the couple is charged by causing an electric current to traverse it, when the red lead is reduced to the state of peroxide on the positive electrode and lead upon the negative electrode. When the whole mass has been thus electrolyzed the couple is ready for discharging. On being discharged again, the reduced lead is oxidized, and the peroxide is reduced until the couple becomes inert. It is then ready for a new charge of electricity. It is stated that a quantity of energy can be stored capable of performing a horse-power of external work during an hour in a Faure battery of seventy-five kilograms in weight. A correspondent of the *Times*, "F. L. R. S.," has since given an account of a meeting of the Société d'Encouragement pour l'Industrie, in Paris, presided over by M. J. B. Dumas, at which M. Faure's battery was exhibited, and the following somewhat enthusiastic description of a box containing four batteries, which was taken by the writer from Paris to Glasgow: —

On Monday, 9th inst., in Paris, a Faure battery, or *pile secondaire*, was charged with the electric fluid direct from the ordinary Grove battery, and in my presence. It may be more economically done from a Gramme or Siemens machine. The receptacle consisted of four Faure batteries, each about five inches diameter and ten inches high, forming a cylindrical leaden vessel, and containing alternate sheets of metallic lead and minium wrapped in felt and rolled into a spiral, wetted with acidulated water, and the whole placed in a square wooden box, measuring about one cubic foot, and weighing some seventy-five pounds. This was protected by a loose wooden cover, through which the electrodes (in lead) protruded, and were flattened down for convenience of transport. This box of "electric energy" was handed to me by M. Faure, at my request, with the object of submitting it for examination and measurement to our eminent electrician, Sir William Thomson, F. R. S., at the University of Glasgow. I had the box by me all through the journey from Paris on Tuesday night, including a five hours' delay at Calais. I arrived at Charing-cross at 11 A. M. on Wednesday, after running the gauntlet of customs and police authorities, who suspiciously looked askance, and seemed to doubt my statement that my box only held "condensed lightning," and contained no infernal machine or new explosive destined to illustrate some diabolical Socialistic tragedy. From time to time on the journey I tested the force of the discharge, and found it to have well maintained its energy. From London to Glasgow required only another ten hours, and finally, in about seventy-two hours from the time of charging in Paris, I had the satisfaction of presenting to Sir William Thomson M. Faure's rare offering of a "box of electricity," intact and potent, holding by measurement within that small space of one cubic foot a power equivalent to nearly one million of foot-pounds! This wonderful box is now deposited in the laboratory of the Glasgow University, under the vigilant eye of its director, and is being submitted to a series of tests and measurements.

CONDITION OF THE SAHARA. — Dr. Lenz, in a recent lecture at Paris on his journey from Morocco to Timbuctoo, has been correcting some of the generally received notions as to the condition of the Sahara. It really forms a great plateau, about eleven hundred feet above the level of the Atlantic. In no part of this plateau is there found that depression below the level of the ocean which is shown on the maps of certain geographers, and which has led to wild schemes of converting the Sahara into a great inland sea. Moreover, the Sahara is not one dead sandy level, but is really greatly varied in its aspect. Rocks are succeeded by sandy plains, here and there are oases covered with alfa grass and stagnant shallow sheets of water. The fresh-water fossils, which are met with in many parts, show that the Sahara is not the bottom of a dried-up sea. Again, the temperature is not nearly so hot as might be expected. In short, the Sahara is not so bad as it has been called; wild beasts are rare, and the most formidable enemies to be met with are the Touraeg tribes, who, according to report, recently massacred the French Trans-Saharan expedition. As to Timbuctoo, Dr. Lenz found he had to traverse a great space covered with ruins before he could reach the inhabited part. There are now only twenty thousand inhabitants.

BURSTING POWER OF ICE. — Ed. Hagenbach experimented, during the past severe winter, upon the bursting force exerted in the expansion of water when freezing. Two interesting experiments were made with cast-iron hand grenades. The outer diameter was 15 centimetres (5.9 inches), the inner diameter 12.8 centimetres (5.04 inches). The shells were filled with water, closed with a screwed iron plug, and exposed to the cold. Both shells were broken, and a curved thread of ice was projected, by means of an ice column, from the upper surface. One of the plugs was evidently thrown out with great violence, and to such a distance that it could not be found. The curvature in that case was bent upward. — *Wiedemann's Annalen.*

PROPHETS WITHOUT HONOR — The old proverb is illustrated by the inventors of thermometers. In England they use Fahrenheit's thermometer, the invention of a German. In Germany the thermometer of Reaumur, a Frenchman, is still the most common. In France and in many other countries the Centigrade thermometer, which was invented by the Swede Celsius, is universally adopted. — *Verkehrszeitung.*

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.*]

242,099. Lock. — Alonzo S. Appleby, Ash Grove, Nev.

242,114. Extension-Ladder. — John L. Crafts, Somerville, Mass.

242,121. Drying Apparatus. — John W. Evans, Cleveland, O.

242,144. Hoisting Apparatus. — James M. French, Bowling Green, Ky.

242,150. Wrench. — Seth E. Hurlbut, Chicago, Ill.

242,154. Weather-Strip. — Edmund Randolph, Springfield, Ill.

242,160. Wrench. — Charles Scholz, Dayton, O.

242,169. Method of Ventilating Sewers and Drains. — Theodore S. Very, Boston, Mass.

242,180. Window-Screen. — Warren S. Bartle, and John E. Stuart, Newark, N. Y.

242,236. Sewer-Trap. — Pedro Torelli, Benicia, Cal.

242,242 Wood-Turning Lathe. — Charles W. Wilder, Fitchburg, Mass.

242,243. Fire Hydrant. — William L. Adams, Pottsville, Pa.

242,247. Reversible Latch. — James P. Bailey, Alleghany, Pa.

242,249. Wood-Bending Machine. — Ludwig Barthelmes, Astoria, N. Y.

242,261. Reversible Latch. — John Broughton, Brooklyn, N. Y.

242,264. Ventilating Buildings, etc. — Richard Bullymore, Buffalo, N. Y.

242,287. Water-Closet. — Abraham Edwards, Philadelphia, Pa.

242,291. Adjustable Eaves-Trough Box. — Hiram G. Filson, New Cumberland, W. Va.

242,298. Compound for Removing Paint. — Herman Gasser, Platteville, Wis.

242,300. Steam or Hot-Water Radiator. — Samuel F. Gold, Englewood, N. J.

242,326. Paint-Can. — Herbert H. Hall, Cleveland, Ohio.

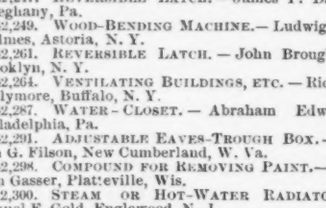
242,329. Inlet or Trap for Sewers. — Arthur J. Kelly, Kansas City, Mo.

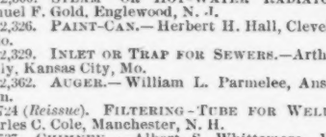
242,362. Auger. — William L. Parmelee, Ansonia, Conn.

2,724 (*Reissue*). Filtering-Tube for Wells. — Charles C. Cole, Manchester, N. H.

9,737. Chimney. — Albert S. Whittemore, Willimantic, Conn.

237,736. Overflow Apparatus for Cesspools. — George W. Alexander, Baltimore, Md. This invention relates to means for deodorizing and disinfecting the overflow-water from cesspools, in order that the same may be discharged to a sewer. The cesspool has an overflow-pipe with a strainer at the inner end, which extends to the sewer, and in this overflow-pipe is a deodorizing and disiufecting trap, which separates from the overflow-water the offensive and injurious matter contained in it. A is the cesspool. B is the overflow-pipe, having a strainer at its inner end to





prevent the entrance to the pipe of the larger solid matter. C is a well, to which the outer end of the overflow-pipe is connected. The well C has a cover, *a*, accessible from the surface of the ground; and a removable basket, *b*, containing charcoal or other disinfecting and deodorizing material, is placed in the well in such position as to receive the overflow-water as it enters. The overflow-water, after percolating through the charcoal, is discharged through the pipe D to the sewer E. The inner end of D is bent downward, so as to be below the main part of the pipe, and form a trap to prevent noxious gases passing from the sewer when the water in the well is below the upper inner surface of the pipe D, as shown in the drawings.

SUMMARY OF THE WEEK.

Baltimore.

Building Permits. — Twenty-four building permits have been issued since the last report, the following only being of sufficient importance to be mentioned.

BUILDING INTELLIGENCE.

Rev. William H. Starr, two-st'y brick building (chapel), n w cor. Townsend St. and Mt. Royal Ave., 40' x 90'.

Wm. Wiltgriefe, two-st'y brick building in rear of 229 Broadway, between Aliceanne and Lancaster Sts.

Jno. C. Weaver, three-st'y brick building, n w cor. Hanover and Winder Sts.

Jos. King, three-st'y brick building, n e cor. Charles and Biddle Sts.

Samuel Bratt, extend present factory 98 feet on York St., near Johnson St.

Church. — Mr. Chas. L. Carson has been appointed architect for the new Strawbridge M. E. Church, to be built on the corner of Wilson St. and Park Ave., to be 130' front by 77' 6" deep, of Falls' Road stone and Scotch (red) sandstone; cost, about $20,000.

Houses. — Mr. Jno. Hubner is building 13 three-st'y dwells. on Druid Hill Ave., commencing on the corner of Gold St. They are 16' x 60', three stories high, of pressed brick and marble finish.

Mr. Joseph Hampson is building 18 three-st'y dwells. on Druid Hill Ave., near Presstman St., 18' x 100', of pressed brick with marble finish.

Office-Building. — Work has been commenced on the building for the Equitable Gas-light Company, situated on the corner of Bayard and South Paca Streets, a large force being employed.

Wages. — The house painters have demanded and in many instances are receiving an advance of fifty cents per day, making $2.50.

Boston.

Building Permits. — *Brick.* — *Marlborough St.*, between Gloucester St. and West Chester Park, for James M. Hubbard, dwell., 20' x 47', four stories; Woodbury & Leighton, builders.

Huntington Ave., near West Newton St., for J. B. Thayer and G. Bradford, trustees, 2 dwells., 25' x 120', and dwell., 25' 6" x 52', four stories; Robert R. Mayers, builder.

Sawyer St., No. 53, for Rebecca J. Spencely, dwell., 20' x 36', three stories; C. J. Spencely, builder.

Washington St., Nos. 367 *and* 369, for estate of John Boyle, building, 23' x 63', four stories; Thos. J. Whidden, builder.

East First St., near O St., for Walworth Manufacturing Company, storage-building, 38' x 86', two stories; foundry and forge-shop, 60' x 362', one-st'y.

Margaret St., Nos. 7 *and* 9, for David Flynn, tenement-house, 24' x 48', four stories; Donahue Bros., builders.

Wood. — *Vinton St., Nos.* 8 *and* 10, near Dorchester St., for Michael Downes, 2 dwells., 22' 6" x 38', three stories; Wm. H. Lee, builder.

Allston St., near Summit Ave., for N. E. Chase, dwell., 30' x 36', two stories.

Alban St., near Ashmont St., for Wm. C. Wendté, dwell., 35' x 46', two stories.

Holmes Pl., off Mill St., for Elizabeth M. Bentham, dwell., 14' x 27'; Ed. G. Bentham, builder.

Romsey St., cor. Dorchester Ave., for Ezra H. Baker, dwell., 26' x 46', two stories; McNeil Bros., builders.

K St., No. 197, for M. W. Lyman, dwell., 21' x 32', two stories.

East Seventh St., No. 552, for Geo. Smith, dwell., 21' x 34', two stories; David A. Berry, builder.

Holmes Pl., off Mill St., for Frank L. Nichols, dwell., 18' x 24'.

East Sixth St., cor. I St., for Locke & Nolan, 4 dwells., 19' x 31', two stories; Locke & Nolan, builders.

Brooklyn.

Building Permits. — *Twelfth St.*, s s, 220' 6" w Seventh Ave., 2 three-st'y brick dwells.; cost, $14,000; owner, architect, and builder, J. H. O'Rourke, 78 Douglass St.

St. Marks Ave., s s, 150' w Carlton Ave., 5 three-st'y brownstone dwells.; cost, each $9,000; owner and builder, John Donovan, 109 St. Marks Ave.; architect, M. J. Morrill.

Sixth Ave., s e cor. Prospect Place, three-st'y brownstone dwell.; cost, $12,000; owner, F. E. Robinson, 350 Ninth St.; architect, W. J. Merritt; builder, Charles Lang.

Sterling Pl., n s, 173' w Seventh Ave., two-st'y brick stable; cost, $12,000; owner, A. L. Rogers, 248 Adams St.; architect, R. Dixon; builders, P. Carlin & Son and Hartt & Boyd.

Sackett St., s s, 309' w Seventh Ave., three-st'y brick dwell.; cost, $12,000; owner, A. T. Bordy, 141 Sixth Ave.; architect, C. T. Burdett.

Twenty-third St., n s, 100' e Third Ave., three-st'y brick store and tenement; cost, $6,000; owner, John Schlegel, 132 Twenty-second St.; architect, Julius Boekell.

Atlantic Ave., s e cor. Brooklyn Ave., three-st'y brownstone store and dwell.; cost, $7,000; owner, Mrs. Simpson, Pacific St.; architect, Wm. B. Ditmars; builder, J. Herd.

Cumberland St., e s, between Willoughby and DeKalb Aves., four-st'y brownstone dwell.; owner, John Antrim; mason, T. Gibbons.

Jefferson St., s s, between Bedford and Franklin Aves., 3 three-st'y brownstone flats; owners and