

BOSTON, OCTOBER 19, 1878.

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THE reproach has more than once been brought against modern archaeological explorers that they were too exclusively interested in what they could carry away, and made too little account of what they had to leave behind; that the zeal of the collector overbore that of the investigator. It is doubtless true of the two most successful of recent explorers, Dr. Schliemann and General di Cesnola, that their explorations would have been still more valuable if they had taken as much pains to critically examine and record the architectural and structural remains among which their treasures were found, as to secure the treasures themselves. Some negligence in this respect is very natural in men whose archaeological study is the fruit rather than the seed of their explorings, and who set about their work with the eye of an untechnical observer, to which swords and bowls are in themselves more interesting objects than walls or broken capitals, quite independently of their bearing on the special problems of archaeology. Continental archaeologists have brought a like complaint against some of the various English explorers — even Mr. Newton himself — who have been assisted by the British Museum, or have worked with an eye to it, alleging that in their eagerness to increase the Museum they have paid attention only to such artistic movables as could enrich it, and have lost many opportunities to advance the world's knowledge by more thorough exploration; and even Englishmen, from Byron's day to ours, have cried out against Lord Elgin's high-handed plundering of the Parthenon. Thoughtful people have agreed that these complaints are more or less true, and ought to be kept in mind, in order that what is done hereafter may be more easily done, but they have consoled themselves by reflecting that the benefit of the museums to art and science far outweighs the errors of inconsiderate collectors; and that the Elgin marbles are both more useful and more honored where they are than if they had been left to clothe the Parthenon or had found their way into the Greek Museum, where they would have remained, like many other precious relics, uncared for and inaccessible.

THIS compensation also is doubtless real, but it appears in its turn to have its counterpoise. The zeal of conservation has often shown itself as formidable as neglect or even violence. We are used to this in architecture; the ravages of the restorer of paintings are proverbial, but it takes one by surprise to be told that the wonders of Greek sculpture are dying a slow death at the hands of their friends. A gentleman who was in England not long ago wished to bring home copies of some of the Elgin marbles to form part of a collection for the use of students, and applied to have casts taken from them. He was told that he could have them made, but that he would do better to take them from moulds made thirty years ago, because the sculptures themselves had deteriorated since then. On careful comparison of the early casts, he found that this was literally true. It is the custom, it seems, to preserve these marbles from deteriorating influences by rubbing them once a week with cloths. This conservative process, which in the course of thirty years would give some fifteen hundred rubbings, has in that time visibly affected the sculptures. Fifteen hundred impressions, indeed, would tell on a copper plate; it is not surprising that they should have their effect on the marble relief. It appears that a similar care is taken of the pictures in the National Gallery. These — excepting the Turners, which have for safety's sake

been put under glass — are wiped over with a silk cloth every week. This process, gentle as it may be, must tell upon them also in time, if it has not already; but the English conservancy is tenderness itself compared with what we see elsewhere. The French habit of scraping off a film from the sculptures of a building whenever they get darkened by time is well known, and it is not long since we quoted an account of the tooling over of the carving in the Cathedral of Florence. These things, too, are mild compared to the treatment which pictures may undergo even when they are not repainted. The pictures in the Uffizi Gallery, the most precious collection in the world, not long ago narrowly escaped a wholesale cleaning with acid after the invention of some ambitious Italian. Fortunately a preliminary experiment was tried on a single picture; it was disastrous enough to arouse even Italian indifference, but there was some difficulty in checking the process.

THE English Royal Commission on Copyright continues its study of the question of copyright in works of art, and we find in the *Architect* of September 28 a report of the evidence given before it by Mr. Thomas Woolner, R. A. Some of Mr. Woolner's answers to the questions of the commission are noteworthy, if they indicate what are the common ideas of his fellow artists on this subject; and from his professional standing we may presume that they do. They lead us to infer, what we might have imagined, that while artists are anxious in a way to secure for themselves a protection in their work like that they see secured to authors, they really take little care to use the advantages that the law allows them, or even to inform themselves what these advantages are. Thus, Mr. Woolner, when reminded that sculptors could protect themselves against copies by registering their works, could not remember that any of his profession had ever done so in a single case. It would appear that English artists do not even care to acquaint themselves with their rules of registration, for the eminent sculptor, whose works have been before his countrymen some thirty years, during which time the provisions have been changed by law twice or more, when questioned concerning these provisions could only recur to what he had heard concerning them when a pupil. At present the English law provides that copyright on works of sculpture can be secured for fourteen years, with right of renewal for fourteen more, on registration by means of a copy, drawing, print, or de-cription, according as the registrar shall determine; but this gives security against copying only, and not against reproduction by engravings or photographs. Mr. Woolner argued that the copyright should be assimilated to that in books, which runs to forty-two years at least, or seven years after an author's death, and should be a defence against engravings and photographs as well as against copies. At the same time he acknowledged that such reproductions were rather a benefit than an injury to an artist, because they increased his reputation.

WE suppose it may be assumed that artists everywhere have much the same feeling as Mr. Woolner. They do not want, that is, to be troubled with registering; they want all that anybody has in duration of right, and they want to be protected against unauthorized prints and photographs, more, after all, as against an infringement of dignity than as against any pecuniary injury. The truth with them is that the business aspects of the protection, to use the phrase of an old army officer concerning some special duty, do not suit the shape of their minds; yet it will be difficult to induce legislators to consider other aspects of it. It is not easy to see how any system of copyright can be made to work satisfactorily without registration, which, however, can be made sufficiently easy, as Mr. Woolner himself suggested, by filing photographs. Prints and photographs may fairly be forbidden, not merely because artists feel themselves entitled to suppress them, — for this, though it be reasonable, will not appeal greatly to the average lawgiver, — but because the right to make them, being a source of profit, and therefore merchantable, belongs of right to the artist who created it with his work. But it will hardly be best to try to extend this, as some favorers of architectural copyright would have us, beyond actual representations taken from the object itself, for the authorship of ideas in these days is a very inscrutable and slippery thing. As for the duration, there is not the same reason for extending the protection over works of art as

over books, for with the multiplication of these, if they are unpublished, the protection is a continued source of revenue, which it is not with a work of art. The proper analogy, if it could be made to work, would be in giving the artist, or his heirs, a royalty for a fixed period on the increase of value which time and a growing fame added to his works after they had passed out of his hands. This would not be unreasonable, and would cure many a case of cruel injustice; but we fear it would be difficult to make it prevail.

THE second annual report of the School of Drawing and Painting attached to the Boston Museum of Fine Arts gives a good showing of the progress of the school during the last year, while the new year begins with a larger number of students than ever before. The whole number of students received during the year was a hundred and sixty in the day classes, of whom a hundred and twenty were women; and sixty-three, men and boys only, in the evening classes. The students in the painting class were ninety-seven; whether all of these painted from the models, who sat every day, we are not told, but the life classes have been naturally the principal feature of the school. The greater part of so many pupils being women, it is fair to infer that comparatively few will become professional artists; yet the whole curriculum and discipline of the school have been arranged with a view to professional training. The attendance of last year, and the work shown to the public at the end of the session, indicated that the training at least was not slackened to suit the liking of amateur pupils, and the zeal of the students was shown in their forming a sketching club, which included the greater number of them, says the report, and occupied the painting room during off hours with voluntary work. The most interesting experiment of the year was the course of modelling which was introduced into the curriculum. Although this was confined to the figure, it was not arranged as a class for students in sculpture merely, but as part of the regular work of every pupil, in order, as the report says, "to give a more intimate knowledge of form and a readier perception than drawing alone could give." We suspect that this is the first example where the modelling of the figure has been made an essential part of the instruction of a large school of painting for both sexes, and we could wish it might have a thorough trial. We are inclined to think such a study a very important help in the training of painters of the figure, giving as it does a fineness of knowledge and conception that is only to be acquired by much longer labor in drawing alone. Unfortunately the teacher at the school, Mr. Dengler, an artist from the Munich school, whose work and instruction were full of promise, was obliged by failure in health to break off his course. The experiment, however, had lasted long enough — we quote again from the report — "to show that while the value of modelling as an educational and disciplinary exercise had not been overrated, there yet were difficulties which had not been counted on in the way of making it part of the regular work of the school. For while a certain number of the students greatly enjoyed the work, and others, though not caring much about it, highly appreciated the advantage they derived from it, to others it was positively distasteful, and to a certain number, particularly among the young women, it seemed to be injurious to the health, either from the fatigue of the unusual exertion or from the unavoidable dampness of the work-room."

THE horrible disaster at the Colosseum Theatre in Liverpool, a few nights ago, reminds us again that the things which crowds dread are not the things that injure them. It shows conspicuously that what an audience most dreads is fire, and that their fear itself is the fatal thing to them. A mere squabble in the pit was enough to make some foolish person catch at the idea of fire and scream it out; then the audience at once grew frantic, and three dozen of them were trampled to death. The most perfect fire-proofing would not have helped the matter here, for no fire-proofing is so safe as the absence of fire. If a theatre should be built with absolutely no material in it but brick and iron, and planned as theatres are commonly planned, an alarm of fire in it would still certainly be fatal. No doubt some adventurous managers will hasten to conclude from this calamity that fire-proof construction is after all of little avail and not worth its cost, but there can be no doubt that an actual fire would have added enormously to the loss of life among the people — four or five thousand, it is said — who were in the theatre, as it did in the case of the Brooklyn Theatre. It only proves once more

that the greatest danger is of panic, for it is that which adds the chief peril to fire, while without fire at all it is still itself a deadly peril. Therefore while an incombustible construction is a *sine qua non* in a properly built theatre, the most unpardonable sin is difficulty of egress. The Liverpool theatre, we are told, while it was enormously large, was intricate in arrangement and hard to get out of. The exits converged into a narrow space, where bodies were piled up six or seven deep. A standard which divided the doorway so obstructed the crowd that they were blocked until it was driven away with an axe, — an illustration of a theory which has found some favor, that it is a good thing to put obstructions in the way of an escaping crowd, so as to prevent its injuring itself by going too fast. Unfortunately if there is one thing that the proprietors of theatres are more unwilling to provide than a proper construction, it is sufficient means of exit: the one costs money, the other both costs money and consumes space. The desire for large houses and the call of the multitude for cheap amusement are arguments which they cannot of their own strength resist. It is imperative then in the legal regulation of theatres to insist that they not only shall not burn easily, but shall be planned from the beginning with plenty of outlets expanding towards the exterior, and so arranged as to subdivide and distribute the audience as it retires.

THE accumulation of fatal accidents which are the results of carelessness in construction is beginning to make people realize that it does not do to slur our accountability for them. A coroner's jury, in the case of the man who was killed by the fall of an elevator in the building of A. T. Stewart & Co., New York, though apparently unwilling to directly ascribe the death to negligence, has declared in its verdict its belief that the elevator was not in proper order, which amounts to the same thing. The evidence showed that the pawls of the elevator had manifestly failed to do their duty in catching it when it fell, being probably clogged with coagulated oil. There is every reason to ascribe this to neglect in not keeping the machinery in proper order, and every reason to suppose that a great part of the elevators in the country are in the same condition, since experience makes it clear that appliances which are kept unused, intended to be ready in emergency, are seldom in condition for use when they are wanted. The coroner's juries on the explosion of the boiler of the Adelphi at Norwalk go farther, and declare unshrinkingly that "the boiler exploded because of overwork and overpressure, legalized by a United States statute, increased after shiftless inspection, and persistently used by the attendants in charge after there was sufficient evidence of its dangerous defects." The Massachusetts Railroad Commissioners have indicted for manslaughter the conductor to whose mismanagement they have traced the fatal collision which happened a few days ago on the Old Colony Railroad. On the other hand, the coroner's inquest on three men killed lately by the breaking of a scaffold on the New York Elevated Railway has ended in a verdict of accidental death, but with the significant recommendation that henceforth a competent person should be appointed to select timber for the scaffolds. We shall succeed better in these things when the public grasps the idea that the penalties which are to be inflicted in such cases are not vindictive, or of the nature of personal punishment, but necessary and merciful precautions for the general safety.

CAPTAIN BROWN's report to the Secretary of the Treasury on the progress of Captain Eads's Mississippi jetties shows that the scouring action due to the jetties has lowered the bottom over about one and a quarter square miles in front of the South Pass by nearly two feet during the past year, which represents a scour of 2½ millions of cubic yards. In this deepening process the curve of 40 feet depth has receded shorewards 117 feet, the 50 foot curve 228 feet, the 60 foot curve 190 feet, the 70 foot curve has advanced 46 feet, while the other curves out to 100 feet have receded. The minimum depth of the channel has increased between July 28, 1877, and July 15, 1878, from 20.3 feet to 22.3 feet. The length of the shallow between the 22 feet curves at the one date and the corresponding 24 feet curves at the other remaining nearly the same, — from 150 to 160 feet; 12,500 cubic yards of stone and 4,000 cords of willow have been laid in the east jetty during the year, and 5,500 yards of stone with 1,400 cords of willow in the west, to which are to be added 1,200 cords of willow and 200 yards of stone in the wing-dams.

## THE OPEN FIRE-PLACE. II.

## PRACTICAL EXPERIMENTS ON THE WASTE HEAT AND AIR CURRENTS.

In the fire-place represented in Figs. 1 and 2 (see page 116, *ante*) the back measures 2,500 sq. cm., the sides 500 each, the bottom 500, and the top 350, as per accompanying diagram, making in all 4,350 sq. cm., against 2,500 for the opening in front, so that the rays entering the room directly amount to  $\frac{2500}{4350+2500}$  or, considering the portion intercepted by the grate, to about one third of the whole, or less than 8 per cent of the entire heat generated by the fuel.

To this 8 per cent must be added something for the return radiation from the brickwork, because, although a large portion of the radiated heat, striking the walls of the fire-place, is carried off by contact of the cold air entering the chimney under the influence of the draught, which, as we have seen, amounts to from five to fifteen hundred feet a minute, and part is absorbed by the brickwork, yet a certain portion is returned by radiation and reflection into the room. A simple calculation will give us the amount accurately enough for our purposes. The fire-place represented in our figures being small and blackened with smoke on its sides as well as back, no reflected heat could be counted upon. Moreover the radiating power of these walls being inversely as their reflecting power, what we lose in reflection we shall gain in radiation. The surface of the back, sides, and bottom measures 4,000 sq. cm. According to Peclet 1 sq. metre of brickwork radiates 3.59 units of heat per hour for 1° C. difference of temperature between the radiating and the receiving surfaces. Therefore 0.4 sq. m. would radiate 1.44 units per hour per 1° C. The temperature of the

TABLE II.

| Time. | Average Temperature of Back of Fire-place. | Thermometer at 50 cm. from fire. | Thermometer at 1 m. from fire. | General Remarks. |
|-------|--------------------------------------------|----------------------------------|--------------------------------|------------------|
| 3.32  | —                                          | 19°                              | 19°                            | Fire lighted.    |
| 3.37  | —                                          | 45                               | 32                             | Full blaze.      |
| 3.42  | —                                          | 64                               | 43                             | Declines.        |
| 3.47  | —                                          | 75                               | 48                             |                  |
| 3.52  | 215°                                       | 60                               | 41                             | Fire out.        |
| 3.58  | 210                                        | 45                               | 34                             |                  |
| 4.4   | 190                                        | 36                               | 30                             |                  |
| 4.10  | 155                                        | 34                               | 27                             |                  |
| 4.16  | 135                                        | 30                               | 24                             |                  |
| 4.22  | 115                                        | 27                               | 24                             |                  |
| 4.28  | 100                                        | 26                               | 22.6                           |                  |
| 4.34  | 90                                         | 24                               | 22                             |                  |
| 5.34  | 70                                         | 22                               | 20                             |                  |
| 6.34  | 40                                         | 20                               | 20                             |                  |

walls of the fire-place is shown in the second column of Table II., thermometers being placed in different parts of the back of the fire-place and the average temperature being taken. While the fire is burning brightly the radiation from the walls of the fire-place would be partially intercepted by the fire itself; but taking the average temperature of these walls during the first twenty minutes at 220° C., and supposing that only one half the radiation of these walls was intercepted by the fire, fuel, grate, etc., and finding 20° C. to be the average temperature of the objects in the room, we have  $\frac{220-20}{2} = 100°$ .

$$\frac{1.44 \times 100}{3} = 48 \text{ heat units.}$$

During the next six minutes the average temperature per minute being according to the table 210°, we have  $210 - 20 = 190°$ , from which we have, by calculating as before, 27.3 units radiated. Continuing the calculation in this way for each portion of the time, we have, for the total amount of radiation from the walls of the fire-place, 270 heat units.

Of this we may assume that one half was radiated into the room and the other half lost, and we have 135 units ( $= \frac{135}{100}$  or  $\frac{1}{10}$  of the radiated heat striking the walls of the fire-place) returned into the room to be added to the 826 units, or 8 per cent, of direct radiation. This gives 961 units, or a little less than 9 per cent of the whole heat generated, for our result. According to Peclet only 6 per cent is realized instead of this 9 per cent.

As for reflected heat, under certain circumstances a small amount may be added to the above results when the sides of the fire-place are kept white, or are tiled and of the proper inclination for reflecting the rays. We may take it for granted that the back, top, and bottom reflect only half as much as the sides. Supposing the sides reflect one third of the heat falling upon them, and that they occupy one fourth of the entire surface of the fire-place, as in our case, we have  $\frac{1}{3} \times \frac{1}{4} \times \frac{1}{2} = \frac{1}{24}$  of the whole reflected heat, or in our case  $\frac{1}{24} \times 826 = 34$  units, or about 0.4 per cent. Add 0.4 per cent for the back and bottom, and we have 0.8 per cent of the entire heat generated as the amount which may be added for reflection. Inasmuch, however, as the radiation diminishes as the reflection increases, this may here be neglected.

Duclet's experiments show that the radiation from heated bodies is much greater in proportion at very high temperatures than at moderate temperatures. But we have not added anything to our figures for this, because we consider it more than balanced by losses in other ways, such as that due to imperfect combustion of the fuel, for which we have also made no account. It is estimated that with the ordinary fire-place, about one eighth of the fuel is wasted in unconsumed smoke.

Our 9 per cent so far found must, however, again be modified, in consideration of the heat taken from the room by the cold air entering the doors and windows under the influence of the draught.

In our case we have by Table I. an average of 833 cubic metres of air, which must have passed through the room and into the fire-place from the outside. The average temperature of the room and objects contained in it having been raised one degree by the combustion of our three kilograms of wood (the doors and windows having been kept closed during the experiment), we have  $833 \times 1 \times 1.29 \times .24 = 258$  units, or  $\frac{258}{961} = \text{about } \frac{1}{4}$  of the whole. Deducting 258 from 961 we have 703 units, or only 6 per cent of the heat generated by the fuel, for the total amount of heat which can possibly be utilized from wood fires under the best conditions and most perfect form of ordinary fire-place, to say nothing of the fact that where the rooms are provided with the so-called ventilators near the ceiling, even this little heat is carried off almost as fast as it is formed!

Deducting from the 10,770 units generated by the fuel the 703 units utilized by radiation and the 5,070 units escaping through the chimney mouth into the atmosphere, together with the eighth lost in unconsumed smoke, capable of generating 1,340 units, we have 3,660 units for the amount absorbed in the brickwork. Of this nearly 1,000 units were absorbed in the upper half. The remaining 2,660 must have been taken up by the lower half. In these experiments, however, the flues were cold at the outset and the absorption on the part of the masonry was at its maximum. In winter, when the flues are kept constantly heated, but little is absorbed by the brickwork, its power of absorption being limited by the low conducting power of the material, and the amount lost at the top of the chimney is correspondingly greater.

With coal fires more of the heat of combustion is utilized. Supposing that, under the best of circumstances and with coal having the greatest radiating power, we adopt the figure of Peclet of 50 per cent for the radiating power, we have, as before,  $.50 \times \frac{1}{3} + (\frac{2}{3} \times \frac{1}{3}) .50 = .24$ . From this 24 per cent deduct, as before, one quarter for the amount returned up chimney by the draught, and we have 18 per cent for the total amount utilized, under the best possible circumstances with the best possible fuel. According to Peclet only 12 per cent instead of 18 per cent is realized from a coal fire.

## RESULTS OF EXPERIMENTS.

Our experiments present the following curious results:—

1. Our three kilograms, or 6½ pounds, of wood served to raise the average temperature of our room less than one degree Centigrade, although the heat generated by the wood was sufficient to raise the temperature of 14 rooms of equal size from freezing to 68° Fahrenheit. (The room measured 20 × 20 × 10 feet.)

2. While our fire-place was only sufficient, with three kilograms of dry wood, to maintain the temperature of the room at 1° C. (supposing the outside air stood at 0° C.) for a few minutes, the heat actually generated was sufficient to maintain the temperature at a little below 20° C., or 68° F., and to pass fresh air, raised from freezing to 68° F., through the room for ventilating purposes at the rate of one cubic metre a minute for two days of twelve hours each!

3. Supposing again that the outside air stood at the freezing point, we shall see by consulting the third column of Table II. that a person or object standing 50 cms. distant from the fire would have been heated by radiation up to  $75° - 20° = 55°$  C., or 131°F., while the air flowing by him into the fire would have stood scarcely a degree above the freezing point. At this distance three men would intercept nearly all the heat of the fuel, and all other parts of the room would fall to the freezing point. This radiated heat itself would last at 55° only about five minutes, when it would fall 15°, after which it would continue to fall as shown in the table.

At a distance of one metre, a person would be warmed only to  $48 - 20° = 28°$  C., and six men would appropriate the greater portion of the heat of the fire, which would last, say, five minutes, and then fall 9°. At a distance of two metres a person would be warmed (according to another experiment not here recorded) only 7° C., and at a distance of four metres only about 2° C. But if he happened to stand anywhere in the room sheltered from the direct radiation of the fire, he would enjoy a temperature scarcely half a degree above the freezing point of water.

4. According to our table three kilograms of dry wood cut small served to give a bright fire only ten minutes, and burned out entirely in twenty minutes. To keep a bright fire burning, as in this experiment or as is done in many houses in cold weather, for a day of twelve hours would therefore require 144 kilograms of wood, which according to Rumford are capable of producing  $10,770 \times 144 = 1,550,880$ , or one and half million units of heat, which, if all were utilized in the proper manner, would be enough to keep the temperature of the room up to 68° F. in freezing weather for about ninety days of twelve hours each, equal to three months, or all winter, and give a change of pure air equal to one cubic metre a minute, heated,

say, up to 60° F., for ventilation, during the whole time, it being supposed that the adjoining rooms and those above and below were inhabited and maintained at the same temperature, that the outside wall was double as well as the window, and that the door and window fitted well and were kept closed.

#### THE IDEAL FIRE-PLACE.

What now would be the action of a fire-place and flues ideally perfect?

Ideal perfection would imply:—

1. That all the heat generated by the combustion of the fuel be utilized in heating and ventilating the house, and that the combustion of the fuel be complete.

2. That the supply of fresh air introduced into the house to take the place of the foul air removed be guaranteed perfectly pure; warmed in winter to a temperature somewhat below that of the room; moistened enough to give it its proper hygrometric condition; abundant enough to supply amply the fire and the occupants; so distributed and located at its entrance as to cause no perceptible draught at any point; the gentle air current so directed that it should reach every part of the room; so steady that no part of it should pass over the same spot twice or be twice breathed by the occupants; and so regulated by simple valves as to be under perfect control.

3. That the flues include a special gas ventilator so arranged that all the heat generated by the combustion of the gas should be retained in the room and utilized, while the injurious products of combustion should be carried off.

4. That a complete ventilation of the rooms be effected, both in summer and in winter, without opening doors or windows.

5. That the chimney never smoke.

6. That the construction of the fire-place and flues be simple, durable, inexpensive, safe, and unobjectionable in appearance.

The open fire-place as ordinarily constructed, so much overestimated as a ventilator, satisfies the requirements above enumerated, to the following extent:—

1. Only from five to fifteen per cent of the heat generated by the fuel is utilized in heating and ventilating the house. It must be borne in mind that that is not ventilation which provides only for the outlet of the air and ignores the inlet, and that a hundredth part of the heat of the fuel would be ample to abstract the bad air far more efficiently, if properly applied, than is done by the eighty-five or ninety-five per cent now used.

2. The air introduced to take the place of the foul air removed is not guaranteed pure, but its purity or impurity is left entirely to chance. If the windows are tight, the fire draught will be supplied from the halls, neighboring chambers, or even water-closets and toilet rooms, or, in other words, from soil and drain pipes, bringing poisonous gases and perhaps disease into the house; or, if disease be already there, distributing the noxious air from the sick-chamber into other parts of the house.

If the windows are not tight, the air entering will be too cold in winter, too hot in summer, and always loaded with whatever dust, dampness, or impurity may happen to be in the outer air, to the detriment of the lungs as well as of the furniture of the inmates.

Or, finally, if both doors and windows are closed and tight, as may sometimes happen with careful carpentry and especially at night in bed-rooms, either the air must come in through the chimney itself, causing the fire to smoke, or else no air is admitted, and suffocation is the result.

The history of ventilation furnishes numerous sad cases of such suffocation, cases where the smouldering fire and the sleeper, rendered insensible by smoke or gas, have evidently long struggled for life before either or both succumbed to the want of air.

We may add here that even when the supply of air chances to be pure enough, and abundant enough, and warm and moist enough, and otherwise satisfactory in its quality, it is still unable to ventilate the apartment properly because it is drawn directly up the chimney before it has had time to receive the necessary amount of heat to cause it to rise to the level of the heads of the occupants; while the impure air formed above the level of the mantel, and heated by the lungs and by the gas burners, rises to remain a long time in the room and be breathed over and over again. Or, if special openings are provided above to carry off this upper stratum, what little pure air warmed by contact with the walls, heated by radiation, manages to rise above the mantel, is, as before said, carried off with the impure air almost as fast as it is formed. Thus it often happens with large fire-places and flues that the cold air enters faster than the warm air is produced, so that the more the fuel is piled on and the fiercer the fire the more powerful become the freezing draughts and the lower the temperature of the room.

3. The gas burners are seldom properly ventilated and sometimes not at all. Breathing foul air is as injurious as drinking foul water, yet, while we would shrink with disgust from the idea of drinking water into which the drainage from our houses was known to flow, we allow our gas burners to pour forth a continual stream of carbonic acid and other poisonous gases into our small reservoirs of breathing air, already sufficiently polluted by the exhalations from our bodies and lungs, without giving the matter a passing thought.

4. Complete ventilation in summer as well as in winter is, under the average construction, impossible without opening doors or windows.

5. The chimney often smokes.

6. In one respect our fire-places and flues appear to approach the ideal, and that is in their simplicity, but is it not the simplicity of ignorance rather than that of science?

In order to be able to judge as to how far we may expect to approach our ideal, it will be necessary first to familiarize ourselves with some of the most important devices already tried or recommended by those who have given the subject most attention, and to study the causes which have thus far rendered their adoption so limited.

Many of these devices appear so excellent that it is hard to understand why they were not seized upon at once. But we must bear in mind that the majority of the public are aware neither of the waste of fuel they actually experience, nor of the importance of good ventilation. The style and color of the grate and mantel are of more importance than the construction of flues and all parts which are out of sight. That the pattern and color should be in accordance with the latest fashion is more important than either; and to expect fashion to yield to mere sanitary considerations would bespeak ignorance of one of the most marked peculiarities of human nature.

Then too we know how prone every Yankee builder is to avail himself of his liberty "to follow his own nose by way of a guide-post in the matter of a little science," and how loath he is to leave the beaten track.

These considerations, and the fact that many reject on principle all novelties, on account of the difficulty of distinguishing the good from the bad, are sufficient to render any persistent effort to improve our time-honored forms of building construction most onerous and discouraging, and it would be folly to expect even the most evident improvement, in a matter of this kind, to meet with anything more than a slow and partial recognition.

#### THE ILLUSTRATIONS.

CHURCH OF ST. PAUL, ROME. MR. G. E. STREET, R. A., ARCHITECT.

This illustration, which we reproduce from a past number of the *Architect*, is a view of the church which Mr. Street designed for the Americans in Rome, a description of which appeared in the letter from London which we published last week.

KINDERGARTEN AT WINCHESTER, MASS. MESSRS. J. F. OBER AND GEO. D. RAND, ARCHITECTS, BOSTON.

This building was recently erected for Mr. D. N. Skillings on his estate of Rangely Place, and is known as Rangely Hall. The school-room is 28 by 36 ft., and is finished into the roof, the gable windows being filled with stained glass. The fire-place, including the whole breast, is laid with face brick, and is made an effective feature of the interior.

SHOPS AND OFFICES IN ST. JOHN, N. B. MESSRS. McKEAN AND FAIRWEATHER, ARCHITECTS, ST. JOHN.

This building was begun in the fall of last year and completed in the winter months. It is built of brick and faced with red pressed bricks, chocolate-colored enamelled bricks being introduced in patterns. The string courses and bands are of freestone. The whole building is now used as the Custom House of the city.

MANTELPIECE DESIGNED BY MESSRS. FICKEN AND SMITH, ARCHITECTS, NEW YORK.

This mantel was highly finished in walnut, carved with especial care. Bevelled glass and polished brass were used to lighten the dark color of the wood.

#### CORRESPONDENCE.

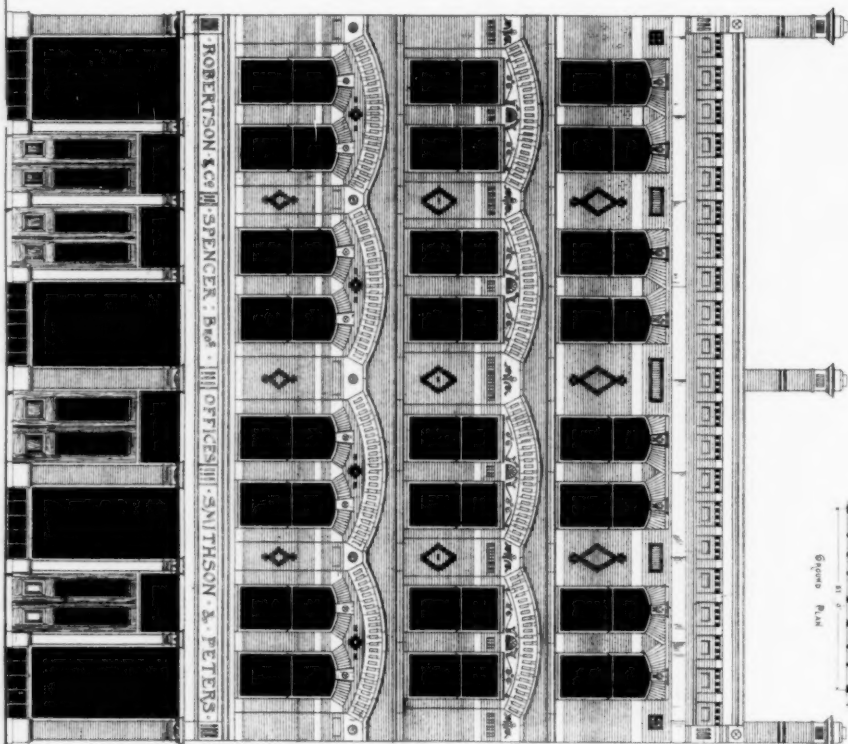
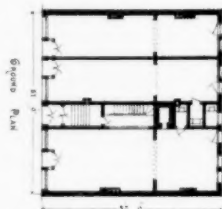
THE MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION'S EXHIBITION.

Boston, October.

THE Mechanics' Fair is at first sight rather disappointing. Since the last fair was held, now four years ago, the Centennial Exhibition at Philadelphia has shown to all classes of the people what may be done both in the way of getting together a great and full display of products of art and industry and of showing them to the best advantage. It was but fair to expect that the influence of that exhibition would be seen, if not in the quality of the things exhibited, at least in the arrangement and display of them in a building erected by the association for the purpose. The contrary is the case. I am disposed to think that in no one of the previous fairs of this association have the goods been thrown together with less apparent regard for the effect they would produce on the visitor. This is partly due, no doubt, to the crowding of the building. The aisles and passages are all extremely narrow, and quickly choked by a very moderate crowd of visitors. But it is due in a much greater degree to a certain incapacity in the average exhibitor to select and combine his goods and arrange them with that happy and instinctive good taste and ingenuity which characterizes the artisans and shopkeepers of foreign lands, and to a less extent those of other parts of our own. The government of the association, also, or that one of its committees having charge of the disposition of the floor space, has its share of the responsibility to bear, in assigning the space to the various applicants evidently without regard to the character of the exhibits, or to the way in which one class of goods was to set off another next



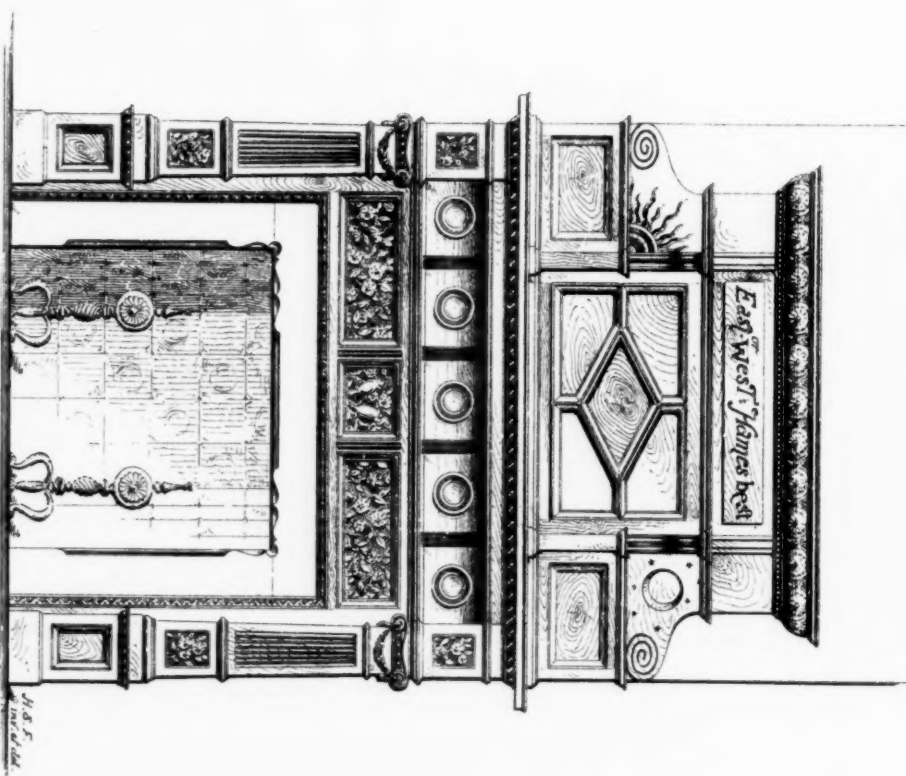
OFFICES AND STORES.  
PRINCE WILLIAM STREET.  
SAINT JOHN N.B.  
FOR  
H. DAVIDSON, Esq.



SCALE OF FEET

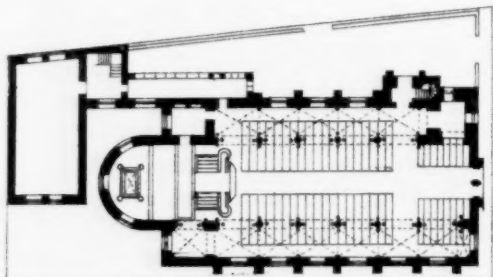
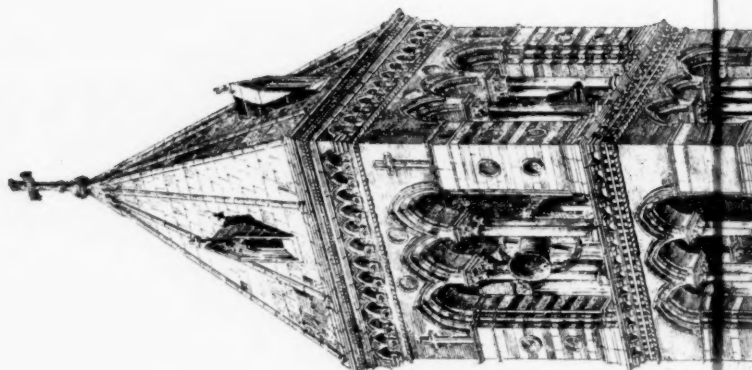
THE "LION" & "TIGER"  
PUBLISHED  
SUNDAY MORNING

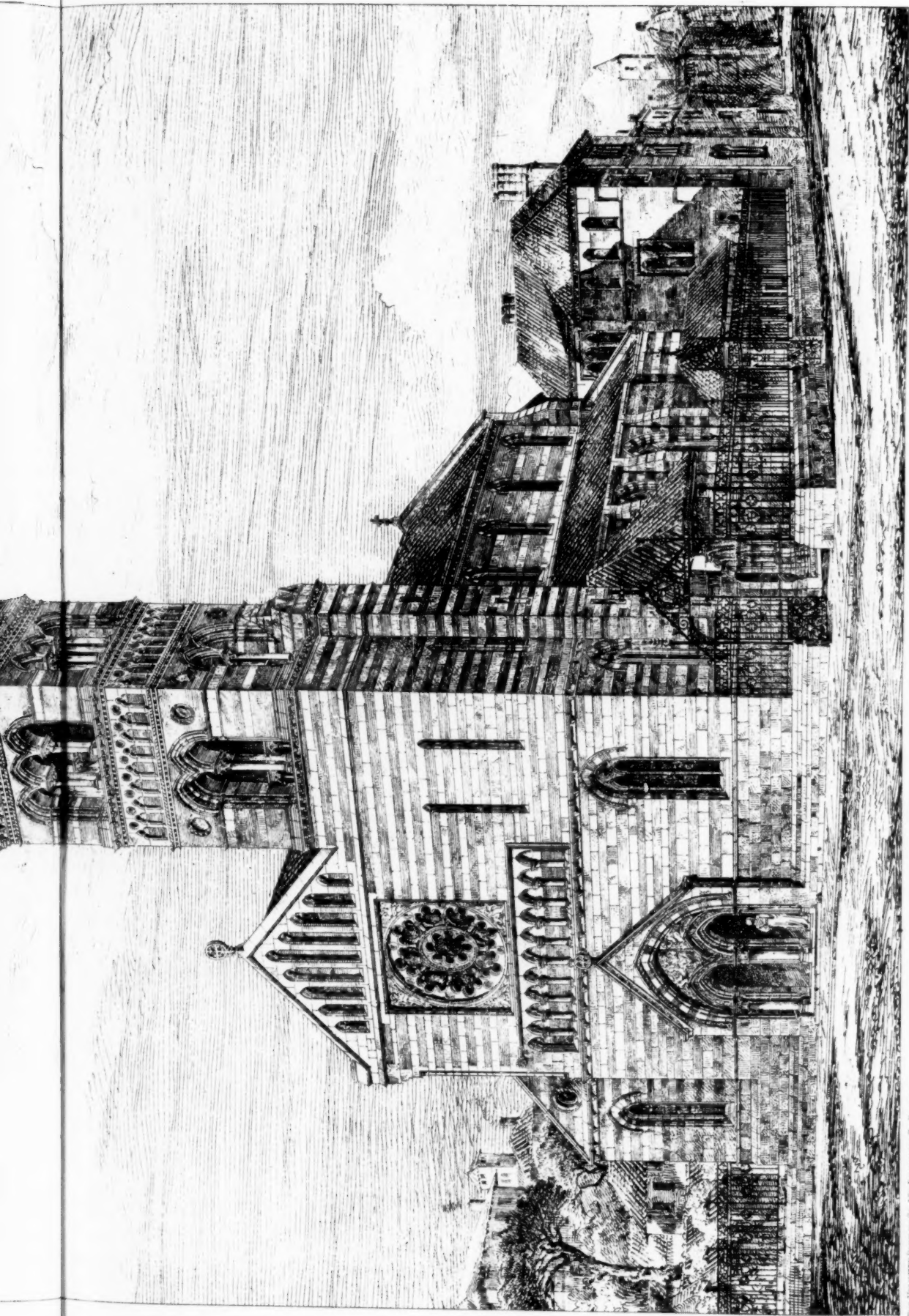
THE PUBLISHERS PRINTING CO. AND LITHOGRAPHERS OF BOSTON



Mantel piece: H. Edwards & Co.  
Charles H. Smith:  
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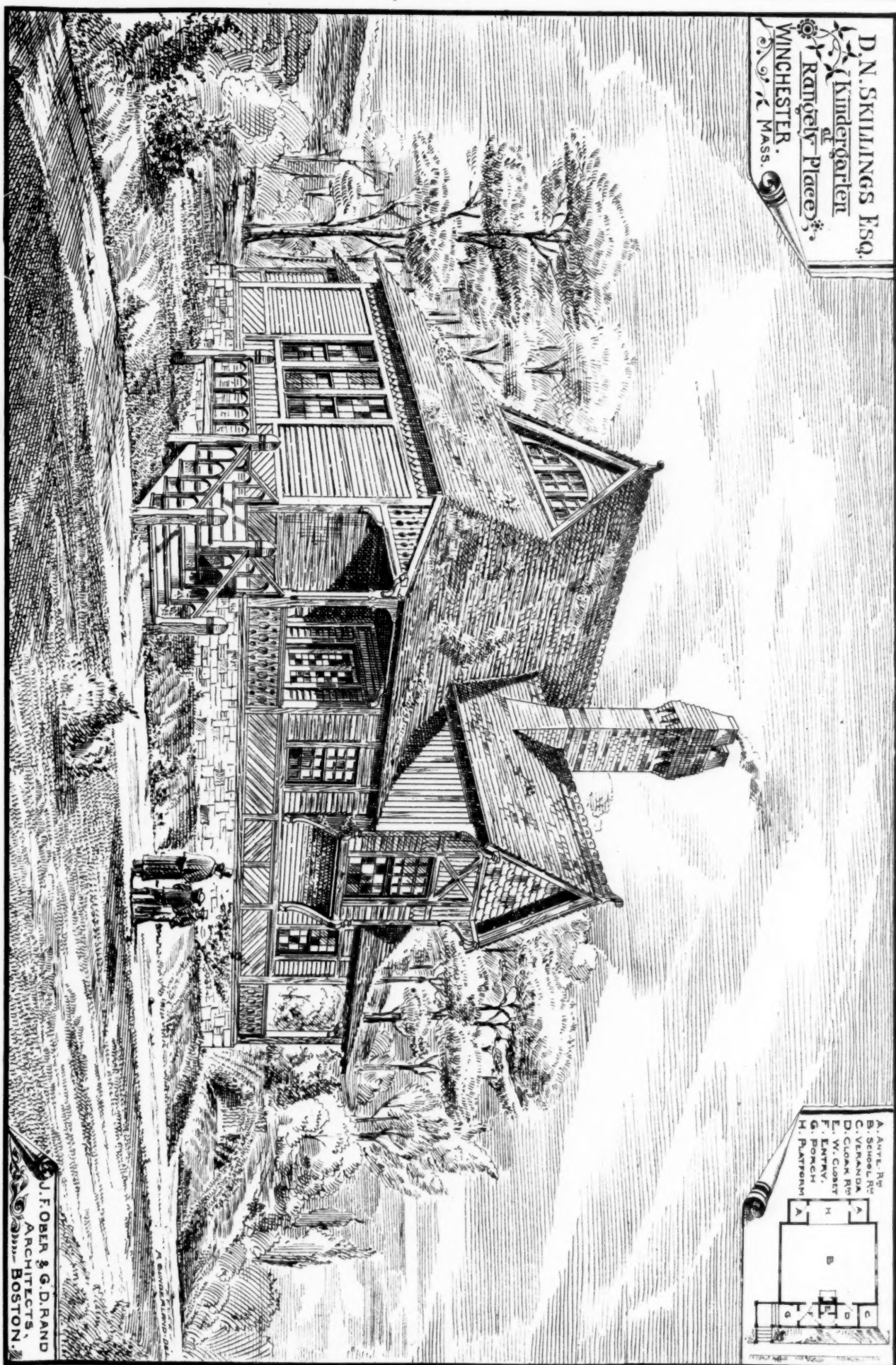




— CHURCH OF ST. PAUL, AT ROME. —  
— G. E. STREET, BA. ARCHT. —

THE ENGRAVER PRINTING CO. NEW YORK







it. Accordingly, we find a tremendous pile of somewhat dowdy calicoes overtopping, on the one hand, a shining case of silverware and jewelry, and, on the other, an exhibit of Portland cement and fire-brick. The machinery, which in the old fairs, if I remember rightly, used to occupy a distinct portion of the great hall over the Quincy Market, is here massed on the centre of the principal exhibition room, and there is no escaping the thunder of the rock-drill, or the deafening clatter of the great woolen loom. But apart from the unfortunate absence of arrangement, one is struck by the commonness of the things exhibited. Hardly anybody seems to have thought it worth his while to produce anything of more than ordinary excellence or beauty for this display. Many of the exhibitors make every day a more interesting show in their shop-windows than at this fair. Add to this that the building is rather barn-like (which of course it must be in the nature of the case), that it is painted in somewhat dull and dusty tones of color, and is almost entirely destitute of decorations, and the result of a general view is apt to be a little *triste* and depressing.

A more careful inspection, however, will modify this first impression. If we can't be greatly amused we shall do well to allow ourselves to be instructed. The practical side of life is after all of the first importance, and at a Mechanics' Fair it is unreasonable to adopt the view of that modern epicurean who said, "Give me the luxuries of life and I will dispense with its necessities." The characteristic of all these fairs has been the clever devices for improving and cheapening manufacture. Here we have the Yankee mind at its best and happiest; it is in this field that all our modest triumphs have been won abroad, and are likely to be, for a generation or two longer at least. In all the departments of art, great and small, we do but follow, however worthily; here we lead. The closeness with which the mind of the inventor follows the working of every piece of machinery, detects every weak point and strengthens it, perceives every opportunity for saving a minute of time, or a stroke of labor, and keeps the machine always abreast of the requirements, or contrives a new one which will do the work of half a dozen of the old, is a national characteristic. On the floor of the main hall, side by side, each in its small glass case, are two very striking examples of this passion for contrivance, and for making machinery do the work of human fingers, which is year by year bringing this country into the place so long occupied by England at the head of the manufacturing nations of the world: the Mosely watch-makers' lathe and attachments, made at Elgin, Illinois, and a complete set of watch-makers' tools, made by the Hopkins Watch-Tool Company of Waltham. The extreme beauty and delicacy of these little tools makes it easy to believe in the precision and uniformity of workmanship which has carried despair into the hearts of the Swiss watch-makers since the report of their representative at Philadelphia two years ago. In most emphatic contrast to this small enginery is the ferocious rock-drill, which under the impulse of its air-compressor alongside delivers its sharp and solid blows on an unresisting block of granite with a force which makes them felt as well as heard throughout the building.

Probably there is no single invention on which so much of incessant labor and ingenuity have been expended in improving, lightening, simplifying, and perfecting it, as the printing-press. There is, I believe, no specimen of any of the great power presses in this exhibition, but there are several new forms of small power and hand presses which are fascinating in the celerity, smoothness, and accuracy of their performance. There is, I presume, no doubt that the world would be better off if half or three quarters of the printing presses could be destroyed, but our faith in this proposition need not make us insensible to the wonderful intelligence and skill which has brought this much abused instrument to its present perfection. The little type-casting machine hard-by is a worthy coadjutor to the presses. I believe all the machines for this purpose have been American inventions, and all, with perhaps a single exception, the work of a single man, David Bruce, of New York. We miss the type-setting machine, which ought to be here to complete the course of instruction.

The usual array of machinery, heavy and light, is brought together on the eastern half of the floor of the main building, and in the gallery over it. The sewing-machines carry the day as to number and variety, but in size and intricacy the great cassimere loom is the most imposing, doing the work of half a dozen hands with a quickness and regularity of which no human hands are capable, and yet under the easy control of a single woman. The power, for all this machinery is furnished by a Brown engine of great beauty, and behind this again we find two great steam-boilers made by the Whittier Machine Co., and set with the remarkable Jarvis Patent Gas-Consuming Furnace, which appears to be a triumph over obstacles which have heretofore been considered insuperable. The advantages claimed for this furnace are, in brief, that by the admission of hot air to the interior of the furnace through a number of small ducts, the combustion is rendered much more perfect than by any other furnace, inasmuch that not only are the gases consumed, but cheap and even wet fuel can be successfully used, such as undried peat, wet sawdust, coal screenings, wet brewery hops, green wood, and various other classes of otherwise impracticable fuel. On one or two days in the week the furnace is fed entirely with wet peat taken directly from meadows in Roxbury, and the usual fuel is anthracite screenings.

A variety of exhibits, more or less especially interesting to architects, are grouped around the entrance of the main hall. The

Selenitic Cement Company shows samples of this cement, which seems to be growing in importance to the profession, but one is hardly helped to any judgment as to its qualities by what he sees of it here. The testimony of well-known architects and builders of England seems to be altogether in its favor as an excellent and economical material. Messrs. Wentworth & Co., and Bowker, Torrey & Co., present rather indifferent examples of marble mantels, and the usual collection of hand specimens of domestic and foreign marbles. The latter firm exhibit, in addition, some fine pieces of the red Bay of Fundy granite, and of the Calais granite, polished. Two or three of the prominent dealers in fancy wood exhibit beautiful collections of specimens, — notably Messrs. Palmer, Parker & Co., of Portland St., who show a most fascinating variety of native and foreign woods, not in small bits, but with fair broad surfaces of each, polished *à ravir*, and arranged with great good taste. Among these woods are some which we rarely see, as the Cocobola, the Amboine, and the Spanish Cedar, and which glow with a sombre splendor of color. The potters are all brought together in this neighborhood, and their displays are, on the whole, promising for the future of this interesting and important manufacture among us. The New England Pottery Co., of East Boston, send a lot of common white china for table service, and chamber sets, mostly plain or very simply decorated, and in very unobjectionable forms, though with no attempt at elegance. Hews & Co., of North Cambridge, reproduce very successfully many of the classical forms in vessels and vases of many kinds, mostly in red clay, with figures in a creamy white. The Portland Stoneware Co. send a great variety of ware of all forms, colors, and uses, from a small match-box to a big garden vase, among which the plain white clay, undecorated and waiting for decoration, appears the best. The Boston Fire-Brick Company exhibit, besides their chief product, an assortment of terra-cotta work from Mr. Loring's works which is very good as far as it goes, but might easily, one would think, have been carried further. I saw nothing from the Chelsea or Beverly potteries.

The virtues of Portland cement are popularly illustrated by a workman who sits with a little pile of damp cement before him, and with a couple of small moulds and a tamper speedily turns out flower-pots and match-boxes of cement, ready for instant service. Messrs. Boorman & Co. had here at the outset of the fair an exhibit of fire-proofing blocks, tiles, etc., which was interesting and instructive to any visitor of a turn for building, but it was judged by the management to be "caviare to the general," and was sent to the cellar. It still has good company, however, and, if it meets fewer eyes than in its old position, will doubtless be seen and marked by those who will most appreciate its merits.

On the right of the main hall Mr. Seth W. Fuller has a very full and worthy collection of his various appliances in the way of bells, tubes, annunciators, etc., which is a striking example of the progress of the age in luxury and the power to provide the small conveniences which obviate trouble.

Of small inventions which make one smile by their simplicity and cleverness, there are perhaps less than the usual variety. The two which I specially remember are a contrivance for so hanging an ordinary pair of outside window-blinds that they may, in the twinkling of an eye, be closed, fastened together, unhinged at the bottom, and swung out from the top like an awning, — and a new form of window sash-holder and lock, consisting simply of a small iron rod behind the pulley-stile, on which slides a pierced disc, running free and holding the sash. When the sash is in motion the disc is held horizontal by the hand and slides easily on the rod; when the hand is removed the disc cants a little and binds, holding the sash immovable. The cost is trifling, and the device seems an admirable one. A third invention, which might come under the same head, is the machine for measuring leather. All leather, except sole leather, is sold not by weight but by the square foot, and as the shape of a skin is very irregular the measurement by the ordinary method is difficult. By this machine a frame holding a multitude of upright iron pins is lowered upon another frame, upon which is laid the skin to be measured. All the pins which are over the leather are stopped by it, while all the pins outside the leather drop through holes beneath them on to a platform just below, which forms part of a balance; a dial above registers the difference between the weight of the pins so dropped and the whole number of pins in the frame. This difference is of course the weight of the pins which are stopped by the leather. The weight of the pins is translated into area, sixty-four pins meaning one square foot superficial.

The furniture men all appear with liberal contributions, but their warerooms are very much more interesting. The space allowed to each is ridiculously small, and the bulky cabinets and bedsteads and sideboards are huddled together in a way that makes it impossible to see them to advantage. I remember nothing here that seems to invite special mention.

A.

#### LECTURE ON ARCHITECTURE. THE NEW THEATRE ORDINANCE.

CHICAGO, October 4.

LAST evening Mr. W. L. B. Jenney delivered the first lecture in his course before the Chicago Academy of Design, his subject being "The Savage Tribes and Egypt." Your representative entered the hall not without much curiosity to see how far the architectural fraternity, so largely represented in this city, might feel inclined to

patronize and encourage the efforts of the management of the Academy to disseminate information on the subject. When the lecturer was announced a survey of the audience showed that not one architect was in the room. A sprinkling of eager and earnest young men indicated that perhaps they might be assistants or students. But the greater part of the audience consisted of ladies and gentlemen entirely without the pale of the profession, while the art students from other classes were very few indeed. In view of the fact that Mr. Jenney gives his services gratuitously to the Academy, the want of encouragement on the part of the profession most interested in the subject places it in a most ungraceful light. The secretary of the Academy took great pains to send full information of the scheme to all the architects and draughtsmen in the city. It is an experiment which needs substantial encouragement, and if the architects do not at least patronize it by buying course tickets for themselves and their assistants, it will be mainly their fault if it is not repeated or continued.

Mr. Jenney commenced with the statement that the art of architecture is the outgrowth of structural form. Its relation to engineering was clearly explained.

Illustrations were rapidly drawn on paper with charcoal and colored chalks. The first showed three plain arches supported on square piers. Taking this as a form of simple construction taken from the Roman type, he first rubbed out one pier and explained how the column was developed from the pier, with cap and base. Then the outer line of the arch was accented by a label moulding and the intersections decorated with carved bosses. Then the arches were moulded and decorated with dog-tooth and chevron ornamentation, showing how the construction was retained without change during all these decorative developments. Hence the justification of the statement that architecture is ornamented construction, the decoration being the accentuation of structural features, and worked in the constructive material.

He then gave a short sketch of the condition of man in primitive times, and how rationally the savage used constructive materials. The second illustration was a Malay hut, the style of which has continued to the present day. He then gave a description of the development of the earliest known stone architecture in Egypt, and a sketch of Egyptian history according to the latest Egyptologists. Speaking of the pyramids he said that it had been discovered that the step-shaped pyramids were the oldest, while the great pyramid of Saphis was a more recent structure, being the largest specimen of that kind which is distinguished by a smooth exterior facing.

The third illustration was an explanation of the nature of Egyptian hieroglyphics, and Mr. Jenney showed great skill in explaining the different kinds of writing on stone that had been used. Your readers may be interested in the following representation of a familiar word.

Of this his explanation was, "The hieroglyphic designating 'an architect' seems to represent him as having finished a plan of a temple, and to be kicking it out of his office. Over his head is a gallows, to hang him on in case the building should fall down, and on one side are three stones to be thrown at him in case the cost of the edifice should exceed the estimate."

The three classes of Egyptian buildings — pyramids, tombs, and temples — were then described in detail, and illustrations of each were drawn. The method of constructing a pyramid as described by Diodorus and Mariette was minutely described, with drawings made before the audience. In describing the rock-cut tombs Mr. Jenney made a drawing of a queen's head in colored chalks, describing as he proceeded the methods pursued by the Egyptian artists, in which drawing, stone-cutting, and painting were employed. The lecture concluded with a description of the great Temple of Karnac.

Altogether the lecture was a greater success than the audience, one of the Academy galleries being only moderately filled. Some excellent examples of life school work by the students are displayed on the walls.

The city council of Chicago passed a very important Theatre Ordinance on the 14th of June last. This is the result of the most persistent efforts of Building Superintendent Cleaveland, who has been working at the matter ever since the Brooklyn Theatre fire. Unfortunately our theatres are all built, and there will be but little to do under the law except to enforce the provisions which relate to the management of existing buildings. Two new theatres, The Academy of Music and Hamlin's, have been built this year, too early to be covered by the provisions of the law relating to new structures, and one, Haverley's, has been reconstructed to a large degree. But none of these conform to the requirements of the new ordinance. It remains to be seen now what the superintendent with the coöperation of Fire Marshal Bruner will be able to do in procuring its enforcement in existing buildings.

W.

#### NEW BUILDINGS.

SAINT JOHN, N. B.

WE have again reached the season when few new buildings are begun, and those in progress are hurried on so that they may be roofed in before the severe winter comes. During last winter, which was unusually mild, a considerable amount of building was done, but it is not expected the next will be like it.

The most important public work, the Custom House, is still undecided, more than a month having passed since the tenders were received at Ottawa. In the mean time the east wall is being built from the foundation to the level of the street, a height of about twenty-one feet, with large blocks of granite in courses from three to four feet in thickness, the wall extending 200 feet on Prince William Street. Mr. Mooney is carrying out this work. Another instance of delay on the part of the Government is the Savings Bank. This work was tendered for in May, and the contract has only recently been awarded to Mr. Geo. J. Grant in place of another contractor who had commenced the work.

The Provincial Government, finding that increased accommodation was needed for insane persons, is now enlarging the lunatic asylum at Fairville by adding a new wing. The plans have been prepared by Messrs. McKean and Fairweather, architects, who are also superintending the work. The addition is three stories high and covers a space of ground 106 feet by 58 feet. The design is made to harmonize with the old work and will be executed in the same materials, brick and stone.

The amount of money spent on churches speaks much for the religious zeal of the inhabitants of this city. Eleven of the old churches remain, and there are twelve new churches, some completed and others building, in all twenty-three, a large number in proportion to the population.

The Church of Saint James, by Messrs. Croff and Camp, cannot be looked upon as a successful adaptation of Gothic work, but the Centenary and Methodist churches, by Mr. Welch, have good detail. In both these buildings the walls are built of rubble work, the jambs, mullions, and tracery being formed of artificial stone. The Reformed Presbyterians are building a church by days' work, instead of contracting with a builder in the usual way. The building, which is Gothic, is about 66 feet by 46 feet, and will accommodate about 400 worshippers; there is also a school-room for 300 children under the church. Brick with stone finish is the material employed. Mr. F. Kain has prepared the plans and is superintending the work.

In the recent competition for Trinity Church the design of Mr. Thomas, of Montreal, was accepted. His drawings illustrated a long, conventual-looking building with semicircular apse, the windows single, lancet form, long and narrow. It is hoped this design will be more satisfactory as regards cost than that prepared by Messrs. Potter and Robertson.

There is a probability that our local architects will once more meet in competition, but this time there are nominally three premiums offered, the first, as usual, being merged in the commission. In the month of June the Provincial Government advertised in the *Royal Gazette* that designs were required for new Parliament Buildings, notifying that on a certain date a plan of the site and particulars could be obtained, but the time has long since passed and expectant architects still wait for particulars. Conflicting rumors are afloat respecting the work, some to the effect that it will be abandoned.

Of important buildings in progress elsewhere the Exhibition Building at Fredericton and the Acadia College at Wolfville, N. S., may be mentioned. The latter building is of wood, and of Italian design. Messrs. Dumaesque and Wickenden are the architects.

From various sources of information I am inclined to think there is a lack of moderate-size dwelling houses in this city. The prevailing system of letting flats, with one entrance and the back yard in common to all the tenants, is not without its disadvantages; and although the houses built since the fire (for which architects have been employed) show better planning than the old ones, there is still room for further improvement.

R. B.

#### THE BOULOGNE LIGHTHOUSES.

THE projected new harbor of navigation and refuge at Boulogne promises to be one of the most splendid on any coast of France, notwithstanding some apparent paradoxes in the scheme of its construction. Its group of lighthouses, however, may be regarded as of even more general importance than the contemplated haven itself, because they will afford an infallible guide to the mariner exactly where he is most liable to mistake his way on the Channel waters. They are to be four in number, furnished with the most powerful lights, upon the best-known principles, and capable of casting a gleam at least of their radiance upon the opposite shore. No similar cluster, supposing this to be completed, exists in the world, the utmost hitherto attempted having been the establishment of two, generally at the extremities of an extended bay in which vessels were in the habit of taking shelter, or where the business of the sea was customarily carried on by night. But it by no means follows that the quartet of beacons at Boulogne will be without a parallel in point of number, different though the arrangement may be. There are no fewer than eleven illuminated signals of the first, second, and third

class, flashing their rays upon the river approaches of the Gironde. At first these were no more than iron baskets of burning coal or wood, suspended on lofty poles; then lamps were substituted, fed with coarse oil, and supplied with round or flat wicks; next, the inventions of Argand came into use, with Carcel following them, whose mechanisms, indeed, have not yet gone out of use, though greatly improved by the combinations of Arago and Fresnel, with whose names the history of the French lighthouse system will always be connected. The catoptric system, with which mirrors or reflectors were introduced, was an improvement, perhaps, though nearly parallel with the dioptric applied by Fresnel to his famous "tower" at Cordonan, almost in the very mouth of the Garonne. This was succeeded by a lighthouse at Mount Agda, on the Mediterranean coast, and another at Cape Bearn, visible to one another at a distance of more than seventy miles. At present, aided by peculiarities of apparatus, the lighthouses of the French coast are nearly all illuminated with colza oil, though the electric element is expected to displace it in lanterns of the first order, and at the greater height. Petroleum was used, in several instances, with no great success, as at St. Gaubain. But it will be less with the kindling power than with the durability of the edifices constructed by them that the marine architects of Boulogne may be expected to principally concern themselves.

The loftiest structure of this class on the French coast, at present, is that of Cordonan, more than two hundred feet, or about the height of the towers of Notre Dame, and followed by those of Dunkirk, Calais, and Baleines, on the western extremity of the Isle of Ré. Originally, it was not much more than half its present height, which is calculated from the level of the highest possible tide. Among its singularities is that, while the exterior suggests the idea of a fortress, the interior recalls that of a palace, elaborately sculptured and adorned. Isolated in the midst of the waters, it has, nevertheless, far above them a vast platform, on which the habitations of the assistant keepers stand in comparative safety. Somewhat similar is the position of the great Pharos of Henri de Brebat, on the Brittany coast, reared upon a huge porphyry rock, formerly the sailors' terror, commenced in 1836 and completed in 1839, in defiance of extraordinary difficulties, occasioned by the violence of the tides acting upon a multitude of formidable shoals and reefs. It was here necessary, not merely to construct an edifice, but also to hew out or blast a little port among the rocks, where the craft employed by the constructors might lie in safety. As the slim though solid tower grew up, every course of masonry was, twice a day, covered by the waves, until a certain elevation had been reached; being thus bestrewn with slime and sea-weed, which, as will be well understood, were no facilities to the builder. Sixty workmen, however, under the direction of the engineers, performed their tasks so well that their platform has scarcely ever since needed a repair. They squared, grooved, and dovetailed every separate block, employing cement which, as they declared, and as it seemed, acquired in a few hours the durability of stone; but whatever the truth in that respect, the result has justified their confidence. Since that period, however, French lighthouse architects have unfortunately been content with foundations of less Roman solidity, and the lighthouses themselves have been constructed of less massive materials. In fact, the manufacture of these edifices in iron for trans-oceanic ports has become almost a distinct branch of French industry, and some of the perilous points on the French coast itself have been thus supplied, — as at Pontallac, near Royan, which indicates an entrance, amid thick-set sandbanks, to the Gironde; and at Walde, which points out a dangerous stretch of the same obstructions, fronting the port of Calais, which, scarcely less than Boulogne, requires a new port, a new pier, and a new set of warnings to navigators.

It is interesting, however, to note, now that so much attention has been attracted by the Boulogne project, that about the middle of the seventeenth century there was near the existing jetty a lighthouse of Roman construction, reputed to have been erected by Caligula, when upon his expedition against the Gauls. Montfaucon affirms that it succumbed in 1644, in consequence of the cliffs below giving way, and he supplies the design of the building, which has every appearance of authenticity. The ground plan of this tower was octagonal, and the tower itself was composed of twelve stories, diminishing, like those of a Chinese pagoda, each by a step, as they rose one above another, and each also having a broad cornice, constituting a sort of gallery, like that of the more famous but kindred building at Alexandria. Each of the eight sides was twenty-five feet in width; but with reference to the height, concerning which no exact details remain, it is calculated that if the measurements of Montfaucon were estimated with any approach to accuracy, it must have approached to that of the structure at Cordonan, or slightly over two hundred feet. The walls were carried up in irregular courses, following, however, a systematic plan; to three layers of Boulogne grey-stone succeeded two layers of a stone softer in substance, and in color yellow; then two layers of immense dark red bricks, followed by the grey-stone, and so forth to the end. This lighthouse would appear to have been restored by Charlemagne, who rekindled the beacon-fires which his barbarian predecessors had permitted to die out; but after his epoch it was abandoned, in what particular period is not known. Curiously enough, however, as M. Reynaud points out in his exhaustive work, in quarto and folio, upon the whole subject, there have been discovered near Dover the remains of a tower, built apparently upon the same lines with that at Boulogne, evidently designed to an-

swer the same purpose, and, moreover, so far as may be ascertained, belonging to the same period. The architects of Boulogne, therefore, may in some measure take unto themselves the credit of reviving a Roman work. The longevity of some among these structures has been remarkable, notwithstanding the furious weather to which their inevitable elevation and the very purposes they serve expose them. That of Genoa, lofty as it is, dates from early in the sixteenth century; and many others, still in use, are equally ancient. — *The Builder*.

#### THE OWNERSHIP OF DRAWINGS.

NEWPORT, R. I.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I have read with interest your remarks on the subject of the ownership of architects' drawings and judicial decisions bearing upon the same.

This subject was very fully discussed by the R. I. Chapter of the Institute in connection with the preparation of a form of contract. This form, which has since been adopted, contains the following clause: "15. All drawings, plans, and specifications shall be returned to the architect before final payment is made." This clause has been found to work advantageously, the contractor usually making his appearance at the completion of the work with a large roll of details, etc. I have never had a case where the owner claimed any portion of the drawings; but, if a clause similar to the above were inserted in all contracts, it would meet such claims on the part of owners as well as contractors; the contract being carefully read and understood by both parties before signing.

Very respectfully,

GEO. C. MASON, JR.

#### BOW CHURCH.

For some time past this famous peal of bells, one of the finest, if not the finest, in the city of London, has been undergoing examination in the public interest, and before long the familiar chimes which captivated or consoled a Whittington, and have since charmed many more from time immemorial, will ring out as before.

The Church of St. Mary-le-Bow, which, if not originally a Roman temple, as generally believed, was one of the earliest churches built by our Norman conquerors, has been destroyed more than once by storm and fire. It was at one time garrisoned and besieged, and was afterward the scene of an assassination. It was first mentioned as a Christian church in the reign of William the Conqueror. Stow says it was the first in the city built on arches of stone, and that it was therefore called St. Mary de Arcubus, or the Bow, although he elsewhere says, but with less apparent probability, that it took its name from certain stone arches supporting a lantern on the top of the tower. The Court of Arches was formerly held in this church, and derived its name from that circumstance.

During the reign of William Rufus the roof of the church was blown off by the wind, and four of the rafters were driven into the ground with such violence that, although they were each twenty-six feet long, little more than four feet of their length was visible, the ground in the neighborhood being then a mere fen. About one hundred years after this event a tumult of a serious nature occurred in the city, which led to the assault upon the church before alluded to. The ringleader was William Fitz Osbert, surnamed Longbeard, who was almost worshipped by the lower orders on account of his exertions as a professed advocate of the poor against the oppressions of the rich. An attempt being made to seize him, he took refuge in Bow steeple, together with various followers, and, being well provided with ammunition and provisions, was able for a long time to defy the authorities. In order to drive him out, the steeple was fired. This had the desired effect; the rioters were made prisoners, and, after a hasty trial, were hanged at the Elms in Smithfield, at that time the usual place of execution. It appeared that Fitz Osbert did not lose his reputation among the people with his life, for it is said that after his death vast numbers of persons resorted to Smithfield, expecting that miracles would be performed, and that they carried away as holy relics pieces of the earth on which his blood had fallen. — *London Times*.

#### NEW PUBLICATIONS RECEIVED.

**INDUSTRIAL SCIENCE DRAWING.** Elements of Plane and Solid Free-Hand Geometrical Drawing, with Lettering, and some Elements of Geometrical Ornamental Design, including the Principles of Harmonic Angular Ratios, etc. For draughtsmen and artisans, and teachers and students of industrial and mechanical drawing. By S. Edward Warren, C. E. New York: John Wiley and Sons.

**THE ARTISAN.** Illustrated by forty Plates of Geometrical Drawings, showing the most Practical Methods that may be applied to Works of Building and Other Constructions. By Robert Riddell, late teacher of the artisan class in the Philadelphia high school; author of "The Carpenter and Joiner," "Elements of Handrailing," "Mechanics' Geometry," "Lessons in Handrailing for Learners," etc., etc. Philadelphia: Claxton, Remsen, and Haffelfinger.

**THE CAMBRIDGE BOILER EXPLOSION.** An Examination of the Attack in the Columns of the *Boston Daily Advertiser* upon the Judi-

cial Decision. By J. R. Robinson. Boston: A. Williams and Company.

ILLUSTRATED PRICE LIST of Prison-Locks and Prison Equipments made by the Yale Lock Manufacturing Company, Stamford, Conn., and 53 Chambers Street, New York.

#### NOTES AND CLIPPINGS.

LOAN EXHIBITION. — The Society of Decorative Art, New York, was to open its Loan Exhibition on Monday last. Among the paintings promised for the picture room are four magnificent works recently collected in Europe by Mr. J. H. Stebbins. One, by Alma Tadema, valued at \$10,000, represents Queen Clotilde, wife of Clovis, first Christian King of France, instructing her children in arms. Another, by M. Gérôme, pupil of Paul Delaroche, is a representation of Molière breakfasting with Louis XIV. at Versailles. Among the nobles present is Cardinal Mazarin, who, with clinched fist and scowling brow, expresses his anger with the young dramatist for daring to sit in the presence of the King. The owner values this painting at \$18,000. A third picture is the portrait of a Spanish lady — the beautiful wife of the Spanish Secretary of Embassy at Rome — by Fortuny, valued at \$10,000. The fourth is by M. W. Bouguereau, a pupil of Picot, and is entitled, "Hesitating between Love and Riches." Mr. Stebbins estimates its worth at \$6,000. Some fine works by other foreign artists have been contributed by Mr. John Wolf, Mr. Marshall O. Roberts, Mr. William H. Vanderbilt, and Judge Hilton, but the titles have not yet been announced by the Committee on Pictures. Mr. LaFarge has come from Boston to search the studios for the latest specimens of American art not heretofore publicly exhibited, and has been successful in obtaining some fine paintings. The ladies of the society have accepted the offer of the Fifth Avenue Band to furnish music, and also those of the florists who intimated their readiness to embellish the rooms with rare exotics.

THE INJURIES OF GAS. — Some London warehousemen having returned goods to the manufacturers because the colors had faded, an inquiry was made as to the cause by Dr. Wallace, of Glasgow. London store-rooms are usually lit by gas, and in many cases the goods are exposed to the products of gas combustion during the whole working day. The cause of the fading is found in the action of the sulphurous acid, many of the pieces of the cotton goods returned having absorbed that substance in notable quantity, while in some the fibre itself was actually destroyed. Dr. Wallace suggests, first of all, thorough ventilation, to remove the fumes of the gas; and, secondly, the use of lime-white on the walls and ceilings, renewed frequently enough to enable the acid vapor to find lime with which to combine.

MEDIAEVAL ARCHITECTURE IN CYPRUS. — During the reign of the Lusignans at Cyprus, Nikosia, the royal residence, contained many monasteries and about three hundred Greek and Latin churches. Of these only ruins remain, but the ruins attest the splendor the churches once possessed. The Gothic towers have been torn down, their mere stumps left standing, and the tracery of the window over the recessed doorway has been rent away in patches. Alongside the broken stump of each tower rises the incongruity of a Moslem minaret, built with the decorated hewn stone of the towers. The slab on which once rested the effigy of a Christian knight, the inscription yet visible on its site, has been prostituted to form a threshold. Another ancient Christian church is now occupied by the Turks as a granary. One little church used by the Armenians has escaped desecration. Every flagstone of the floor is the tombstone of a Christian. On most of the stones are graven full-length portraits of those who lie beneath them. The knights wear long, bushy hair and full, short bluff beards; they are clad in armor, and wear spurs on their heels. The ladies, whose faces are for the most part broad and short, of the Italian type, have the hair tightly braided under close-fitting caps, whence descend long veils that enwrap the body to the feet.

A GAS CLOCK. — There is a clock in the Guildhall Museum, London, of which the motive power is hydrogen gas, generated by the action of diluted sulphuric acid on a ball of zinc. The clock itself resembles a large colored glass cylinder without any cover, and about half full of sulphuric acid. Floating on the top of this acid is a glass bell, and the gas generated forces forward this concave receiver until it nearly reaches the top of the cylinder, when, by the action of a delicate lever, two valves become simultaneously opened. One of these allows the gas to escape, thereby causing the receiver to descend, and the other permits a fresh ball of zinc to fall into the acid. The same operation is repeated as long as the materials for making the gas are supplied, and this is effected without winding or manipulation of any kind. The dial plate is fixed to the front of the cylinder, and communicates by wheels, etc., with a small glass perpendicular shaft, which rises with the receiver and sets the wheels in motion.

LONGEVITY OF ARTISTS. — Artists as a class are remarkable for longevity; a list comprising 1,122 artists was made some years ago, which gave the following results: Died under sixty years old, 474; sixty years and under seventy, 250; seventy years and under eighty, 243; eighty years and under ninety, 134; ninety years and under one hundred, 19; and above one hundred, 1. — the mean age at death of the whole number being fifty-five years; from which some infer that the pursuit of fine arts has a tranquillizing effect upon the spirits and a tendency to moral refinement in the habits and manners of its professors, extremely favorable to longevity.

WILLOWS AND RAILROAD EMBANKMENTS. — On one of the Prussian railroads willows have been grown with advantage on the slopes of excavations and embankments. It is surprising that a similar method of beautifying and strengthening the roadways of railroads is not more generally adopted. A perfect network is formed by the roots, binding the whole surface firmly, and preventing washouts; and the thick green growth covers ugly gashes in the earth, and unsightly elevations, with an agreeable, eye-relieving thicket. Almost any of the varieties of willow can be used with success, but that which is recommended as the best is the *Salix amygdalina*. In dry soil the cuttings should have a good length underground.

HYDRAULIC SALT-MINING IN BAVARIA. — A correspondent of the *World* describes at great length the process of salt-mining in use at Berchtesgaden, Bavaria. At this place the salt does not occur in deep rocky strata, as at the Polish mine at Wieliczka, but in a thick layer of saliferous earth in the heart of a mountain. The mine is entered by horizontal shafts, and the salt ingeniously removed by the solvent action of water working upward. At the end of each shaft a chamber is mined, and when it is large enough the entrance is dammed up and the chamber filled with fresh water through an opening at the top. The water is to dissolve out the salt from the roof of the chamber; hence it is necessary that the chamber be kept entirely full. At first, the water acts also upon the bottom and sides of the chamber, but soon there is left a pasty water-proof covering of clay, which prevents further action. At the top, however, the overlying earth falls away as a fine sediment as fast as the salt is dissolved, leaving always a fresh surface for the water to act upon. The falling sediment forms, under pressure, a water-tight floor to the chamber, which rises as the solution of the roof goes on, so that the chamber slowly climbs from the bottom to the top of the salt-yielding stratum. The solution has to go on with the utmost quiet, and not too rapidly, or else fragments of the roof will fall to the bottom, where the water is saturated with salt, and be lost. To keep the water constantly pressing against the roof, a proper supply of fresh water is continually added from above. Complete saturation of the water is effected in about three weeks, when it is pumped out and carried in pipes to Reichenhall, twenty miles distant, for evaporation. Fresh water is then pumped into the chamber, and the process repeated until the upper limit of the salt deposit is reached. In this way the mountain is being slowly washed, and its saline treasure stolen away, without removing the clay with which it was associated. The saliferous earth removed in tunneling is refined in the usual way.

INDIAN MOUND AT FORT LEAVENWORTH. — Major F. G. Adams, Secretary of the State Historical Society, was in the city on Thursday, and in company with Dr. R. J. Brown visited Fort Leavenworth and found six mounds on Sheridan's Drive, a short distance west of the post, one of which was 1½ feet high, with a diameter of from 12 to 15 feet. After the discovery was made the gentlemen called on Dr. Fryer, and secured assistance in making the excavations. Yesterday Major Adams, R. N. Hershfield, C. A. Peaper, Rev. W. N. Page, and Dr. R. J. Brown visited the mounds, in company with Dr. Fryer, having two men with picks and spades. They dug a hole four feet square in one of the mounds, and found it walled up with regularly laid stone, arched, the walls being about one foot thick. They also found two parallel walls about six feet in length. Appearances indicated that fire had been used, apparently for the purpose of cremation, but no bones were found. The mound was not, however, fully explored. Next week further examination will be made, and a force of men employed in the excavation. In 1830 a government surveyor named McCoy wrote a book, in which he stated that a number of mounds were in existence just west of Fort Leavenworth. This book accidentally found its way into the hands of Major Adams, and led to the exploration. The location of the mounds was so well described that no difficulty was experienced in finding them. The number was not specified in McCoy's report. Trees are growing around the mounds, but none upon them. These are the only Indian mounds ever discovered west of the Mississippi. — *Omaha Republican*.

STATUE OF THE EMPEROR VALENTINIUS I. — The remnants of the bronze statue recently found in the bed of the Tiber at the Sistine Bridge have been placed in the small museum at the Palace of the Cæsars. They are a series of fragments of gilded bronze, the most part representing drapery. The feet, attached to the marble plinth, and shod in the sandals, are well executed. The arms, with the marks of sword and axe, have also a historical, but not much of an artistic attraction. The identification of the statue has been made, and Baron Visconti, the Papal archaeologist, has published the facts in a note to the *Osservatore Romano*. The source of information is the inscription cut in a marble slab, which formed the pedestal of the statue. This indicates that the statue was erected by the Senate and the Roman people, in gratitude towards the Emperor Valentinianus I., praising him for the providential work which he, with his brother Valens, did for the advantage of the Eternal City. It is known that the bridge bore the name of Valentinianus, after having borne that of Probus, as the Regionaries record. It remained until the present without any historical record. Ammianus Marcellinus relates that the work of the bridge was concluded by Aurelius Symmachus, Prefect of Rome. This was supposed to refer to the Cæstian Bridge. But the new inscription shows that the passage refers to the present Ponte Sisto. The date of the statue and the bridge is therefore between 364 and 365. This is the first result that follows from the discovery of the inscription. A second is that the statue, which was supposed to belong to the best period of Greco-Roman art, is only a specimen of art in its great decline, though some good qualities are still retained. — *The Pilot*.

THE GIBRALTAR TUNNEL. — The proposed tunnel between Spain and Africa is still before the public. This tunnel, according to the plan at present contemplated, is to extend from within a short distance of Algiciras, on the Spanish side, to between Tangier and Ceuta, on the African side. The length of the submarine tunnel will be nine miles, with an inclination of one foot per hundred, and the approaches will have an extent of six or seven miles. The greatest depth of the sea is 3,000 feet; and, as it is intended to have a thickness of some 300 feet of rock left between the roof of the tunnel and the sea bottom, the greatest depth of the tunnel will thus be 3,300 feet below the level of the sea.

A COINER'S TRICK. — Professor B. Silliman mentions a curious case of debased coinage. A large number of spurious doubloons were uttered by one of the Peninsular governments during the late civil wars, the nucleus of which was a disk, or blank, of platinum, which was inclosed between faces of gold, the blow of the coining press concealing the fraud, while the weight of these spurious pieces was identical with the genuine coin: the value, however, of the platinum being about one third that of the gold coin it represented. These platinum blanks had been prepared by the Russian government for use in the suppressed coinage of that metal.