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CONTENTS.

THE clever article on the Capitol of New York, in the December *Scribner's*, by Mr. Montgomery Schuyler, has recalled the controversy of three years ago over the architecture of that building. What it says about this is of interest, because it shows how the most intelligent laymen, and naturally then the general public, may fail to allow for the real professional point of view of architects in such a controversy as this and others, of which there are many, that turn on like considerations. As for the old quarrel itself there is not much to be said. The protest of the architects against the change in the original design seemed to us intemperate and hasty, — as we said at the time, with some offence to our friends, — and it is not strange that it brought some disparagement of the profession with the public, or provoked keen retorts from persons who were quicker to resent its tone than to recognize the ideas that lay behind it. The question was taken up on all sides by the defenders of the revised designs first presented by the Advisory Board, and the opposition of their critics was received as if it had been simply a question between two styles, or of purity of style. It was really a question of design, and of such a juxtaposition of visibly discordant styles as made a conspicuous dislocation of the design at half height. Now, if there is anything for which American architects to-day are notable, it is not for purity of style; moreover, as Mr. Schuyler well says, "at most, fidelity to style is but a means to artistic quality." But the first of purely artistic qualities is unity, and it is for its friendliness to artistic unity that purity of style is intelligently valued, and for its hostility to unity that a jumble of styles is intelligently condemned. Different styles may indeed be mingled in the same design so as to produce unity in the result, but this requires both unusual skill and unusual pains. For most designers it is far safer to adhere with considerable steadiness to one style, for the reason that a style is itself the result of the prolonged endeavors of many successive designers to adjust a series of forms to artistic unity. The more completely each of two styles is at one with itself, the more will their discordance be emphasized when they are juxtaposed. We will not claim purity of style for the original design of the Capitol at Albany, and no one will claim it for the design of the Advisory Board; and this was not the question, but they were consistent enough, each with itself, to be in very visible conflict with each other.

IN the case of the Albany Capitol, then, the question of style was prominent, simply because it was the mask under which the greater question of unity presented itself. If it had been raised for its own sake, whatever opposition individuals might have made, there would have been no general protest. The opposition that might have been raised would probably have failed of effect, if the design of the Advisory Board had shown a careful and skilful effort to fuse and adjust the different styles, so as to give unity of effect. "If it could not be made pure," says Mr. Schuyler, "it seems praiseworthy to attempt making it at least peaceable." It would have seemed so, certainly, and the justification of the opposition of the whole profession was that, in the new design, as first presented, no such attempt was made. It was not an effort for peace, but a plain declaration of war. The upper half of the exterior bore written upon it the expression of open hostility to the lower half. It was more than this; for the absolute denial in the upper half of all consideration for the lower savored of ostentatious contempt, and, in view of the close relation of the different stories, had the disagreeable effect of a conspicuous family quarrel. It was a *scandalum magnatum*, a public washing of dirty linen. No excellence of the design of the upper stories could overcome the ill effect of this discord, or make it, we think, anything less than intolerable. It was only natural, if artists who believed that unity of effect was the first essential of a work of art had even preferred the carrying out of the first design, with its monotony and its feebleness of detail, to this discordant union, had that been the only alternative. But it was not the only alternative. Every architect knew that all the good qualities which were shown in the new design could be secured as well in another, which, if not identical in style, should at least fairly harmonize with the older work; that the transition from the old to the new could be accomplished without the violent jolt which was proposed. It may be said, then, without any reference to the personal aspects of the controversy, that it was natural, and, considering the importance and publicity of the matter, it was reasonable, that whoever had an interest in it, and had a right to raise his voice in a thing of public concern, should make his appeal for a different solution of the difficulty.

THE wisdom of the change, and the usefulness, though not the manner, of the opposition that was made to the proposed design, are amply justified by the result. The New York legislature passed a resolution that the exterior of the building should be carried out, as it was begun, in Italian Renaissance. This restriction, which has been not too rigorously interpreted, but sufficiently heeded to avoid undue violence of transition, made it easier for the architects to recede from an untenable position, and has given them an opportunity to recast their design at leisure. There is no question, as we said once before, that the building has gained greatly by the change of architects: it is unquestionable that it has gained as greatly by the change from the first modified design. For, be it remembered, the design of the new stories as they are carried out differs more absolutely from that against which the opposition was made than it does from the intention of the first designer. It adds to the good qualities of the design of the Advisory Board those which are due to a longer study of the problem, and a considerate endeavor to unite the new and the old without a jar, seconded by the harmonizing influence of a resemblance in style which is sufficient to avoid a shock to a catholic mind. As for the shibboleth of style, to which, as Mr. Schuyler hints, the legislature of New York bowed without understanding its meaning, with not too great a veneration for it we may say that for once it seems to have done good service. Doubtless the legislators did vote for the Italian Renaissance without knowing what it meant, but after all it served them as a formula which they could use to secure a good end, if they did not understand the means to it. In truth, when unskilled persons meddle so much in questions of art as they do among us, we may be thankful if the name of a style saves them from losing their way altogether, as it sometimes does. And in the matter of the Albany Capitol it seems at least to have helped the people of New York to a tolerably good solution of an awkward complication.

THE energy of M. de Lesseps seems likely to be the spur to drive not only his own countrymen, but ours, to the work of building an inter-oceanic canal. The pity seems to be the danger that the activities which it sets in motion will be divided in the making of two canals, when one is enough, not only for the needs of commerce, but for the means which both countries could easily be persuaded to contribute to the project. M. de Lesseps, in spite, it is said, of some disappointment in the subscriptions to his company's stock, is bent on giving his enterprise the advantage of being the first on the field. He proposed to sail from France on last Saturday, and with so much assurance of carrying through his plan that he would take his family and establish himself at the Isthmus. He also carries two contractors who have worked with him on the Suez Canal, with the necessary apparatus to begin work at once. He has bought out from its owners the concession formerly granted for the Isthmus Canal, and has his resident engineer already there. He pro-

poses to solidify the general interest in his scheme by forming a commission of eminent engineers from various countries, among whom he hopes, we are told, to include General Totten, of the United States Engineer Corps, having been outbidden by the projectors of the Nicaragua scheme in his proposition to secure General Grant as honorary president of his company.

M. de Lesseps's last *Bulletin du Canal Interocéanique* was a sort of parting manifesto before setting out. In it he pays his respects to the American opposition, saying that it has not a leg to stand on, and that the Monroe doctrine, instead of being an obstacle to his plan, should tell in its favor, inasmuch as the enterprise is undertaken under a concession from the government of Colombia. He sums up the case between his route (the Panama line) and the Nicaraguan route, which its projectors would like to impose upon the people of the United States as the American route, by repeating that the Nicaraguan line is four times as long as the other, and by virtue of its score of locks would make several days' delay in the transit, which is costly, and that the actual expense of construction would be no less than for its rival, in spite of promising estimates. The country it traverses is subject to earthquakes, while the Isthmus is not; the outlet to the Lake of Nicaragua is crooked and difficult, and the thirty curves of the canal to it are of too short radius to allow for the easy turning of a large steamer. He cites the almost unanimous decision of the European engineers at the Congress against the Nicaraguan line, and accusing the American engineers who have conducted the surveys of having been led away by a preconceived idea, he says: "Here is a people who have spent in twenty years twenty-five or thirty millions of francs in sending their most competent men to study the Isthmus. Their best engineers and their best sailors have been upon all the coasts of the Atlantic and the Pacific, and have examined all the passes; but their studies did not furnish a practical solution, because they always contemplated a canal with locks." He adds that "the Americans had a kind of cold chill on seeing that a solution was found which had escaped them, because they studied the question from one side only."

These objections to the Nicaraguan Canal are known, and are substantially those which were brought forward against it in the discussion of Mr. Menocal's paper upon it at a late meeting of the American Society of Civil Engineers. To these Mr. Shelburne, in the discussion, joined the criticisms that the canal as planned was inadequate and its estimated cost too low, its locks being too small and its section not large enough, so that to make it serviceable, thirty millions of dollars must be added to the cost; that the canal would be much more difficult to construct than had been counted on, and more difficult to protect when built. The objections that are urged against the Panama Canal we have before enumerated. They are, briefly, its great initial cost and the danger to it from freshets, as well as the difficulties of the tides, which Mr. Menocal thinks will interfere considerably with its use. Meanwhile, the imminence of the Lesseps project has stirred up its opponents here to great activity. A joint resolution has been introduced into both houses of Congress, committing the United States, in a rather reckless way, it seems to us, to the support not of an inter-oceanic canal simply, but a canal "via Nicaragua," which is declared to be "a necessity for the prosperity of the commerce of the world and the interests of the United States," and, with a vagueness which would give good cause for uneasiness, to a "full and entire protection" of its company. It is a misfortune that an undertaking of this kind, whose *raison d'être* is its importance to the commerce and common service of the whole world, should be embarrassed among us who are most immediately concerned in it, not as a nation, but as a commercial people, by political notions and the mere pride of country; and it is likely that the support which the undertaking gets here will be mainly due to the fact that it is an American project, and one that is made to appear as if it were the representative American project, to the name of General Grant, if he lends his name to it, and to such considerations as were adduced by Senator Burnside in his speech of last week, which we must fain consider a weak one. Shrewd capitalists will judge the matter as one of commercial profit, but the next thing will be an appeal to Congress for a subsidy, and before Congress the question will become one of politics and bunkum. It is not our province to discuss the Monroe doctrine, which is essentially the same in spirit as the theory on which England has made her Afghan and Zulu wars, but when it is stretched to cover the undertakings of private foreign capital, in which our own capital is invited to join, it seems to be stretched to tenuity. It is an absurd waste of force to build two inter-oceanic canals close together, when it is a question whether one alone is not too great a work to undertake; but to this things seem to be tending.

There is no longer much likelihood that either protests from home or resistance at Alexandria will prevent the American emissaries from bringing Cleopatra's Needle to New York. The protests, indeed, were entered much too late to accomplish anything, even if there had been a chance of it from the beginning. Americans were too much preoccupied — ourselves among them, we must confess — to consider at the beginning the full extent of the injury to Alexandria and the offence to the world involved in this abstraction, which, notwithstanding that the act of spoliation was really committed by the late Khedive in the moment of abdication, resembles too much in spirit the pilfering of the Elgin marbles. But when many thousands of dollars had been spent in preparations, and the ship and machinery which were to bring back the obelisk were already at Alexandria, it was no longer of use to protest, under the certainty that no opposition but that of law or of force would be allowed to prevail. Those who have lifted up their voices can only lament, if they hoped to have any effect, that they were not more wide-awake or more enterprising. As for the opposition at Alexandria, there appears to have been none among the natives. The Alexandria of the future, if civilization overtakes her, will doubtless bitterly lament her acquiescence; but the present Alexandria cares nothing for infidel relics or pre-Mohammedan associations. The only resistance which amounted to a real obstacle seems to have been that of the Italian proprietor on whose land the Needle stood, and that was easily overcome by vigorous action and the pledging of a quarter of the five thousand francs which he demanded. A despatch sent to the *World* by Commander Gorringe, on Saturday, told that the obelisk had been actually lowered into its horizontal position. A pit had been dug about it, and a canal led out to the sea, through which it was to be rafted to the ship that waited for it. The excavation about the base exposed a plinth of red syenite (the material of the obelisk), seven feet high by nine square, below which were three marble steps, resting on a foundation of masonry. The plinth is to be brought here with the shaft. With the steps beneath it, the bottom of which is about eighteen inches above the sea-level, it adds nearly fourteen feet to the height of the structure, showing what has been the accumulation during eighteen centuries of the sands which have choked the famous harbor of Alexandria.

The New York Superior Court has rendered judgment in the suit against the city of the widow of the man who was killed by the fall of the Forty-Second Street Tunnel in New York. The suit was dismissed on three grounds, which amount to this: first, that the city could not be held responsible for the consequences of a want of judgment on the part of the Commissioner of Public Works in fixing the form and construction of the vault that fell; second, that there was no error of judgment, for the balance of testimony indicates that if the vault had been faithfully built as it was planned, it would have been strong enough; third, that the error of judgment was on the part of the man who went under the vault when he was warned not to. We have heard this plea of error of judgment from those in authority before, and with very little respect. We gave our reasons at the time (see *American Architect* for October 26 and November 2, 1878) for believing that the vault was planned in a way in which no competent engineer would have planned it. But letting alone this special case, the plea of error of judgment seems to us like that of drunkenness, which may be made to cover pretty much any but premeditated mischief. We do not see that there is any blunder of shameful incompetence or outrageous folly that cannot be covered by it. The building of the stand that fell in Blackstone Square, in Boston, a year or two ago, was an error of judgment. The building of the grand-stand at Adrian was another. If cities are not responsible for the damage done by their servants in such ways, why should corporations be, or why should individuals? If the plea of error of judgment is restricted to cases in which a thoroughly informed and careful human judgment could not foresee the result, that is one thing; but if it is to be used with the loose interpreta-

tion which seems to belong to it in this case and another in which we have lately noticed it, we may look to see it held up as the ægis of incompetence and folly.

THE Permanent Exhibition at Philadelphia still shows some vitality, or its supporters do. A meeting of stockholders was held a week ago, in which it was voted unanimously that the Exhibition should be maintained and the great centennial building in the Park preserved. This, we presume, implies an intention to accept the conditions of the Park Commission and provide a genuine industrial exhibition of a kind to do credit to the city, instead of the somewhat miscellaneous shows which have occupied the building and wearied the patience of the Commission for a year past. It is keeping up a brave front. The question remains how well the promises of the stockholders can be redeemed by the successful carrying out of a scheme which has failed before under what seemed better opportunities.

STRENGTH OF COLUMNS.

THE use of columns or pillars in buildings is so common that every architect and builder should be able to determine the exact load that a given pillar, or column, will bear with safety.

Usually, those who have written upon this subject have entered so deeply into scientific considerations, that the majority of those who should apply their formulæ have been unable to understand them.

The following formulæ and tables are deduced from the best authorities on this subject.

The following is the notation employed in the formulæ: —

Let A denote the area of the cross-section in square inches; B, the external breadth, or *least thickness*, of a square or rectangular pillar, b, the internal breadth of a hollow pillar or column, both in inches; C, the resistance to crushing of one cubic inch of the material; D, the external diameter of a cylindrical column, or the depth of a square or rectangular pillar; d, the internal diameter or depth of a hollow column or pillar; E, the modulus of elasticity; L, the length of column or pillar *in feet*; l, the length of column or pillar *in inches*; W, the greatest load that the pillar will sustain *with safety*.

It has been found that the manner in which a column or pillar breaks depends upon the ratio of its length to its diameter, or least thickness. Hence pillars have been divided into *Short*, *Long*, and *Medium*.

Short Pillars. — Under this class are placed pillars of cast-iron whose lengths do not exceed five times their least thickness; and pillars of wrought-iron and wood whose lengths do not exceed ten times their least thickness or diameter.

The safe load for a pillar of this class is obtained by the general formula, $W = \frac{A \times C}{5}$, 5 being the factor of safety. In special cases we have: for solid square or rectangular pillars,

$$W = \frac{B \times D \times C}{5};$$

for solid cylindrical pillars,

$$W = \frac{\pi \times \frac{1}{4} D^2 \times C}{5}, \text{ or } W = \frac{3.1416\ D^2 \times C}{20};$$

for hollow rectangular pillars,

$$W = \frac{(B \times D - b \times d)\ C}{5};$$

and for hollow cylindrical columns,

$$W = \frac{3.1416\ (D^2 - d^2) \times C}{20}.$$

VALUES OF C, OR RESISTANCE TO CRUSHING, IN POUNDS PER SQUARE INCH.

	Lbs.		Lbs.
Cast-Iron	80,000	Hemlock	5,400
Wrought-Iron	36,000	Locust	7,650
Steel	114,000	White Oak	6,660
White Ash	8,140	White Pine	4,800
Beech	8,540	Pitch Pine	6,770
Birch	11,660	Spruce	6,820
Cedar	5,860	Black Walnut	5,690

EXAMPLE: What is the greatest load that a pillar of white pine, 6 × 8 inches, and 6 feet long, will bear with safety?

Ans. $W = 6 \times 8 \times 4{,}800 \div 5 = 46{,}138$ lbs.

Long Pillars. — Under this class are placed columns and pillars of cast-iron and timber whose lengths exceed thirty-five times their least thickness; and columns and pillars of wrought-iron whose lengths exceed sixty times their least thickness or diameter.

There are no formulæ that are entirely satisfactory for the strength of long columns. The following are deduced from the theoretical formulæ of Weisbach and others; breaking weight $= \frac{\pi^2 E I}{l^2}$. Using for long columns a greater factor of safety, 10, we have $W = \frac{\pi^2 E I}{10\ l^2}$; or, for solid square or rectangular pillars,

$$W = \frac{E \times B^3 \times D}{1{,}750\ L^2};$$

for hollow square or rectangular pillars,

$$W = \frac{E \times (B^3 \times D - b^3 \times d)}{1{,}750\ L^2};$$

for solid cylindrical columns,

$$W = \frac{E \times D^4}{2{,}970\ L^2};$$

for hollow cylindrical columns,

$$W = \frac{E \times (D^4 - d^4)}{2{,}970\ L^2}.$$

VALUES OF E, OR MODULUS OF ELASTICITY, IN POUNDS PER SQUARE INCH.

	Lbs.		Lbs.
Cast-Iron	15,960,000	White Oak	1,620,000
Wrought-Iron	24,000,000	Southern Pine	1,700,000[1]
Steel	31,000,000	White Pine	1,410,000[1]
White Ash	1,080,000	Yellow Pine	1,600,000
Locust	2,046,000	Spruce	1,600,000

EXAMPLE: What is the greatest load that a wrought-iron cylindrical pillar, whose diameter is 5 inches, and length 30 feet, will bear with safety?

Ans. $W = 24{,}000{,}000 \times 5 \times 5 \times 5 \times 5 \div 2{,}970 \times 30 \times 30 = 5{,}611$ lbs.

The above formulæ apply to long pillars of any material; but for cast-iron, we have the more satisfactory formulæ derived by Mr. Ernest Hodgkinson from his experiments on the strength of cast-iron columns: —

For solid cylindrical cast-iron columns, with flat ends,

$$W = \frac{9{,}890\ D^{3.6}}{L^{1.7}};$$

for hollow cylindrical cast-iron columns, with flat ends,

$$W = \frac{9{,}923\ (D^{3.6} - d^{3.6})}{L^{1.7}}.$$

The diameter and length can be raised to the required power by obtaining the logarithm of the diameter or length, multiplying it by the respective power, and then seeking the number corresponding to the logarithm; or it may be found by means of tables made for the purpose, such as those given by Mr. Trautwine in his hand-book for engineers.

If it is desired to obtain the *breaking weight* of a long pillar, multiply the *safe weight* by 10.

Medium Pillars. — Under this class are placed those columns or pillars in which the ratio of the length to the diameter, or least thickness, is between that of the two classes already considered. Most of the columns and pillars in common use come under this class. The formulæ in most general use for this class of columns are those deduced by Mr. Lewis Gordon from Mr. Hodgkinson's experiments. But for timber pillars, Mr. Tredgold has altered Gordon's formula, so that it will give results agreeing more nearly with those obtained by experiments. Mr. Tredgold's formula for square or rectangular timber pillars is,

$$W = \frac{A \times C}{10\left(1.1 + \frac{L^2}{2.9\ B^2}\right)}.$$

For cylindrical pillars, find the safe weight as if the pillar were square, and divide by 1.7.

EXAMPLE: What is the greatest load that a white oak pillar, 10 inches square and 15 feet long, will sustain with safety?

Ans. $W = 6{,}660 \times 100 \div 10 \times \left(11 + \frac{225}{2.9 \times 100}\right) = 35{,}501$ lbs.

The following are Mr. Gordon's formulæ for the forms of cast and wrought iron pillars in most general use: —

For solid cylindrical columns of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{266}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{3{,}000}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{400}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{4{,}500}\left(\frac{l}{D}\right)^2\right)};$$

for hollow or solid rectangular pillars of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{500}\left(\frac{l}{B}\right)^2\right)};$$

for solid rectangular pillars of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{3{,}000}\left(\frac{l}{B}\right)^2\right)};$$

for hollow rectangular pillars of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{6{,}000}\left(\frac{l}{B}\right)^2\right)};$$

[1] Obtained from experiments made by the writer.

for H-shaped section of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{l^2}{3{,}000\,B^2}\,\frac{a}{a+b}\right)}$$

in which B = breadth of flange, a = area of both flanges, and b = area of web.

In the above formulæ for medium pillars, the numbers in the denominator printed in heavy type are factors of safety, and should be omitted in obtaining the *breaking weight.*

The formulæ for medium pillars are in such a form that tables can be calculated for different values of $\frac{l}{D}$ or $\frac{l}{B}$, giving the safe or breaking load per square inch of cross-section. Below are tables for pillars of oak, white pine, pitch pine, and spruce; for hollow cylindrical and rectangular cast-iron columns; and for hollow cylindrical and rectangular wrought-iron columns.

To use these tables it is only necessary to divide the length *in inches* by the breadth if rectangular, or the diameter if cylindrical, also in inches, and, looking in the first column of the table for the whole number nearest that quotient, take out the safe load per square inch, and multiply it by the number of square inches in the cross-section.

Thus: What is the greatest safe load of a wrought-iron hollow cylindrical column, whose external diameter is 5 inches, and internal $4\frac{1}{2}$ inches, and whose length is 15 feet? Here $\frac{l}{D} = 36$, and, looking in the table for the strength of wrought-iron columns, we find opposite 36, under safe load, 6,987; multiplying this by the area of the cross-section $= .7854\ (D^2 - d^2) = 3.73$ square inches, we have greatest safe load $= 26{,}061$ pounds.

In order to make a table for timber pillars we have to change the formula by substituting $\frac{l}{12}$ for L, and the formula then becomes:

$$W = \frac{A \times C}{10\left(1 + \frac{1}{417.6}\left(\frac{l}{B}\right)^2\right)}.$$

If the pillar is cylindrical, divide the results by 1.7.

STRENGTH OF RECTANGULAR TIMBER PILLARS.

$$W = \frac{A \times C}{10\left(1.1 + \frac{1}{4.6}\left(\frac{l}{B}\right)^2\right)}.$$

Length divided by Breadth.	Safe Load in Pounds per Square Inch.			
$\frac{l}{B}$	White Oak.	White Pine.	Pitch Pine.	Spruce.
8	532	383	540	544
9	515	371	523	527
10	497	358	505	509
11	479	345	487	491
12	461	332	468	472
13	442	319	449	453
14	424	306	431	435
15	406	292	413	416
16	389	280	395	398
17	372	268	378	380
18	355	256	361	363
19	339	244	345	347
20	324	233	329	331
21	309	222	314	316
22	295	212	300	302
23	281	202	286	288
24	268	193	273	275
25	256	185	261	263
26	345	176	249	251
27	234	168	238	240
28	224	161	227	229
29	214	154	217	219
30	204	147	208	210
31	195	141	199	201
32	187	135	190	192
33	179	129	182	184
34	172	124	175	176
35	165	119	168	169

In using iron columns or pillars it is, of course, cheaper to use those of a pattern made by some manufactory, than to have new patterns made to order. Different iron mills have published handbooks of all the forms of columns, beams, etc., of their make, containing also much valuable information, which they will send to architects and builders on application.

Any one desiring further information on the strength of columns, or the manner in which the formulæ are derived, will do well to consult Professor De Volson Wood's treatise on Resistance of Materials, Rankine's Civil Engineering, and Mr. Bindon Stoney's Theory of Strains in Girders and Similar Structures.

STRENGTH OF HOLLOW CYLINDRICAL OR RECTANGULAR CAST-IRON PILLARS.

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{400}\left(\frac{l}{D}\right)^2\right)}; \qquad W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{500}\left(\frac{l}{D}\right)^2\right)}.$$

Length divided by External Breadth or Diameter	Breaking Weight in Pounds per Square Inch.		Safe Load in Pounds per Square Inch.	
	Cylindrical.	Rectangular.	Cylindrical.	Rectangular.
5	75,294	76,190	12,549	12,698
6	73,395	74,627	12,232	12,438
7	71,269	72,859	11,878	12,143
8	68,965	70,922	11,494	11,820
9	66,528	68,846	11,088	11,474
10	64,000	66,666	10,666	11,111
11	61,420	64,412	10,236	10,735
12	58,823	62,111	9,804	10,352
13	56,239	59,790	9,373	9,965
14	53,859	57,471	8,976	9,578
15	51,200	55,172	8,533	9,195
16	48,780	52,910	8,130	8,817
17	46,444	50,697	7,741	8,449
18	44,198	48,543	7,366	8,090
19	42,050	46,457	7,008	7,743
20	40,000	44,444	6,666	7,407
21	38,050	42,508	6,341	7,085
22	36,200	40,650	6,033	6,775
23	34,455	38,872	5,742	6,479
24	32,787	37,174	5,464	6,195
25	31,219	35,555	5,203	5,926
26	29,741	34,014	4,957	5,669
27	28,343	32,547	4,724	5,423
28	27,027	31,152	4,504	5,192
29	25,785	29,828	4,297	4,971
30	24,615	28,571	4,102	4,761
31	23,512	27,310	3,918	4,818
32	22,472	26,246	3,745	4,374
33	21,491	25,172	3,581	4,195
34	20,565	24,154	3,427	4,026
35	19,692	23,188	3,282	3,864

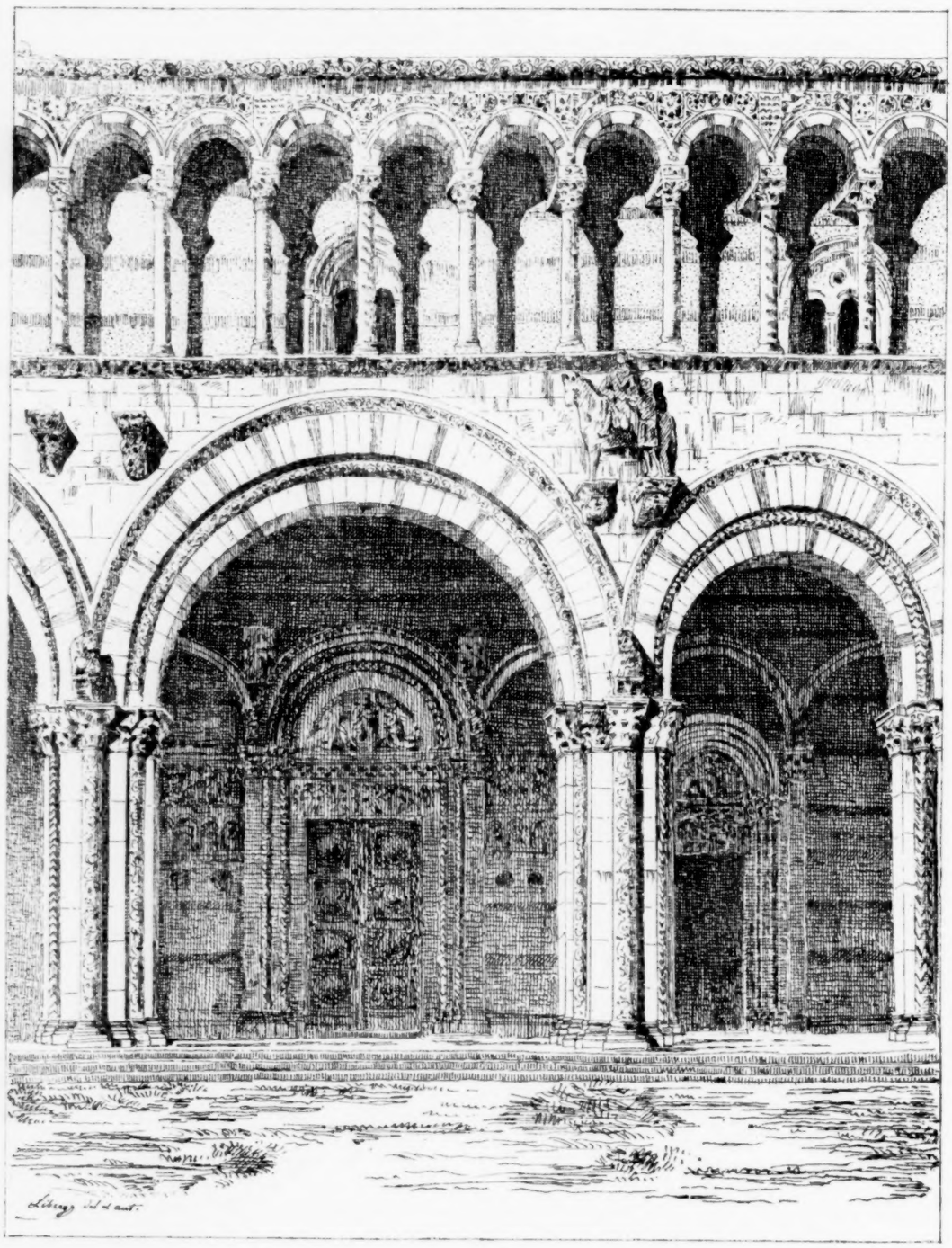
STRENGTH OF HOLLOW CYLINDRICAL OR RECTANGULAR WROUGHT-IRON PILLARS.

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{4{,}500}\left(\frac{l}{D}\right)^2\right)}; \qquad W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{6{,}000}\left(\frac{l}{B}\right)^2\right)}.$$

Length divided by External Breadth or Diameter.	Breaking Weight in Pounds per Square Inch.		Safe Load in Pounds per Square Inch.	
	Cylindrical.	Rectangular.	Cylindrical.	Rectangular.
8	35,495	35,620	8,874	8,905
9	35,309	35,520	8,842	8,880
10	35,217	35,410	8,804	8,852
11	35,057	35,288	8,764	8,822
12	34,883	35,156	8,721	8,789
13	34,687	35,013	8,674	8,753
14	34,497	34,861	8,624	8,715
15	34,286	34,698	8,571	8,674
16	34,062	34,527	8,515	8,632
17	33,827	34,346	8,457	8,586
18	33,582	34,155	8,395	8,539
19	33,327	33,957	8,332	8,489
20	33,061	33,750	8,265	8,437
21	32,787	33,535	8,197	8,384
22	32,504	33,313	8,126	8,328
23	32,213	33,083	8,053	8,271
24	31,915	32,846	7,979	8,211
25	31,610	32,604	7,902	8,151
26	31,298	32,354	7,824	8,088
27	30,981	32,100	7,770	8,025
28	30,659	31,840	7,665	7,960
29	30,331	31,574	7,583	7,893
30	30,000	31,304	7,500	7,824
31	29,665	31,030	7,416	7,757
32	29,326	30,758	7,331	7,689
33	28,985	30,469	7,246	7,617
34	28,642	30,184	7,160	7,546
35	28,297	29,896	7,077	7,476
36	27,950	29,605	6,987	7,401
37	27,603	29,312	6,901	7,328
38	27,254	29,017	6,813	7,254
39	26,906	28 719	6,726	7.179
40	26,557	28,421	6,639	7,105
41	26,209	28,121	6,552	7,030
42	25 862	27,821	6,465	6,955
43	25,515	27,511	6,378	6,877
44	25,171	27,218	6,293	6,804
45	24,827	26,916	6,206	6,729
46	24,486	26,614	6,121	6,653
47	24,146	26,312	6,036	6,578
48	23,809	26,011	5,952	6,503
49	23,475	25,711	5,869	6,428
50	23,143	25,412	5,786	6,353
51	22,814	25,113	5,703	6,278
52	22,488	24,816	5,622	6,204
53	22,164	24,520	5,541	6,130
54	21,845	24,226	5,461	6,056
55	21,528	23,934	5,382	5,983
56	21,215	23,642	5,304	5,910
57	20,906	23,354	5,226	5,838
58	20,600	23,067	5,150	5,767
59	20,298	22,782	5,074	5,695
60	20,000	22,500	5,000	5,625

The values of C and E given above are taken from those given by Barlow, Rankine, Wood, and other accepted authorities.

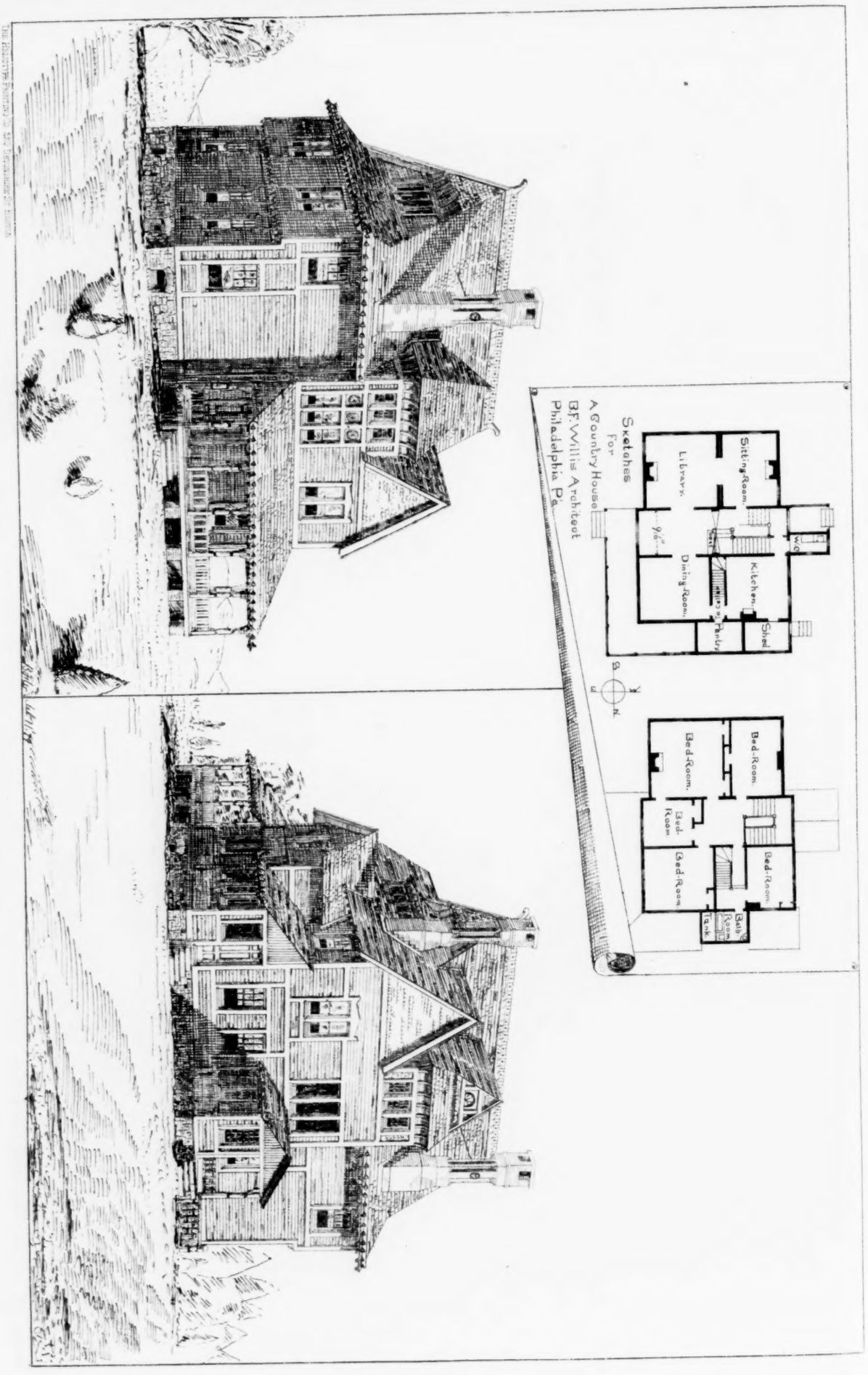
F. E. Kidder.



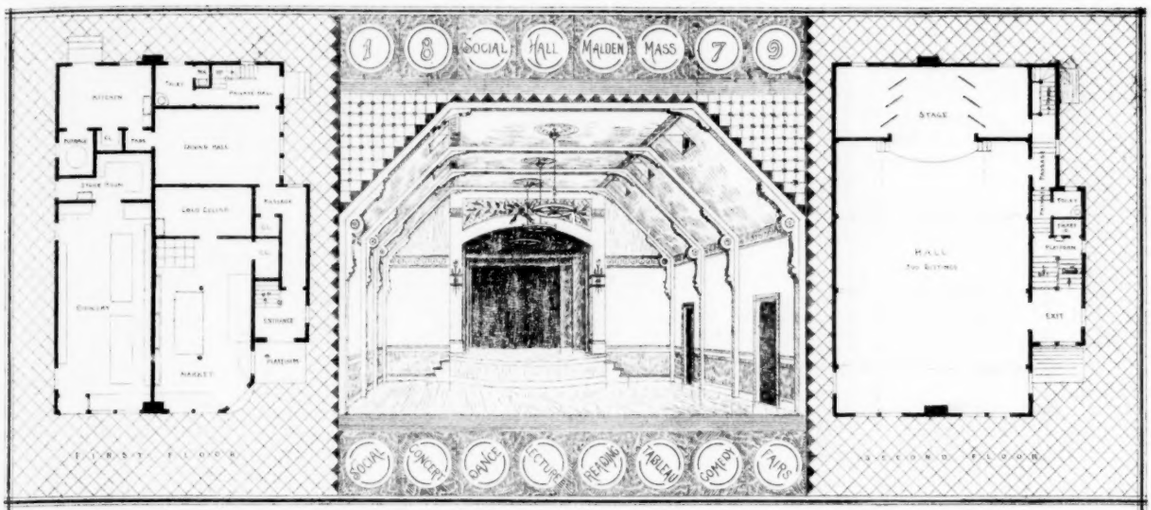
CHURCH OF S^t MARTIN . LUCCA.

Principal Façade.

THE HERALDIC PRINTING CO. 239 DEVONSHIRE ST. BOSTON


Sketches
For
A Country House
B.F. Willis Architect
Philadelphia Pa.
Sitting Room.
Library.
Dining Room.
Kitchen.
Shed
Bed Room.
Bed Room.
Bed Room.
Bed Room.
Bed Room.
Bath Room
Tank

VIEW ON PRINCIPAL FLOOR.
PLAN OF STAIRCASE
STAIRCASE · RESIDENCE OF · J. HOWARD KING ESQ. · ·
No 1 PARK PLACE ALBANY N.Y.
WM M. WOOLLETT ARCHITECT
VIEW OF LANDING FROM SECOND STORY



SOCIAL HALL, MALDEN, MASS.

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

THE ILLUSTRATIONS.

STAIRCASE-HALL IN HOUSE OF J. HOWARD KING, ESQ., ALBANY, N. Y. MR. W. M. WOOLLETT, ARCHITECT, ALBANY.

WOOD-WORK cherry, with wall colorings in greens and gold. Stained-glass in windows on landing; ceilings of cherry, with brass ornaments.

DESIGNS FOR COUNTRY HOUSES. MR. B. F. WILLIS, ARCHITECT, PHILADELPHIA, PA.

PORTION OF THE FACADE OF ST. MARTIN'S CATHEDRAL, LUCCA, ITALY.

The Cathedral of St. Martin, of which this illustration represents the principal entrance, was built in 1060–70, in the Romanesque style, by Bishop Anselmo Badagio, who afterwards became Pope Alexander II. The principal façade was built about 1204 by Guidetto. We copy the illustration from the *Croquis* of the Intime Club.

SOCIAL HALL, MALDEN, MASS. MESSRS. KIRBY & LEWIS, ARCHITECTS, BOSTON, MASS.

This hall was built during the past summer for Alexandre Ballou, Esq.

THE RESTORATION OF ST. MARK'S.

DURING the recent agitation with regard to St. Mark's, at Venice, it has been too readily assumed that the Italians will be eager to listen to any advice we have to offer. The University of Oxford, following the example of Cambridge, has recently held a meeting to protest against the proposed rebuilding of the great façade of the Venetian cathedral. The Dean of Christ Church occupied the chair, and several speakers of influence and authority addressed the meeting. With the general purpose of these speeches we cordially agree; but we are by no means sure that sufficient care was used to avoid the danger of wounding the sensibilities of the Italian people. When, for example, Dr. Acland said that "friendly advice to friends can never be taken amiss," he surely ventured upon one of the most disputable propositions in the whole range of social ethics. Friendly advice, especially when it is offered with the air of superior knowledge and refinement, is perhaps of all human gifts the most exasperating, and its effect is even more doubtful as between great nations than in the ordinary intercourse of individuals. Moreover, as a matter of fact, we are not, as a nation, in a position to give ourselves airs upon this subject. We have done much in the way of restoration that must ever be a source of regret to those who are truly interested in the reverent preservation of the remains of ancient architecture; and, although we have lately advanced to a better understanding of what is fitting in this matter, it is surely too soon to attempt to dictate to others in a spirit of self-righteousness. The late Sir Gilbert Scott, who was entitled to speak upon this subject, has clearly pointed out that most of the errors committed by our architects arose out of an excess of zeal for the beauties of a particular style; and it is surely only just that we should credit our neighbors with motives at least as good as our own.

With these reservations, which refer rather to the manner than to the substance of the recent movement, we most heartily concur in the efforts that are being made to save a unique and noble building. The Cathedral of St. Mark may justly be described as one of the richest monuments of art and history that have survived to us; and in its preservation, not Italy alone, but the whole civilized world, is deeply interested. In the fact that by its possession Italy is favored beyond other nations we can only recognize a graver responsibility, such as all cultivated Italians would, we are assured, be ready to acknowledge. Italy is in no exaggerated sense a museum for all Europe. To such cities as Florence and Venice the students of every country must flock as to great schools and centres of art culture; and it cannot, therefore, be a matter of indifference to the thousands who have learned what such fortunate places have to teach, whether the treasures they contain are or are not to be preserved as the inheritance of future generations. If her riches were of less account, a country like Italy might, perhaps, reasonably resent the advice or interference of foreigners; but it is due to her unrivalled position as a treasure-house of beauty that, when the existence of such a building as St. Mark's is in debate, she should frankly admit to her counsels the other nations of Europe. No amount of caution can be deemed too great in dealing with a building which depends even more upon its picturesque beauty and the inexhaustible interest of its details than upon the more abstract qualities of architectural style. If the fabric is in danger, adequate means must, of course, be taken to insure its safety; but all the resources that science can command would be well bestowed in order to restore solidity to the structure without needlessly disturbing the surface of the building. There is, perhaps, no other architectural monument in the world in regard to which this particular consideration acquires greater force and urgency. The ornament of St. Mark's, bearing the record of various styles and stamped with the impress of different nationalities, could by no ingenuity of modern craftmanship be renewed or revived. Its character and beauty defy any process of imitation, and both must assuredly perish under any such comprehensive scheme of reconstruction as would seem to be contemplated. It is scarcely necessary, therefore, in this particular instance, to refer to any of the vexed questions which have lately arisen in regard to architectural restoration. Upon the general principles which should govern the restoring architect we have more than once expressed our opinion, and there is no need again to declare that we have never ranked ourselves with those who would permit a noble building to sink into decay out of an exaggerated sentiment of respect for the picturesque evidences of age. The attempt to reconstruct St. Mark's would inevitably sweep away more solid charms than those which are bestowed by the mellowing hand of time. Unfortunately upon this point there is no room for doubt, and what has already been done in the way of repairs, both within and without the building, shows only too clearly what would be the effect of anything like a complete renewal of the western façade. The curious and interesting mosaics on the ceiling of the portico could scarcely be saved; for it is notorious that when submitted to a similar process of restoration many of the mosaics inside the church have been irreparably injured.

A serious difficulty in the free discussion of this question arises from the feeling of uncertainty as to what is actually proposed by the Italian architects. The scope of the contemplated restoration is not yet clearly ascertained, and it might, perhaps, be plausibly urged that we should wait for fuller information before proceeding to memorialize the Italian people. The plea would be altogether unanswerable if it were not for the fact that all experience in these matters proves that a decision once taken is not easily changed. When the scheme in all its details shall have been finally determined, it will be practically useless to express our lamentations and regrets, while in the mean time we may, perhaps, strengthen the hands of those Italians who are themselves most anxious to avert the threatened calamity. In the introduction to a catalogue which has just been issued, Mr. Ruskin goes so far as to declare that "at this very hour committees of Venetian builders are meeting to plot the total destruction and reërection, according to their own notions and for their own emolument, of the entire west front of St. Mark's." Mr. Ruskin has doubtless earned the right to speak warmly of what concerns the fate of Venice, and his English readers, at any rate, will by this time have learned to make allowance for any imprudences of expression. But we must think that such language, coming from a critic of authority, is peculiarly unfortunate at the present moment. If Mr. Ruskin's object is not merely to indulge his own rhetoric, but to save a building which he reveres, he could scarcely have taken a more unwise course than to impute unworthy motives to those who have the question under their consideration. For it is not to be denied that the subject offers many difficult and perplexing problems. Much of the material employed in the construction of St. Mark's was not originally destined to its present use. The slabs of marble which enrich its surface, and many of the columns, had already done duty in older buildings before they were borne across the sea to Venice, and the signs of disintegration and decay which they now exhibit are such as are scarcely to be encountered elsewhere. The work of repair has therefore to be carried out under difficult and trying conditions. It is true that these slabs of marble, as stated in the memorial now distributed for signature, "have not fallen down;" but there seems to be no doubt in the minds of those who are entitled to speak with authority, that some measures of precaution are needed in order that they may not split up and fall from their places. All we ask is that these necessary repairs should be carried out with as much tenderness and regard for the ancient surface as is consistent with safety. What may be the fittest means to be adopted in order to satisfy both these objects is obviously a question that can only be decided by experts, and those who have not the special knowledge that would enable them to pronounce an opinion must be content to limit their appeal to general considerations. They can bring strongly to the notice of the Italian people the deep interest with which all cultivated minds watch the fortunes of a noble building, and they will hope in return that those to whom the delicate task of restoration is intrusted will be duly mindful of their responsibility. — *Saturday Review.*

THE SEWERAGE OF MEMPHIS.

THE following is Mr. George E. Waring's plan for sewering Memphis, which was read at the Nashville meeting of the Public Health Association, and will probably be adopted by the sanitarians now in Memphis as the best plan in their opinion: —

"In my judgment a perfect system of sanitary sewerage, for a small town or a larger one, would be something like the following: —

"No sewer should be used of a smaller diameter than six inches, because (a) it will not be safe to adopt a smaller size than 4-inch for house drains, and the sewer must be large enough surely to remove whatever may be delivered by these; (b) because a smaller pipe than 6-inch would be less readily ventilated than is desirable; (c) and because it is not necessary to adopt a smaller radius than three inches to secure a cleansing of the channel by reasonably copious flushing.

"No sewer should be more than six inches in diameter until it and its branches have accumulated a sufficient flow at the hour of greatest use to fill this size half full, because the use of a larger size would be wasteful, and because when a sufficient ventilating capacity is secured, as it is in the use of a 6-inch pipe, the ventilation becomes less complete as the size increases, leaving a larger volume of con-

tained air to be moved by the friction of the current or by extraneous influences, or to be acted upon by changes of temperature and of volume of flow within the sewer.

"The size should be increased gradually and only so rapidly as is made necessary by the filling of the sewer half full at the hour of greatest flow.

"Every point of the sewer should, by the use of gaskets or otherwise, be protected against the least intrusion of cement, which, in spite of the greatest care, creates a roughness which is liable to accumulate obstructions.

"The upper end of each branch sewer should be provided with a Field's flush-tank of sufficient capacity to secure the thorough daily cleaning of so much of the conduit as from its limited flow is liable to deposit solid matter by the way.

"There should be sufficient manholes, covered by open gratings, to admit air for ventilation. If the directions already given are adhered to, manholes will not be necessary for cleansing. The use of the flush-tank will be a safeguard against deposit. With the system of ventilation about to be described, it will suffice to place the manholes at intervals of not less than 1,000 feet.

"For the complete ventilation of the sewers it should be made compulsory for every householder to make his connection without a trap, and to continue his soil-pipe to a point above the roof of the house. That is, every house connection should furnish an uninterrupted ventilation channel four inches in diameter through its entire length. This is directly the reverse of the system of connection that should be adopted in the case of storm-water and street-wash sewers. These are foul, and the volume of their contained air is too great to be thoroughly ventilated by such appliances. Their atmosphere contains too much of the impure gases to make it prudent to discharge it through house-drains and soil-pipes. With the system of small pipes now described, the flushing would be so constant and complete, and the amount of ventilation furnished, as compared with the volume of air to be changed, would be so great, that what is popularly known as sewer-gas would never exist in any part of the public drains. Even the gases produced in the traps and pipes of the house itself would be amply rectified, diluted, and removed by the constant movement of air through the latter.

"All house connections with the sewers should be through inlets pointing in the direction of the flow, and these inlets should be funnel-shaped so that their flow may be delivered at the bottom of the sewer, and so that they may withdraw the air from its crown; that is, the vertical diameter of the inlet at its point of junction should be the same as the diameter of the sewer.

"All changes of direction should be on gradual curves, and, as a matter of course, the fall from the head of each branch to the outlet should be continuous. Changes of grade within this limit, if considerable, should always be gradual.

"So far as circumstances will allow, the drains should be brought together, and they should finally discharge through one or two main outlets.

"The outlet, if water-locked, should have ample means for the admission of fresh air. If open, its mouth should be protected against the direct action of the wind.

"It will be seen that the system of sewerage here described is radically different from the usual practice. I believe that it is, in all essential particulars, much better adapted to the plan of sanitary drainage. It is cleaner, much more completely ventilated, and is exactly adapted to the work to be performed. It obviates the filthy accumulation of street manure in catch-basins and sewers, and it discharges all that is delivered to it at the point of ultimate outlet outside the town before decomposition can even begin. If the discharge is of domestic sewage only, its solid matter will be consumed by fishes if it is delivered into a water-course, and its dissolved material will be taken up by aquatic vegetation.

"The limited quantity and the uniform volume of the sewage, together with the absence of dilution by rainfall, will make its disposal by agricultural or chemical processes easy and reliable.

"The cost of construction, as compared with that of the most restricted storm-water sewers, will be so small as to bring the improvement within the reach of the smaller communities.

"In other words, while the system is, in my judgment, the best for large cities, it is the only one that can be afforded in the case of small towns."

THE NEW THEATRE AT GENEVA.

The curious question as to the right of the city of Geneva to make use of the munificent bequest of the Duke of Brunswick which has just arisen, as we explained last week, makes it desirable to publish the following description of the building, which is furnished by the Geneva correspondent of the London *Times:* —

The new theatre is one of the handsomest and largest structures of the sort in Europe. In beauty and extent it ranks next to the opera-houses of Paris and Vienna. In external appearance it greatly resembles that of Paris, being built in the same style of architecture, while the decoration and arrangement of the interior are as perfect as lavish expenditure and artistic taste can make them. The vestibule, which fronts the Place Neuve, is connected with the first *étage* by two noble flights of stairs with balustrades of red marble, and stuccoed, ornamented panels, lighted by splendid candelabra representing a group of children, the work of M. Carrier-Belleuse. The upper part of the staircase walls and the ceiling are richly painted: one scene, by M. De Beaumont, depicts the four seasons; another by M. Dufaux, the four elements; and M. Léon Gaud has contributed several allegorical figures of high merit. The five doors which give access to the first gallery are surmounted by busts of Plautus, Voltaire, Shakespeare, Racine, and Sophocles. The *grand foyer* (the crush-room), immediately over the principal entrance and lighted by three balconied windows, is one of the most remarkable parts of the theatre. The floor is in variegated *parqueterie*. The prevailing tint of the wainscotting is light chamois. The pillars supporting the painted ceiling are at once graceful and solid, and the gilding is profuse without being too prominent. But the *chefs-d'œuvre* of the room are the carved chimney-piece in the style of Louis XIV., bearing in the centre the arms of Geneva and surmounted by a bust of Apollo; and the mural paintings by M. Milliet, representing the comic and the tragic Muses. The auditorium is in keeping with the rest of the house. The form of the galleries, the prevailing tint (light chamois on a red ground), and the style of ornamentation are in excellent taste. The three tiers of galleries have an outward inclination, the lowest tier being in advance of the highest. The auditorium is lighted by a splendid lustre, a veritable work of art, with four hundred bronze burners. The seats are upholstered in red velvet, and the lower parts of the walls are papered or painted to match. While every precaution has been taken to prevent fires, the amplest facilities for exit are provided, and the theatre can be emptied of its occupants in a few minutes, so numerous are the doors, and so spacious are the staircases and corridors. Twenty-eight jets of water at full pressure are always ready to be directed on any point of danger, and by means of iron curtains and doors one part of the house can be immediately cut off from the rest. The cost of this splendid temple of Thespis has been defrayed from the proceeds of the Brunswick legacy, and, including the value of the land on which it is built, exceeds five million francs. It is, of course, the property of the city of Geneva, and for a year, at least, will be managed by the municipality, in order that they may ascertain by actual experience the extent to which it will be necessary thereafter to subsidize the lessee. In any case, I believe it is intended to continue the system, certainly peculiar to Geneva, of submitting the claims of débutants to the direct suffrages of the play-goers. A book is kept in which regular frequenters of the theatre may enter their names, and whenever it becomes a question of making an addition to the company the aspirant is required to perform three times, after which a meeting is called to decide whether he shall be permanently engaged or not. Players at Geneva are thus, like pastors and town councilors, chosen by universal suffrage. Judged by its results, however, this system cannot be looked upon as altogether satisfactory, for the old theatre, whether as regards the character of its plays or the qualifications of its actors, was one of the least reputable in Switzerland. But confident hopes are now expressed that the drama in Geneva will henceforth be conducted in a manner befitting its new and beautiful home.

THE WHITENING OF RED BRICK.

In an article upon "Brickwork," which appeared in No. 1287 (September 5, 1879) of the *Building News*, it was said that a white brick of a novel character — being made from red clay — will shortly be introduced to the London market from the neighborhood of the Humber. That paper now says: —

"This discovery is protected by patent, sealed March 5, 1879, granted in favor of Robert Pickwell, Esq., A. M. I. C. E., of the firm of Clarke & Pickwell, civil engineers, Hull, who was partly led to the discovery of mixing a common ingredient largely found and cheaply obtained in this country with red brick clays, by his chemical experiments upon building materials submitted to the firm by contractors for marine and other works executed under their supervision, and partly by his practical knowledge obtained in the firm's being engaged in brickmaking from the strong warp clays which so largely abound on the banks of the river Humber.

"It is a fact that certain brick earths when burnt produce bricks of a red color, whilst others produce, under the action of fire, bricks of a white or buff color; but the chemical character of these clays has been little considered, and with the exception of incorporating therewith cretaceous matter, nothing had been done in the way of altering the composition of our various red clays until Mr. Pickwell took the matter in hand. For some years it has been patent to this gentleman, that, with the mechanical appliances now brought to bear upon the trade, an attempt to deal with the composition of the brick-earths might reasonably be made, and that the material wanting in the red brick clays to enable them to fire into white bricks might, in a pure or concentrated form, be readily and cheaply added. This, as experiments upon a variety of red clays proved, required but the intermixture of a common ingredient, the cost of which in a dry state varies with locality, but on the average ranges about 12s. per ton. Its action, we may state, is to flux with the iron so largely present in the red clays, and to render it inoperative in coloring the bricks.

"The process of making and burning these patent bricks in no way varies from the ordinary mode; but the intermixture of this dry composition renders clays of a strong character sufficiently dry to work in Matthew's and other brickmaking machines, which is not possible with them in a natural state. The mixing of the clay with this ingredient is the most essential detail, and this is done by an appliance constructed for the purpose, the cost of which is very nominal, and which in most establishments where steam-power is employed would entail but little addition to the existing machinery. Another and a great advantage is that the red clays, which in this case are merely wanted as a basis, do not require to be of that fine quality neces-

sary in making best red bricks, and a commoner class of material, when submitted to this mechanical treatment, will serve to produce best quality white or yellow bricks; and lastly, the fact of the largest and best deposits of clay in the country, which are well known to be red in color, being placed at the disposal of the makers of white bricks, is an advantage the estimate of which we cannot reach.

"The discussion of these details brings us to the following considerations touching our natural deposits of white brick earth. This earth is sparingly disposed throughout the country, and it is rarely found incorporated with the requisite amount of bleaching material. If too weak in this composition, the bricks will burn pink in color, and if too strong they suffer in hardness and in their bearing qualities, and become tender and rotten in their texture. Where red clays are made the basis, and the mixture is wrought by artificial means, the point of perfection can be easily reached and rigidly maintained. It is a bold assertion to put forward, that artificial brick-earths can be worked with more perfection than natural ones; but, nevertheless, the assertion holds good in the majority of cases.

"With the bricks under notice, the questions of durability, persistence of color, and other details do not arise, if perfect mixture of the bleaching material and burning apart from red bricks are observed, as the material, in its perfected form, is identical in character with the best beds of white brick earth found throughout the country.

"Messrs. Clarke & Pickwell have put down a large plant for the manufacture of these bricks at New Holland, on the southern or Lincolnshire bank of the river Humber, where rail and water communication of the first order exists, and they are now fairly at work manufacturing white bricks from the local warp or red brick clays, a sample kiln of which was drawn on the 5th inst. in our correspondent's presence. These works are being taken up by the 'Patent White Brick Company, Limited,' who have bought the exclusive patent right over an area the radius of which extends sixty miles from the works. In this radius the company holds the exclusive right of granting licenses to work the patent, and the patentee is commencing active operations in connection with the letting of other districts, as our advertising columns indicate.

"The patentee has strongly tested his invention in commencing operations on one of the strongest and most ferruginous deposits of clay in the kingdom, and it is clear, if he can successfully produce good white bricks from this material, that his task in applying his invention to milder and lighter clays is an easy one.

"As to the opening offered for the sale of these bricks in the neighborhood of the works, it may be noted that the red bricks of local manufacture are vending at 28s. per thousand, whereas white bricks, which have to be brought a considerable distance, are rating at 50s. This disparity of cost, from the extreme rarity of good white brick earth, is by no means peculiar to the Humber district, and this fact goes far to prove the useful character of the invention and to argue its general application.

"Such, then, in brief, are the particulars of this new discovery in brick-making, and from the reports which have reached us we are led to anticipate its general adoption in districts where red brick or inferior white brick earths exclusively prevail."

THE LAMP OF TRUTH.

ONE reasonable view of the "graining" business is set forth in a homely but convincing way by the following anecdote, which we extract from an exchange paper.

During the past summer one of Charlotte's German residents came to Rochester for lumber to finish a house which he had built in the former place. He gave the matter his personal attention in order to get the best material in the market. He spent several hours in picking out the choicest boards, and, after paying a good round price for the same, mounted his purchase and proceeded homeward. After the lumber was cut and sawed, and put in position pleasing to his eye, he engaged a painter to put on the finishing touches. Being called away on business matters for a day or two, the German left instructions with the manipulator of the brush to do the painting in a manner consistent with the material to be decorated and to make a first-class job. Business matters adjusted, the German returned to the spot uppermost in his mind to inspect the progress made during his absence. The artist, intent on pleasing, had almost completed the work after his nicest designs of oak imitation. The German took it in at a glance and approved of the business in a manner little anticipated by the painter. "Mein Gott, feller! Vat der h——l you make of dot knots und stringy peashness for doze blanks? You tink I vas a fool und make of myself mit a lumber pile von whole day, and bay four exdra dollars mit a hundred feet for doze nice poards mitout knots, und den pring you here mit your rags und iron combs und tings, und bay you tree dollars a day to put knots in 'em? Not py a tam sight; if I vant knots I puy knots tammed scheap. Gone avay quick." The artist, accompanied by his kit, went out astride the violin-box hung at the end of the Dutchman's leg, and that vicinity knows him no more.

"THE LAND OF HEALTH."

DR. BENJAMIN RICHARDSON, who four years back delighted the Social Science Congress at Brighton, in England, by his marvellous sketch of the imaginary Hygeia, the "model City of Health," drew for the recent sanitary congress at Croydon an equally enchanting picture of the healthful country of Salutisland. In this ideal realm sickness and sorrow are all but unknown. The inhabitants lead Arcadian lives under sanitary conditions so perfect that none die before their hundredth year, while many add a sixth score to the century, and, on their 120th birthday, meet death with the welcome due to a friend who arrives at the appointed hour. For in Salutisland, the dark king is stripped of his terrors by a wholesome life extended to the utmost natural limit. Dr. Richardson, with scientific care, has banished from the bright region created by his fancy all the forces and agencies that sap vitality before it is ripe. There are no lawyers, for contention is unknown. Physicians find limited tolerance as "professors of sanitary science and preventive medicine." No city in this blissful country is permitted to exceed a population of one hundred thousand, or to dispense with embowering gardens and wide tree-shaded streets. The houses stand on arches, so that a free circulation of air is secured on all sides. The living-rooms are separated from the bedrooms. There is a garden to every dwelling. Even the roofs are beautified by flower plots. The people of Salutisland recognize the right of the inferior animals to life. No creature dies that man may dine. Cows are kept for their milk, and sheep for their fleeces. All personal transit is done on horseback or on the bicycle, railroads being employed only for moving heavy goods. Not more than three hours in each day can be spent in toil. The taxes are of the lightest, for Salutisland possesses neither army, navy, nor diplomatic service. When laws are to be made or changed, the legislators retire to some inaccessible spot "amid dry rocks on a mountainous range," where business is likely to be transacted with the least disturbance and the utmost speed. Thus, the fortunate Salutislanders pass serene lives, free from passion or trouble or toil, and are carried forward to the "anatomical limit of life" by the most consummate sanitary arrangements which Dr. Richardson's trained imagination can desire. Evidently, modern science holds, with Sidney, that the best ingredients of health and long life are

"Great temperance, open air,
Easy labor, little care."

Boston Herald.

KANSAS NATIVE OR UNBURNT LIME.

AMONG the natural products, some of them possessing very peculiar characteristics, which the young and growing State of Kansas contains, is a singular substance, lying in very considerable beds, and called "Kansas native lime." It is of a beautiful white color and of a very fine-grained texture. It is soft, smooth, and readily made into a plastic condition by the admixture of a suitable quantity of sand and water. The mortar thus made up has seemingly identical qualities to the best mortar as made from superior limes selected from kilns where the lime rock which had been employed for burning had been of the very purest nature.

The native lime is a sort of whitish and pure white clay, lying disposed favorably in beds more or less horizontal in their position. These beds are seen to be outcropping along the borders of certain streams and in the breaks of hills, and in such places the beds can be worked entirely above the water level. Experiments which have been performed by workmen and artisans in Kansas have exhibited the fact that the Kansas native lime mortar serves as good purposes as any other usual styles or kinds of mortar, and even better than some of the artificial mortars, especially for nice inside work. The tendency of this newly discovered deposit of pseudo-lime, when made into mortar for walls and stone-work or plastering, is to soon set and harden. Another remarkable quality then noticed is its turning immediately to an intense whiteness. The beds are very thick and easily dug; so that large quantities of the substance can be thrown up, and at once applied to use. Beside its ready adaptability to purposes of mortar, it has also been applied to the purposes of whitewashing, and in this respect it has been accepted as an admirable substitute for lime prepared artificially. These immense beds of pseudo-lime occur in localities where railways of eastern Kansas can readily be utilized for shipping the material to all parts of the country. It is, perhaps, presumable that upon the spread of the knowledge of this fact, the excellent natural mortar-lime and whitewash-lime from these native deposits may become articles of export, especially as improved styles of building and more permanent structures everywhere in Kansas, Missouri, Nebraska, Iowa, and Illinois are growing to be more and more the requisites of the times. The great pseudo-lime beds or native beds of calcined lime rock are a geological phenomenon. They are difficult to account for in any plain or obvious manner. They have a close resemblance in their physical condition and looks, and in their feel or touch, and in their action when mixed to form mortar, to the best mortars made in the usual ways with the very best of limes. Can it be possible that some of the unknown laws of electro-magnetism and of terrestrial magnetism, which cause certain metamorphisms to occur in metalliferous beds, are likely to be discovered as the laws also which set the elements at work to alter the chemical conditions of this singular lime-rock stratification? Can the problem of their origin and nature be clearly or satisfactorily accounted for in any other way? Does such a strange product as this occur in any other section of our continent? ††

THE ST. LOUIS SUB-CONTRACTOR'S SIGN.

ST. LOUIS, December 5, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — Your St. Louis correspondent must plead guilty to the charge made by "Junior," in your issue of the 29th ultimo, that he did not notice the objectionable placard described by "Junior" in a former letter, and did not intend to notice it; moreover, that he has not seen nor heard of any one else who has noticed it, save your correspondent "Junior."

The senior member of the firm of architects which has control of the building apparently referred to by "Junior" is one of the oldest and most successful architects in this city, having erected a greater number of fine buildings, probably, than any one else, and

enjoying at present much the largest practice in St. Louis. He is therefore not likely to need sympathy nor counsel, nor to be at all deficient in ability to take care of himself.

Very respectfully, C. E. I.

NOTES AND CLIPPINGS.

A $10,000 Verdict for an Architect. — The long litigation over the claim of Mr. J. A. Vrydagh against Vigo County, Ind., terminated December 6 in a verdict for the plaintiff for $10,425. Mr. Vrydagh's plans for a $200,000 court-house were adopted seven years ago, but the citizens of Terre Haute enjoined the Commissioners from going on with the work, and the architect sued on his claim, with the above result. The case was on trial for a week in Greencastle.

Churches in Chicago. — The great fire in Chicago in 1871 left standing, we believe, but a single church in the whole city; yet such have been the spiritual need and the enterprise of the citizens that there are now, according to a recent enumeration, two hundred and thirteen churches in the city, besides about twenty missions and eleven Adventist and Spiritualist societies. The Roman Catholics have thirty-five churches, the Baptists twenty-four, the Evangelical Lutherans twenty-four, the Methodists nineteen, the Presbyterians eighteen, the Episcopalians, Congregationalists, and Hebrews each ten.

The Organ for the Stewart Memorial Cathedral — The organ which is now building for the Stewart Cathedral at Garden City, L. I., is in several respects one of the most remarkable instruments in the world. It will be placed in four different parts of the building, the organist sitting at a key-board in the chancel and playing all four parts at once by means of electrical connections. There is also an echo organ in the roof, which can also be played from the chancel, and the chime of bells in the tower will at times lend its voice in the same way. In spite of the necessarily complicated nature of the mechanism, the adjustment of all the parts is so perfect that no greater pressure is needed upon the keys than in playing a piano. The organ will have some one hundred and twenty speaking stops, which are thirty-six more than in the great organ in Boston Music Hall, and nine more than in the huge instrument in Albert Hall, London. Five hydraulic engines will run the organ. The cost of the instrument will be some $40,000.

Mississippi River Improvement. — The Mississippi River Improvement Convention, which was held in Quincy, Ill., a few weeks ago, adopted a resolution instructing its president, ex-Governor Stanard, of St. Louis, Mo., to appoint an executive committee to prepare a memorial to Congress setting forth more in detail the views of the convention upon the subject of the improvement of the channel of the Mississippi River and tributaries, to collect and publish statistics bearing on the subject for the information of the people and government, and to use all further means to procure early and favorable action upon this subject by Congress. In accordance with these instructions, Mr. Stanard has just appointed the following named gentlemen as the committee: J. Ham Davidson, St. Paul; Charles Seymour, LaCrosse; M. T. Johnson, Galena; Robert F. Bower, Keokuk; John A. Scudder, St. Louis; John Bofinger, St. Louis; S. F. Covington, Cincinnati; Enoch Ensley, Memphis; Jos. H. Oglesby, New Orleans. Mr. Stanard is also a member of the committee.

Illicit Commissions. — A case (heard in the Lambeth County Court before Mr. Put-Taylor) was lately brought for the recovery of a balance of commission, and is reported in the *South London Press*. Plaintiff is described as a draughtsman, carrying on business at Norfolk Street, Strand; defendant is a builder carrying on business in Beresford Street, Walworth. The claim was for £4 15s., balance of an account for commission. Plaintiff, it appeared, had had placed under his control five dilapidated houses situate in Broad Street, Lambeth. Plaintiff had also the option of employing any builder he saw fit to carry out the necessary repairs. Plaintiff and defendant had some conversation on the subject, and plaintiff asked defendant what percentage he would allow him in the event of his obtaining defendant the job. Defendant said he would allow him five per cent. Plaintiff complained that that was a small percentage on a £200 job, but agreed to obtain it for him on those terms. The contract was obtained by the plaintiff for defendant, and amounted with extras to £215. Plaintiff then claimed his commission, £10 15s., but defendant refused to pay more than £6 of that amount. This sum had been paid to the plaintiff, and he now sought to recover the balance of £4 15s.

The Judge (to plaintiff). — It is my duty to tell you that you have committed a gross fraud, and you may consider yourself fortunate you have not had to appear before a magistrate. A gentleman engages you for the purpose of obtaining a builder at the cheapest rate, but instead of doing so you make the best bargain you can for yourself. It is a gross fraud, and you ought to be ashamed of yourself; so get out of the court as soon as you can.

Judgment for defendant, with costs of solicitor.

The Cost of Theatres. — A German return which has been lately published gives the following interesting particulars of the cost of building some of the leading Continental theatres. The Stadt Theatre, at Leipsic, built in 1868, cost, altogether, $419,110. The Court Theatre, at Dresden, which was burnt down, and which was built between 1838 and 1841, cost $395,970; and the present theatre, which took from 1871 to 1878 to build, cost $1,075,000. The Théâtre du Châtelet in Paris, built between 1860 and 1862, cost $685,000. The Comic Opera House, in Vienna, built between 1872 and 1874, cost $418,500. The Théâtre Lyrique, in Paris, built between 1860 and 1862, cost $449,560. The Imperial Opera House, in Vienna, which took from 1861 to 1868 to build, cost, altogether, $2,700,000. Finally, the Grand Opera, in Paris, the building of which occupied from 1861 to 1875, cost $8,000,000. — *Continental and Swiss Times.*

Who was Terra-Cotta. — The Providence *Press* tells of a lady in that city who, after attentively examining a bust in a window, eagerly inquired, "And who was this Terra-Cotta, any way?"

The Famous Aztec Ruins at Palenque. — M. F. Maler describes in *La Nature* some important results obtained by him in a recent visit to the famous Mexican ruins of Palenque. Taking the Palace of the Kings for his point of departure, he made excursions in all directions. He came upon innumerable heaps of stone, the last remains of once solid monuments. He found hundreds of houses, partly standing, partly demolished; small bridges; aqueducts, in which even now the water flows so fresh and pure that M. Maler and his companions could not help taking a drink from it. The number of temples and palaces still standing on their pyramidal bases, more or less great, is (counting the large Palace of the Kings, with its tower, as a single edifice) exactly a dozen. The result of M. Maler's researches relative to the great extent of the ruined city, especially in an east and west direction, is quite in accordance with the accounts of the oldest explorers. He only disagrees with those modern explorers who, having only visited the buildings situate close to the Royal Palace, without penetrating further into the almost impenetrable forest, have cast doubts upon the abundance of the ruins. M. Maler describes in detail one of his new discoveries, — a temple hitherto ignored, which contains in its sanctuary a mysterious sculpture, with a figure of a cross, affording much food for thought to American archæologis s. To give an idea of the incredible thickness of the forests in these wild places, M. Maler states that the temple is at no great distance from the centre of the ruins, being quite close to the Temple of the Cross (known long ago) and the Temple of the Trophy. These three temples are situated at a short distance from the Royal Palace, towards the southwest, that is, in the direction of the Cerro Alto del Palenque, with their façades towards a little triangular space, of which they occupy the three angles. They are built on an almost identical plan, which may be called the typical plan of the temples of Palenque. Each of them is raised on a pyramid, which, in the case of each of the temples already known, is detached on all sides, while in the case of the newly-found one it rests against the slope of the Cerro Alto. The distance of one temple from the other did not appear to exceed 150 metres, and of the commencement of one pyramid from another not fifty metres. On the platform of the pyramid, at a length of perhaps forty metres, rises the newly-found temple, which, from its base to the verge of the stone roof, does not exceed a height of eight metres. It is built entirely of calcareous ashlar, dressed along the edges. The façade or external part of the vestibule, once formed, like the two neighboring temples, by four pillars which support the stone roof, has, unfortunately, already yielded to the sad work of vegetation, which is to be regretted, as the pillars were generally ornamented with superb figures in stucco richly painted. The bottom of the sanctuary in the central chamber is adorned with sculptures, the most curious at Palenque. They are executed on three slabs of calcareous stone of one metre eighty-one centimetres in height, by two metres eighty-nine centimetres in total breadth. The two pillars which support the vault of the sanctuary were formerly, as in the other temples, decorated with sculptured figures on large slabs of calcareous stone, which, unfortunately, have disappeared. Some fragments of these figures, representing richly vestured personages, still lie on the threshold. The sculpture at the bottom of the sanctuary is still perfectly preserved and quite visible, notwithstanding its feeble relief. On a species of pedestal rises a cross, of a design even more striking than that of the neighboring temple, so well known. The cross is surmounted by a strange head, bearing on its neck a collar with a medallion. Above the cross is seated a bird with a hieroglyphical head; to the right, a man is placed on a graceful leaf ornament. This personage is not habited in the manner of the great lords of Palenque; he represents, without doubt, one of the people, as does the woman on the opposite side; the latter holds in her hands an offering. Both man and woman have the mouth open, as if speaking. Four rows of katun (or magic writing signs), on the right and left of the group, contain, no doubt, the legend as to the worship to which the temple was dedicated and the epoch of its foundation.

The Open Air Theatre at Oberammergau. — The Commune of Oberammergau has built a new theatre for the representations of The History of the Sufferings and Death of Jesus, which will be given in the famous valley next year. The part for the spectators will accommodate between five and six thousand persons. Exactly as in the great theatre built for the Wagner festival at Beyreuth, the orchestra will be placed quite out of view of the spectators. The number of persons who will be engaged in the performance, including children, will be between six hundred and fifty and seven hundred. Of these, nineteen will be actors and solo singers. The orchestra will consist of thirty performers. Almost the entire population of the city will have some share in these gigantic representations.

What a Fire Insurance Policy does not Cover. — Fire insurance policies do not include in their indemnity, among other things, the following: Fences and other yard fixtures, also store furniture and fixtures, and plate-glass doors and windows, when the plates are of the dimensions of three feet or more. It is important that this fact be mentioned in the wording of the policy, if such articles are to be included under the policy. If a building falls, no insurance will attach, or cover its loss, unless it is caused by fire. Losses from explosions are not to be paid unless fire ensues, and then only the actual fire loss is to be settled for. The assured, in case of a fire, must invariably do his best to save it, and carelessness in this respect will vitiate his claim. In no instance shall he abandon his premises to firemen or thieves. — *Philadelphia Insurance Reporter.*

The Baltimore Aqueduct. — A Philadelphia paper states that the great subterranean aqueduct which is to supply the city of Baltimore with water is almost completed. It is twelve feet in diameter and very nearly seven miles in length. By means of a dam across the Gunpowder River at Lock Raven, twelve miles from the city, the water is turned into the tunnel and carried to Lake Montebello, seven miles distant, where it is discharged into an immense natural basin, which has been paved with brick and cemented, so as to answer all the purposes of a reservoir. From this basin the water will be distributed to the supply-mains of the city, five miles distant. The tunnel cost $1,500,000. It was commenced in 1876.

A Model School-House. — At Perkinsville, Vt., is building a school-house, the cost of which will be between $16 and $17.