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IN beginning a new volume, we are obliged to ask the indulgence of our readers for any delay or irregularity that they may notice in the delivery or the construction of this number, and to beg that they will refer all such to the fiery experience we have suffered since our last issue. We will, in fact, hope that they may generously refer all our shortcomings whatsoever, so far as they may observe them, to the same cause. The fire which burned the stock and premises of our publishers destroyed all our manuscripts and matter for illustrations, including the copy we had prepared for this number, nearly complete as it was, and even the matter set up in type, which by a rare conjuncture happened to be within reach of the fire. It was necessary then to begin absolutely *de novo*, and to prepare this number afresh, under pressure of a haste which will, we trust, be held to excuse some degree of imperfection, — the more so since the Heliotype Company, which prints our illustrations, requiring as they do deliberate handling, was altogether stripped of its appliances and shelter. We assure those of our contributors who had sent us articles for publication, and especially those who had entrusted to us valuable drawings which it is not easy to replace, of our extreme regret for their loss. If any correspondents, owing to the destruction of their letters, find their communications neglected, we must beg them to favor us by writing again. We shall try to put our paper, as soon as possible, on the footing it would have held if it had met with no misfortune. To the friends who have hastened to help us in this emergency we give most hearty thanks.

THE fire itself ought to go far toward dispelling the notion, which seems to have been common, that the great fire of 1872 had been followed by any striking improvement of the methods of building in Boston. Some decided gains there were in a more stringent building law; in the abolishing high wooden roofs and wooden cornices, to the absence of which some of the neighboring warehouses now owe their existence; in somewhat heavier party-walls, which possibly saved the spread of the fire on one side; and in a greater number of iron doors and shutters, most of which proved a very idle attempt at defence. But the general character of the construction still remains the same, with a little freer use of material, corresponding to the larger and more expensive scale of the new buildings. There are the same wooden floors and stairways, the same flue-like combinations of communicating hollow spaces, the same general use of combustible material, with more hatchways and elevators. Almost all the precautions that were adopted were simply to check the spread of fire from one building to another. In this respect some gain is evident, and it is a thing to be thankful for. But as to the liability of any building to burn, or the danger to its contents and its occupants, if fire gets into it, there is no noticeable improvement. There is no appearance, unless in conspicuously exceptional cases, of any effort at fire-proof construction, or even at slow-burning construction.

IT is true that the seven years since the great fire have brought us much experience in the means of resisting fire as well as of its dangers that we had not at that time; and that while a specially new peril has come in with elevators, discussion and invention have furnished us with many devices for safety in construction and the use of material that were then unthought of. We are gradually learning that insurance costs more in the aggregate than safe construction; that certain parts of buildings are especially vulnerable, — stairways and elevators, for instance, — and ought to be made invulnerable; that where we cannot afford, or think we cannot, to build houses and warehouses that will not burn, we may build those that will burn but slowly; that solid wood is a safer material than iron, that either is safer for being protected by the other, or by plaster, and that brickwork is better than all. We are still far, nevertheless, from having reduced these principles to rules of practice, and still far in the rear of those cities of the Old World which have learned to care for their own security. The new work of Boston was mostly done before some of these principles of building had been verified and generally accepted, even by architects. In fact, the conviction grows upon us, while it comes too late, that in the rebuilding of Boston, whether from haste, ignorance, or want of enterprise, we lost a great opportunity. A writer in a conspicuous monthly magazine, reviewing the new buildings in Boston a year after the fire, and acknowledging the great improvement over the architecture they replaced, regretted in the interest of further improvement that if the fire must needs have come it could not have come a decade or two later. In the same way, in the interest of a safer construction, we may wish that it could have been delayed till the gradual growth of more suitable methods of building had taught our community the better way.

A QUEER case, to which we have already once alluded in our notes, is in litigation before the Court of Exchequer, in London. The Messrs. Botterill, architects, of Hull, had been engaged, some time ago, to make restorations of the fourteenth-century Gothic church, called Skirlaugh Chapel, near Hull. These gentlemen, it appears, were dissenters, and though they had built a good many schools and chapels for Wesleyans had done little or nothing of what is called in England "church work." The neighboring vicar of Nunkeeling took alarm, and wrote a letter of remonstrance to the committee who had the restoration in charge, complaining that the architects were Wesleyans, and could "show no experience in church work," and asking if nothing could be done to avert the loss which would be caused if the church were "ignorantly tampered with;" and again, in another letter, expressing his annoyance, asked if the committee were aware that the architects "are Wesleyans, and cannot have any religious acquaintance with church work." These he followed up with a memorial, which was signed by forty persons who were interested in ecclesiology, including the Dean of York and the Archdeacon of Cleveland. This led the committee to reject the plans of the Messrs. Botterill, and to put another architect in charge of the restorations. Thereupon the Messrs. Botterill sued Mr. Whytehead, the vicar, for libel, laying damages at five hundred pounds. The case was tried at the Leeds Assizes, and a verdict for fifty pounds was given for the plaintiffs. It was carried up to the higher court on a demand to set aside the verdict, with the plea that it was against the evidence, and on the ground of excessive damages.

IT is easy to see why an architect who had not done "church work" should for that reason be distrusted by ecclesiologists, or by other lovers of old monuments, when he came forward with plans for the renewal of a venerable Gothic church, a task which demands both skill and knowledge, as well as sympathetic handling. It is difficult to see, on the other hand, how a reverend vicar could help laying out trouble for himself when he put especial stress on the disqualification of being a Wesleyan, a mode of attack which gave color to the plaintiffs' accusation of malice, and drew from the Lord Chief Baron the natural remark that a man might "be a Mohammedan or a heretic, and yet have a professional knowledge of church work." When it came to substantiating their knowledge of church work, the plaintiffs did not fare so well; for although it was argued that they had once put a roof on a Gothic church, and that their design for the new restoration had been approved by Sir Edmund Becket, — which to many architects might not count as a high recommendation, — it was made to appear that the vicar of the church which they had re-roofed was one of the signers of the remonstrance against their employment at Skirlaugh, and that the architects to whom the plans for the restoration had been submitted — six names were mentioned, among them that of Mr.

Gilbert Scott — had unanimously condemned them, saying that the spirit of the work would be destroyed and its value as a historical building sacrificed by them. A touch of genteel comedy was given to the trial when the counsel for the defendant read a passage from the Seven Lamps of Architecture, as an illustration of the vicar's feeling toward the plaintiffs, bringing out from one of the justices the inquiry whether, if the Seven Lamps had been written about living architects, he could not imagine Mr. Ruskin as a defendant in libel cases. A farcical tinge was added by the claim of the defendant's counsel that the fifty pounds damages which had been awarded, one tenth of the plaintiffs' claim, were excessive, and that they had not been injured to the value of a farthing by conspicuously withdrawing a commission from them, on the ground of incompetence, and giving it to another architect. The court reserved its decision.

An accident which happened in San Francisco not long ago illustrated an unexpected danger from bad drainage. A Mr. Cullen, plumber and gas-fitter, noticed a smell of escaping gas in his house, and having traced it to a water-closet investigated it with a lighted match. A tremendous explosion followed, which tore the plumbing apparatus to pieces and injured the investigator. By a simultaneous explosion in the connecting Eighteenth Street sewer, the street was torn open from Jessie Street to Mission Street, and a great blaze of gas went up from a broken gas-main at the corner of Mission Street. With a curious simplicity, the fire department brought a hose, and spouted water at the escaping gas in vain for an hour, we are told, before it was decided to put out the flame by burying the outlet under the upheaved earth, which was finally done, or by cutting off the gas, which might have been done, one would think. Examination showed that the trouble lay with the sewer, which, being old and of wood, had decayed. It had sunk in at the crossing of Mission Street a week before, and in doing so had broken the gas-main which passed beneath it. The escaping gas had gradually filled the adjacent sewer for a long distance, mixing with the contained air into an explosive compound, which made its way into the houses along the street, or at least into Mr. Cullen's. It is not strange that a city built in haste, as San Francisco was, should have wooden sewers, if it were sewered at all; but it would seem to be evidently time to do away with them now. One could have supposed, too, that the interval of a week would give time to find out and cure whatever mischief had been done by the caving in of a sewer at a street crossing. The explosion itself is an illustration, of which many are to be found, of the dangers of the gas-fitter's common trick of going about with a light in search of leaking gas. An exploded plumber under such circumstances might perhaps take comfort in that his irruption has taken the place of typhoid fever or diphtheria, and be warned in time to no longer arrange his drains and soil-pipes so as to conduct gas into his house, while his customers might possibly benefit by his opportunity to learn necessary precaution at his own expense rather than at theirs. A curiously similar accident happened at about the same time in Oakland, across the bay, where gas from the gasometer had escaped into the brick sewers, and, permeating the adjoining houses, in due time blew up in two of them.

Some months since a fire occurred in a planing-mill and caused a fatality of a peculiarly distressing kind: The shavings and sawdust, which were made there in great quantities, were carried by an air-blast through a long chute into a chamber to which access could be had only through the chute mentioned. The fire caught while a man was engaged in cleaning out this chamber, and as he had no chance to escape except into the mill, he was burned alive like a fly in a fly-trap. This incident is called to mind by the statement made by the *Evening Post* that the operatives in the corset factory of Messrs. West, Bradley & Carey on West Twenty-ninth Street, New York, which was burned on the night of December 22, could not escape from the building because they were locked in. We do not find this fact mentioned in the more detailed account of this disaster which we have received, so we may hope that so needlessly criminal an act — for we can hardly suppose that the manufacture of corsets, however carefully they may be guarded after they are manufactured, is one which has to be conducted behind locked doors — was not actually committed. The fact remains, however, that a number of female operatives found it impossible to escape from a seven-story factory which had been on fire six times within two years, and was notorious for its inferior construction. Here was an opportunity for the interference of the society for the prevention of cruelty to women, which some one has suggested forming. And here still is an opportunity for some one who will deserve well of posterity if he can bring about very much the same reforms in the building of factories where many persons, male and female, are employed that, to a degree, have been effected in the construction of theatres. Any one who has been much in factories is familiar with the thoroughly irresponsible behavior of the ordinary factory-hand, the reckless way in which unprotected gas-lights are used, the slight and inadequate stairs, the wooden elevator-shaft, and the rough finish bristling to encourage the flame. The subdivision of large rooms by fire-proof walls, fire-proof stairways, and plenty of them, doors opening outward, fire-escapes, and reasonably good planning and construction should be as much insisted on in factories as a fire-proof proscenium wall, fire-screen, and ample exits in theatres.

Another need was made evident at this fire as well as in the fire in which we have a more personal interest. At both fires a large portion of the fire department was called out: it was found in one instance that there was no engine powerful enough to throw a stream to the top of the seven-story building, and in the other case that the most satisfactory impression upon the fire was made by massing three hose nozzles together, and so throwing upon one spot a stream large enough to produce an effect. These facts show a deficiency in our fire departments which should be supplied at once. A certain number of more powerful fire-engines are needed in every city, — more powerful even than the engines used by the London fire brigade, which, we understand, can throw a larger stream a longer distance than our ordinary engines. With us, even if efficiency is not often sacrificed to showiness, which we suspect it may be, everything is made secondary to the lightness of the apparatus, so that no time may be lost in getting a stream to bear upon the fire. To a degree, this is as it should be, but as every well-equipped army has its siege-train, as well as its flying-artillery, so every well-equipped fire department should have several engines, say one for each square mile of territory, capable of throwing half a dozen large streams. These engines need be called into service only when a general alarm is rung, and at such times they could hardly fail to demonstrate their value; for it has been shown again and again that the ordinary engine cannot cope successfully with a really large fire, even in its early stages.

It is possible that retributive justice was never more speedily visited on an offender than in the accident in Wilmington, Del., on the twentieth day of December, which was brought about by a seemingly flagrant case of jerry building. Late in the afternoon, the builder, a Mr. Ruth, his three sons, a mason, and a young child left two three-story buildings in the western part of the city, — not only left them for the night, but left them, as people were given to understand, completed. Shortly afterwards the whole party returned to search for some money that had been lost, and while they looked for it the buildings incontinently collapsed, and buried in their ruins the ignorant or reckless men who had prepared so flimsy a man-trap for unsuspecting citizens. Fortunately for the men, and unfortunately, perhaps, for the future welfare of their fellow-citizens, no lives were lost, and this is probably the last that we shall hear of an accident that has resulted from either the most amazing ignorance or the most criminal recklessness; for the only reason for the occurrence of the mishap that has been given is the possibility that the vibration of the floor caused by the passage of the tumultuous crowd of five men and a child, as they narrowly scanned the floor for the "lost piece," had such an effect on the party-wall that it was shaken down, and caused the fall.

MR. WHICHCORD ON THE QUALIFYING OF ARCHITECTS.

The new president of the Royal Institute of British Architects, Mr. Whichcord, in his address at the opening session last month, dwelt upon a question which is of present interest to architects, since it involves an unsettled problem which is continually recurring to them, — the qualifying of their profession. The Institute adopted two years ago a by-law which required that after a given time every candidate for election as Associate should pass an examination according to a standard to be determined by the council. In order to give due warning and time for preparation, the date when the by-law should take effect was

fixed at May, 1882. The manner of carrying the by-law into force is referred to a special committee. It is possible that as the time for doing so draws nearer, the Institute begins to feel some misgiving as to the difficulty or the effect of carrying out its plan; but it is encouraging to note that the president supports the plan staunchly, and declares not only that some such measure grows more necessary, but that the improved position of the Institute makes it easier to carry out than it would have been five years ago. Mr. Whichcord did not think it desirable, even if it were possible, "to make our profession a close one," by which we suppose he means one in which nobody can lawfully practice without having complied with fixed conditions and being formally enrolled in it as in law and medicine. But he does think it desirable that every member of the Institute should be qualified either by examination under authority of the Institute, or by such a diploma from some educational body as shall be an equivalent for examination. The likelihood that there will be a falling off at first in the number of applications for membership of the Institute the president acknowledges and faces boldly, thinking that the Institute is bound to try its strength in such a test. He is strengthened in his position by the experience of other associations, quoting the example of younger associations, the Institute of Actuaries, for example, which without the advantage of a charter has, by enforcing an examination upon its members, attained such a position that only its fellows are known as qualified actuaries.

In regard to the subjects of examination Mr. Whichcord is not exacting. Passing over as of necessity the subject of æsthetic qualification, obviously out of the range of examination, he specifies as essential, and as fit conditions for qualifying, a knowledge of geometric and free-hand drawing, of the general principles of construction, and of the nature, qualities, and value of such building materials as are in ordinary use. Modern practice requires that to these should be added a knowledge of such sanitary subjects as ventilation and sewerage. Unless these conditions were applied in a very exacting way, they certainly require no more than an architect in ordinary practice ought readily to answer for, and would keep nobody out of a professional association, or out of the profession itself if they were made conditions to it, who had any real title to be in it. In the somewhat difficult question of the application, Mr. Whichcord met the dilemma of those who argued that it would be impossible to force examination upon the present members, and unfair to require of the new what the old had escaped, by quoting the example of the dentists. An act of Parliament, passed a year ago, required every one who would practise as a dentist to be enrolled, and subjected to examination by one of the bodies which are empowered to grant surgical degrees.

Mr. Whichcord had opportunity to learn of the working of the act in Dublin, and the account he quoted showed in an interesting way how a qualifying examination, though usually dreaded, may after all be rather a bugbear than a serious obstacle to anybody who is fairly qualified for practise. The examinations in Dublin were conducted by the College of Surgeons, and the form of it being left to the examiners, they adopted for the qualifying of men who were already established an oral examination *sine curriculo*, that is, we take it, not an examination upon any definite course of study, but an inquiry into the practitioner's competency to deal with the ordinary problems of ordinary practice, having, as a fellow of the Institute writes, "set no papers which would require a candidate of mature years to return to the half-forgotten exercises of youth," but by *viva voce* communication "elicited to their satisfaction whether the candidate was fairly and intelligently acquainted with his profession." It proved that the practising dentists offered themselves very readily for an examination of this kind, and that those who failed to pass, instead of being among older practitioners who had forgotten the formal teachings of their younger days, were mostly very young men who may be fairly assumed to have been imperfectly qualified for their work.

It seems to us that in this matter the example of the Institute and the advice of its president deserves the attention of associations of architects, and of architects who are not associated, in this country. The results of the experiment cannot be known till it is tried, but they are worth watching for, and we shall be surprised if such an experiment, tried with due seriousness and judgment, does not fully justify itself. An association, to try such an experiment, must either have prestige enough to make men willing to undergo some test for the sake of belonging to it, or else backbone enough to endure a temporary falling off of membership for the sake of a gain in solidity; but the second condition would, in our opinion, be pretty sure to soon generate the first. The subject is one which has often been set before the American Institute of Architects, without being ever brought to any practical result. If that body should undergo the decided change in constitution that is now under consideration, the change might give an opportunity to do something in establishing a technical qualification for its membership. Such a result, if it could be brought about, would be a greater justification of the change than any that we have seen offered. And apart from the Institute, any local association that exists or that might be formed for the purpose would, we believe, do itself service by submitting voluntarily to an examination test, if the test were strict enough to have any real significance. No existing profession has adopted or been subjected to restrictions of qualifications without distinct benefit both to itself and to the public. The dentists, who are the newest comers and have shown themselves more progressive, on that side at least, than architects, are examples of the benefit of it. We have argued before, and do still, that it would be reasonable that the public should by law impose upon architects the necessity of technical qualification, — and here we do not agree with Mr. Whichcord's reluctance to make the profession a closed one, as we understand the term, — for the greatest benefit of this qualification would be the public's, and it is in the public's interest before all that it should be demanded. But for architects themselves, who have either pride in their profession, or public spirit, or even a far-seeing eye to their own ultimate interests, there is no doubt which way their interest lies. "What real measures do you take," says an eminent queen's counsel, quoted in the address before us, "to secure that men calling themselves architects should know anything of architecture beyond what they pick up in the offices where they sit for a time copying drawings and specifications?" There are countries in which such measures are taken to this end, and the countries and their architects are the better for it.

THE LIGHTING OF SMALL SCHOOL-HOUSES.

THE principles of fenestration and orientation, in their application to school buildings of importance, containing many rooms, have been so thoroughly discussed that all architects who have had their attention called to the subject are familiar with what is now settled as the best practice for such buildings; but the rules, once learned, are often in danger of being applied to a class of schools whose inferior size and importance, instead of rendering them simpler subjects of treatment under the given doctrine, separates them into a class by themselves, with different requirements, and different modes of supplying them.

The given data are the same in all cases; we know that the sun rises in the east, is at its highest point in the south, and sets in the west; we know also, positively, the good and bad effects of different kinds and degrees of lighting, and varying amounts of sunshine, upon the eyesight and health of children; and applying these data to large buildings, certain rules for such structures have been deduced, in the same way that by applying them to small buildings we shall deduce rules differing from the former, but not less reasonable and necessary in their special province.

It is agreed by all authorities that the most comfortable and wholesome light for the eyes is that coming from one side only of the room, without interfering cross-lights from windows in the opposite side or from front or rear, and it is furthermore desirable that the light should come from a group of windows, or a single one, rather than from a succession of them, separated by wide piers.

For writing or drawing, the light should come from the left, not exactly at the side, but a little in front; then neither the right hand nor the pen will cast a shadow on the paper. For reading, the light may come from either side, indifferently, but should be a little back, that it may shine brightly on the page.

For any purpose, the window must not be far off, or the light will be too dim, even though it may come from the right quarter.

In arranging the more important schools, containing four or more class-rooms on a floor, only two modes of lighting are practicable; one, by windows in two adjacent sides, the other, by windows in one side only. Of these two alternatives the latter should always be chosen. The confusion of cross lights at right angles to each other is very injurious to the eyes, and the slight advantage to be gained for ventilation by windows in the adjacent sides of a large room is not sufficient to weigh against the defectiveness of the lighting so obtained.

The openings in the one illuminated side should be numerous and large, or the more distant portions of the rooms will be too dark, and the seats should be so arranged that the light in each room will fall upon the left side of the pupils.

Under this arrangement, with lofty rooms and large openings, the comfort of the eyes is at its highest point, and it is therefore com-

pulsory in all German schools of every grade, and has become a common requirement in planning the better class of school buildings in this country. For our climate, however, it may be seriously questioned whether, in small houses of one or two rooms, the value during the hot weather of the cross ventilation obtained by opening windows in two opposite walls does not compensate for the inferior quality of the lighting.

Some French schools have endeavored to meet the difficulty, and combine good light with ventilation, by piercing two opposite walls with windows, and then concealing those on one side by permanent screens, like blinds, which allow the air to pass, but not the light.

This expedient answers for high and well-lighted rooms, but there is further difficulty in the fact that, in our low-studded district and ungraded schools it is impracticable to admit from a single side sufficient light to supply the needs of the scholars. The minimum approved proportion of window opening for a school-room is set down at one sixth of the floor area, some authorities demanding more.

In one of our average rooms, thirty by forty feet, the necessary window area would thus be two hundred square feet.

Unless this amount of glass surface is provided, the pupils in the parts of the room farthest from the windows will suffer from insufficient light, which is far worse for the eyes than any possible cross-lights. Now a simple calculation will show that, supposing the ceiling to be twelve feet high, and the windows to extend from a line four feet above the floor to within a foot of the ceiling, to obtain the amount of opening demanded would require a succession of windows, say three and one half feet each in width, occupying the entire length of the longest side of the room, with piers between only twelve inches wide. It is plain that such a construction, though not impossible, is very different from anything which has ever been seen in our country school-houses; yet nothing short of this would give the remoter parts of the room even a bare sufficiency of light, and not that if any darkening by shades or blinds were permitted.

From these reasons it follows, we think, necessarily, that whatever may be the best practice in large buildings, whose high stories admit windows lofty enough to furnish the requisite surface of glass, without reducing the piers to an impracticable slenderness, and where artificial or forced ventilation keeps the air fresh without effort, small buildings of cheap construction can, as a rule, be neither properly lighted nor efficiently ventilated without windows in two walls, and these walls should always be those on the right and left of the pupils as seated.

By this arrangement ample window space can be easily given, with allowance for partial darkening by blinds at times; the light, though less comfortable to the eyes of perhaps half the scholars than would be that from a single direction, will be more comfortable to the remaining half, and far more so to all, teachers and pupils included, than would be the case with windows in two adjacent walls, while the advantage of being able to change the air of the room in a few moments by opening windows in opposite sides, or by the same means to maintain a current in hot weather, is, in our climate, of very great importance.

Adopting, therefore, the principle of lighting by opposite windows, it is necessary to consider the most advantageous aspect for these windows; in other words, presuming that the openings will be made in the longer side of the parallelogram which constitutes the plan of the main school-room, the proper direction of the longer axis of the room is to be determined with reference to the effect of sunshine in the room at different times of the day.

So far as the comfort of the eyes is concerned, the north light is preferable, as it is comparatively unvarying, and through windows so directed there will be no sunshine during school-hours, and therefore no need of shades or blinds, which are always to be avoided if possible.

But the health of children in other respects suffers very seriously from the deprivation of the sun's direct rays, so that steadiness of light must be sacrificed to the necessity for admitting them. Even the German rules recognize this, and require that while no room shall have windows on two sides, only drawing-class rooms shall face the north.

Next to the north aspect, the steadiest light as well as the greatest amount of sunshine is derived from one due south, and while a south window receives the sun nearly all day, the year round, the angle at which it enters is so great that the annoyance from it in hot weather is infinitely less than from the horizontal rays which stream through an east or west window at certain times. For this reason a south exposure is both cooler in summer and warmer in winter than an eastern or a western one, and while it secures the largest possible aggregate of sunshine, a south window needs less shading than any other, except one facing north.

On the whole, therefore, although many authorites hold a different opinion, the writer believes that the main room or rooms in small school buildings will be best placed with the longer axis directed due east and west, and lighted by windows in the north and south sides only. With windows in the east and west wall, as some advise, the sun's rays will indeed traverse the room from side to side, but only at the times when their purifying and life-giving quality is at its least, and their power of annoyance at its highest.

Such a room is unendurable in summer afternoons without much pu'ling down of shades and closing of shutters, processes as disturbing to the quiet of the school as they are injurious to the eyes of the scholars, at the same time that the summer breeze is shut out together with the sunlight.

In winter a room so lighted is chilled on either side alternately, according as the northwest winds of March or the easterly gales strike upon the exposed surface of glass, making the room difficult to warm, unless by using two furnaces, one or the other to be used, according to which side may be the cold one for the time being.

With north and south lighting, all these difficulties vanish. The condition of the room in relation to the furnaces will in winter be always the same, the north side being constantly cold and the south side warm, so that a single stove or furnace placed near the north side will at all times diffuse its heat uniformly through the room. In summer the north windows will never need shading, and those on the south rarely, as the rays of the sun at meridian will be so nearly vertical that they will hardly reach the top of the nearest desks, supposing these to be placed at the usual distance from the wall. Before or after noon, the sunshine would extend somewhat farther into the room, the distance depending upon the width of the windows and the depth of the reveals, and in winter the range would be much greater, though the annoyance would at that season be far less. In any case, the shading of a small portion of the window surface will cut off all the rays which can possible strike upon any desk, while a west window can be effectually shaded only by closing every crevice through which a horizontal beam can pierce. The advantage in hot weather of being able to leave all the apertures on both sides of the room wide open, with fractional shades, if any, over the south windows, can be best appreciated by those who have tried both systems of fenestration.

Nor is the sunning of the room by south windows less effectual, but more so, than by east and west. The most obvious influence of sunshine upon the atmosphere of a room is to set it in motion, the chemical processes of deoxidation or decomposition being too obscure for our senses; but both chemical and mechanical effects are produced with far greater energy by the noonday beams than by the heating though lifeless rays of a horizontal sun, and the circulation between the north and south sides of a room lighted from both quarters is the more active and constant, by reason of their greater dissimilarity in condition, one being always shaded and cold, and the other always warm. Shades and blinds should always be avoided as much as possible. Outside blinds, if any are necessary, cut off the air in hot weather less than inside blinds or curtains, but they are liable to be broken or become loose at the joints from the effect of weather and neglect, and they require so much wall space to fold back against as seriously to restrict the number and grouping of the windows. Inside blinds, if used, should have rolling slats and be well hung and braced. Shades are sometimes necessary, where the close grouping of the windows and the thinness of the wall give no room for folding back either shutters or blinds. These should not be dark; a brown Holland or unbleached linen color is pleasanter to the eyes. All cloth curtains are liable to be drawn in or out of the window in breezy weather, and torn or stained, and a very useful substitute may be found in a screen of unbleached linen, or even cotton, stretched on a frame the size of half the window, one sash, and sliding up and down on slips of elastic wood, like mosquito nettings. Such a screen over a south window will give all the shade required, and the window can be opened as wide with the screen as without it. With such provision for shading the south windows, nothing being necessary for those facing the north, and with windows starting four feet from the floor carried as near the ceiling as the construction of the building will admit, the cheapest district school may be made as pleasant and wholesome to the eyes of its occupants as the elaborate structures of our largest cities.

T. M. Clark.

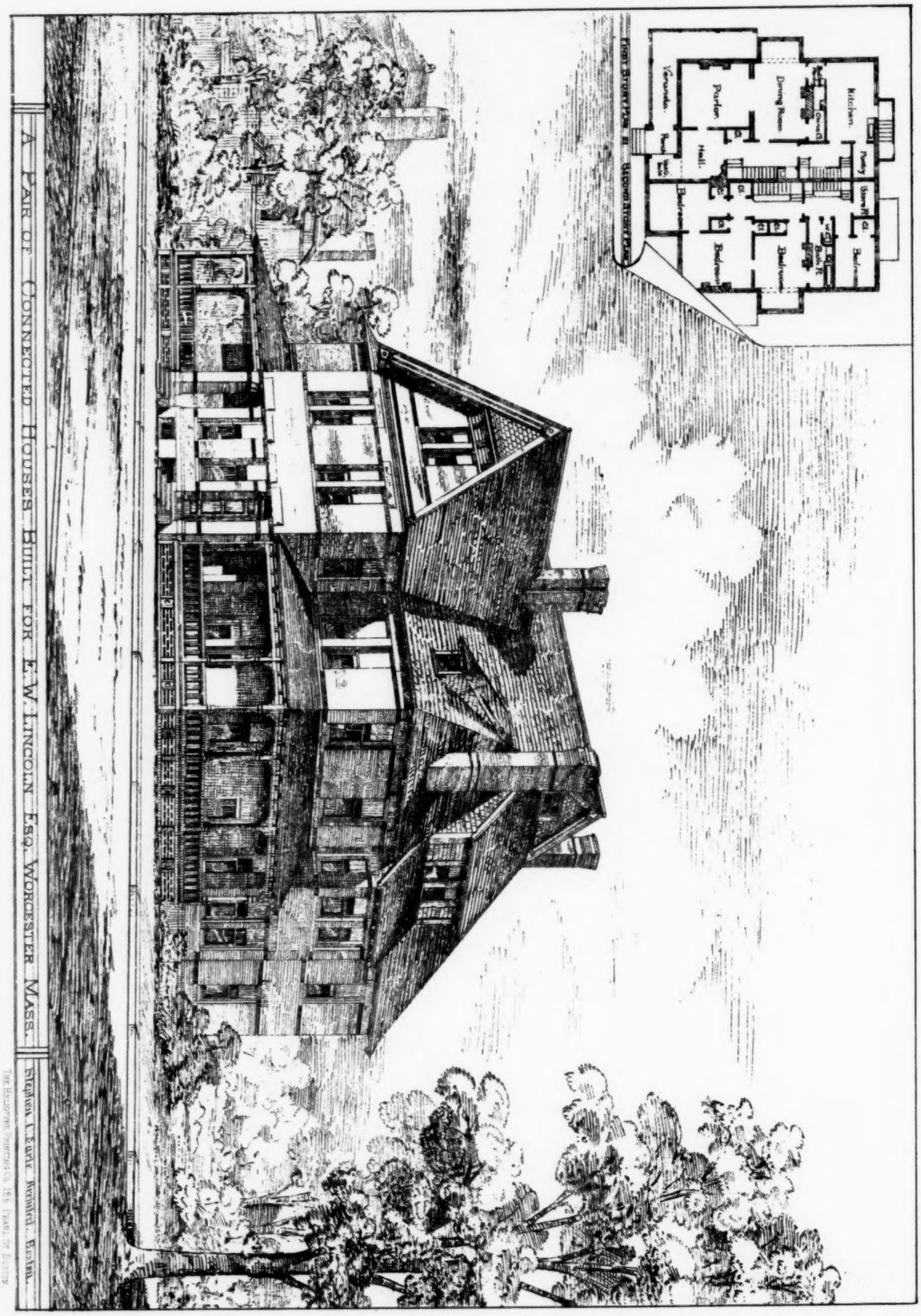
VIOLLET-LE-DUC.

[We translate from the *Gazette des Beaux-Arts* a considerable part of an appreciative notice of Viollet-le-Duc by M. Edouard Corrooyer, who had been one of his pupils.]

Born in 1814, at Paris, Viollet-le-Duc, after studies which, begun at Fontenay-aux-Roses and finished at the Collége Bourbon, were to prepare him for the Polytechnic School, enticed by his taste for art, entered the atelier of Achille Leclerc.

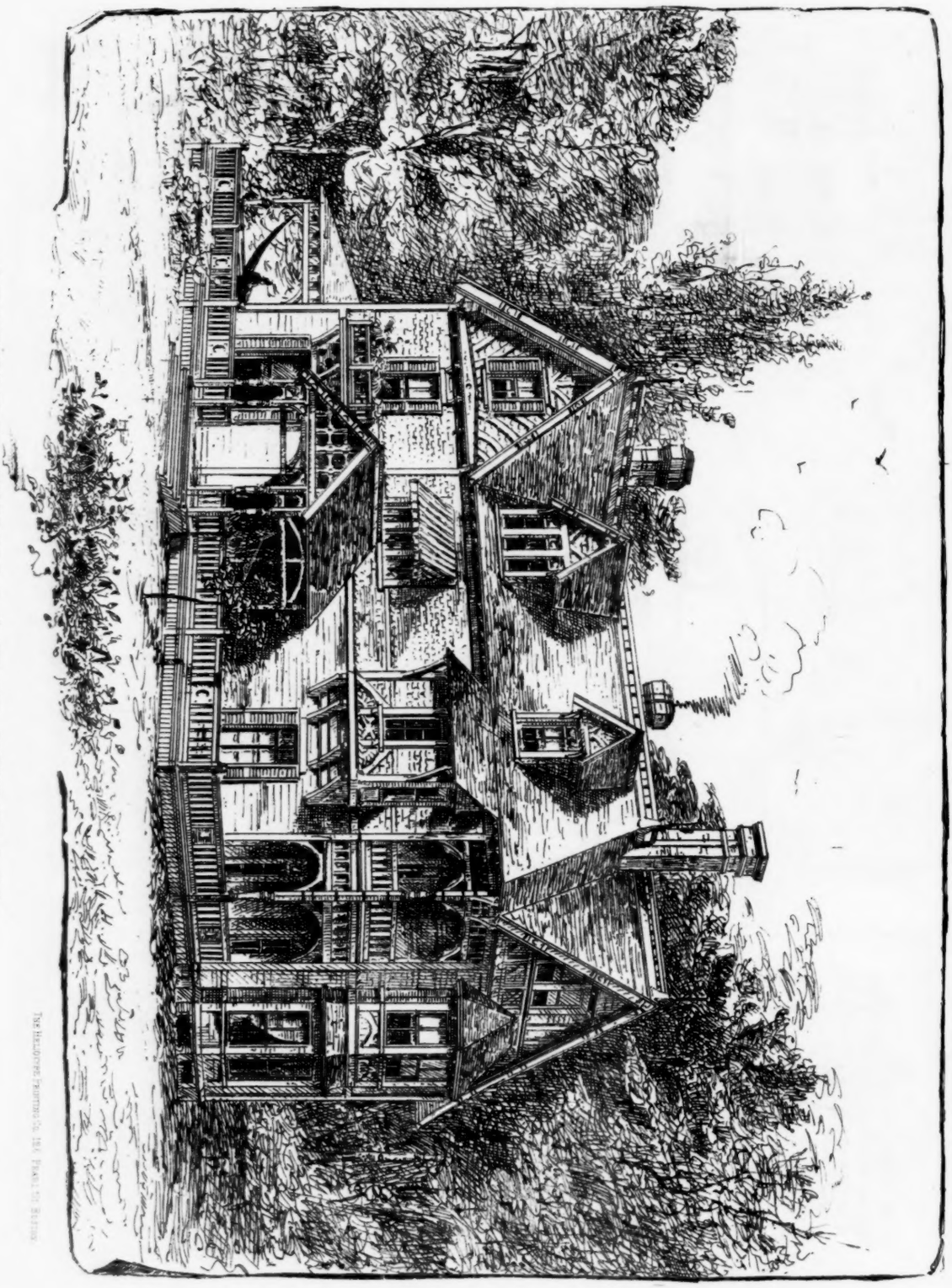
Instead of following the beaten path, too narrow for his wide intelligence, through brambles which grew so much the thicker that they grew upon fertile ground lying fallow, he travelled through all France, studying, recording, and drawing buildings which had been ignored, or rather abandoned, and were called ironically Gothic. His studies, exhibited at the Salon of 1834, brought their author a third-class medal. He was then only twenty years old, but already proved himself an artist born, showing the peculiarity that is common to predestined artists, an astonishing facility, which was apparent from his earliest youth.

In company with Gaucherel, who was then only his close friend, as he always remained, but who became through his example and counsel the admirable etcher whom all artists love and honor, he set out in 1836 for Italy, whose monuments of all ages he studied. It was during this journey, which lasted a year, that he visited Sicily, concerning which he afterwards published a charming volume, illus-



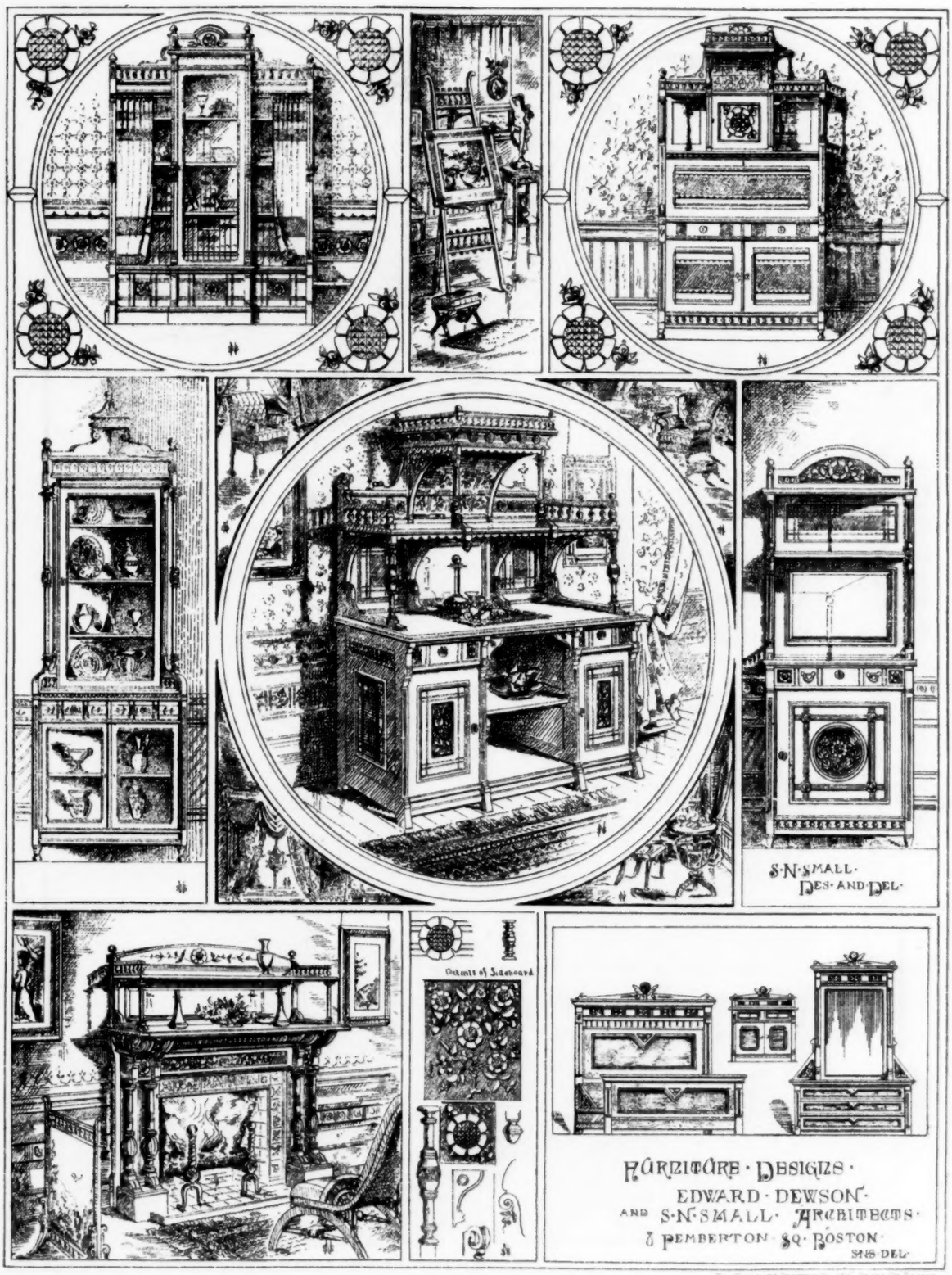
A PAIR OF CONNECTED HOUSES BUILT FOR E.W. LINCOLN ESQ. WORCESTER MASS.

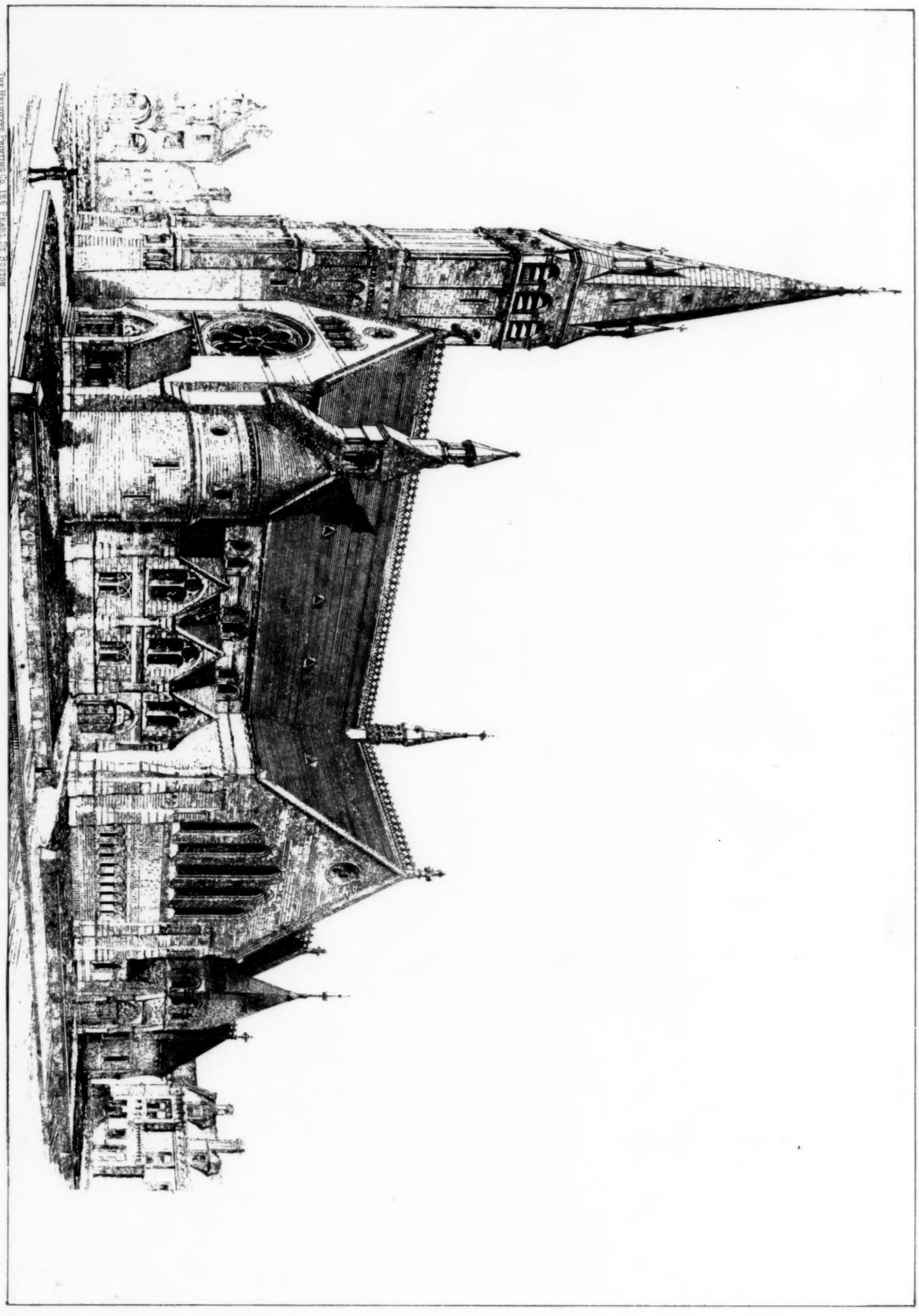
Stephen C. Earle Architect. Boston.



ALTERATIONS TO THE HOUSE OF S. B. PRATT, ESQ., FOREST HILLS, MASS.

CUMMINGS & SEARS, Architects.





COMPETITIVE DESIGN FOR TRINITY CHURCH, BOSTON, MASS.

STURGIS & BRIGHAM, Architects.

trated with fine sketches. (Letters on Sicily, 1840.) He brought back countless documents, drawings, sketches in water-color, some of which, especially his restoration of the theatre of Taormina, excited a veritable admiration, won him a second-class medal at the Salon of 1838, and established his reputation.

But about this time was founded an institution which has powerfully contributed to the preservation of the precious buildings of all schools of architecture which past ages have left us, and which, as a whole, comprise the monumental history of our country: the Commission on Historical Monuments, appointed by decree of September 29, 1837, presided over by M. Vatout, Superintendent of Civic Buildings, and composed of MM. Leprévost, L. Vitet, Montesquiou, Baron Taylor, Carristie, and Duban, — Prosper Mérimée, Inspector-General, being its secretary. Despite the smallness of the appropriation allowed (200,000 francs in 1837), the preservation of our monuments was thenceforth assured, thanks especially to the aid of two distinguished men who filled in turn the office of Inspector-General, Ludovic Vitet, who gave so strong an impulse to archæological study, and Prosper Mérimée, who replaced him in 1833, and who gave to the work that had been undertaken a direction whose excellent results were quickly felt. The commission had from the beginning called to its aid experienced architects, who became its collaborators, and among whom we may mention MM. Charles Lenormant, Duban, Labrouste, Lassus, etc., as well as Viollet-le-Duc, who soon distinguished himself among these celebrated names. . . . .

Besides the archæological works of all kinds with which he was charged, the individual works of Viollet-le-Duc are many. Conceived and executed without regard to the precepts of official instruction, they were as passionately attacked as they were courageously defended. If they are open to criticism, like all human works, they show an effort unceasing, if not always successful, for truth in all its forms. Still, they were only an incident in the life of Viollet-le-Duc, all whose energies were centred upon the study and teaching of French architecture. This was the one abiding purpose of his life, which may be cited as one of the finest examples of intelligent activity. Before all things a man of action, marvellously gifted with various aptitudes, served by an iron temperament and energy, his great brain took in all branches of human knowledge, and his works, of considerable didactic interest, are, and will remain, imperishable monuments of learning, of skill, and of art, condensing under an admirable form, with the embellishment of drawings still more admirable, the fruits of the study of all known monuments, augmented by researches made in libraries everywhere, with the patience of a Benedictine. . . . .

Viollet-le-Duc exerted considerable influence on the study and practice of architecture. He knew how to collect about him a great many artists stimulated by his liberal ideas, and strengthened by his example, who have already shown their vigorous quality in remarkable works, and who will make it their effort to follow with honor the route which their illustrious master has gloriously marked out. This influence extended to the very workmen, necessary auxiliaries in any architectural work. . . . .

Viollet-le-Duc had an admirable understanding of the special position of the architect. He formed in the many workshops which were opened in various parts of France, for the restoration of our mediæval buildings, a nursery of mechanics, skilful and devoted workmen, whom he animated by his creative breath, so to speak, and whom he sustained by the example of his indefatigable and fruitful activity. He revived the Master of the Works, a functionary whose title is much more positive than that of architect, and of much wider meaning, for in Works we must include, as was done in the Middle Ages, all the fixtures and the furnishings of the building, from its foundations to the smallest details of its furniture, its tapestry, lamps, and even jewelry.

Viollet-le-Duc carried the art of the draughtsman to its farthest limit, and his extraordinary skill of hand, the ready servant of a marvellously clear mind, was only equalled by his profound knowledge of effects, securely rendered with the most surprising simplicity, which filled with admiration the numerous students of the course in drawing which he directed for eight years at the National Drawing School, and which has been so well continued by his friend, M. Ruprich-Robert. The numberless details, too, which he gave on the ground, after having drawn them for the most part under the eyes of the workmen whom he was directing, and whom he raised in their own eyes, by treating them as his collaborators while giving them technical explanations suited to their several trades, from the mason and stone-cutter or the carpenter to the carvers themselves, are absolute models which deserve careful preservation. They should first be collected from the different counting-rooms of the work-yards which he directed, and which have become small museums, especially those of Notre Dame, at Paris, of Pierrefonds, of Carcassonne, of Amiens, of Rheims, etc.

If it is no longer possible, as in the Middle Ages, to have beside each of our great religious edifices a house called the Works, in which lodged the architect and the master workmen who from father to son were charged with carrying on the buildings, — as could be seen down to our day in Strasburg, where one of the halls of the *maîtrise* contained part of the drawings on parchment which have served for the execution of the porch of the cathedral, of the tower, spire, etc., — we could at least collect them so as to prevent their being dispersed, after having been the object of more or less profitable speculation. Nothing would be easier, in my opinion.[1] These detailed drawings, whose number is very considerable, should be subjected to a judicious selection and classification, — it could not be better done, it seems to me, than by the Inspectors-General of historical monuments and of diocesan buildings, — which, arranging them in definite series, would then form, if not a complete monograph, at least a synthetical account of each of the great buildings restored or reconstructed by Viollet-le-Duc. These collections might be preserved at the Trocadéro, in the Museum of French Sculpture, of which he was one of the most ardent promoters. They would be, in any case, incomparable models for schools of art, profitable to all artists, and particularly instructive to young architects — or even to those who are not so young, — in the difficult art of directing workshops. While waiting for this wish to be realized, it seems certain that an exhibition will soon be arranged. If his friends, and the many collections of his drawings, and especially the archives of historic monuments, will open their portfolios, this will be enough to make known in all its splendor the enormous work of the strong artist who has already taken rank among the greatest masters of French art, and who by virtue of this will have without doubt his place marked on the new city hall, on the façades of which Paris commemorates her most illustrious children.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR TRINITY CHURCH, BOSTON. MESSRS. STURGIS & BRIGHAM, ARCHITECTS, BOSTON, MASS.

A PAIR OF CONNECTED HOUSES FOR EDWARD W. LINCOLN, ESQ., WORCESTER, MASS. STEPHEN C. EARLE, ARCHITECT, BOSTON, MASS.

THESE houses are built of face brick, with Ohio freestone and black brick for finish.

ALTERATIONS TO HOUSE OF S. B. PRATT, ESQ., FOREST HILLS, MASS. MESSRS. CUMMINGS & SEARS, ARCHITECTS, BOSTON, MASS.

FURNITURE DESIGNED BY DEWSON & SMALL, ARCHITECTS, BOSTON, MASS.

MR. RUSKIN'S EXHIBITION OF PROUT AND HUNT.

WHEN the author of Modern Painters gave, thirty years ago, to an astonished public his critical thoughts on the artists of the day, he pronounced eulogium on Samuel Prout as follows: —

"We owe to Prout, I believe, the first perception, and certainly the only existing expression, of precisely the characters which were wanting to old art; of that feeling which results from the influence, among the noble lines of architecture, of the rent and the rust, the fissure, the lichen, and the weed, and from the writing upon the pages of ancient walls of the confused hieroglyphics of human history. There is *no* stone drawing, *no* vitality of architecture, like Prout's. I repeat there is nothing but the work of Prout which is true, living, or right in its general impression, and nothing, therefore, so inexhaustibly agreeable. Faults he has, manifold, easily detected, and much declaimed against by second-rate artists; but his excellence no one has ever approached," etc.

This high praise was no mere empty breath. Mr. Ruskin testified the genuineness of his appreciation by buying from time to time examples of Prout's work; and though he would probably not now assign to the artist so isolated a superiority as when the above passage was penned, in the face of the painters who have since grown and worked, some even under his own teaching, yet the preface and notes to the catalogue of the exhibition under review show that the critic's admiration is undiminished in fervor, and his discrimination has only taken on a finer edge. It is the same with William Hunt. Both in Modern Painters and in the comparatively more recent issue of notes on exhibitions, Mr. Ruskin has ever held up the water-color work of that artist as an example of right manipulation and healthy perception, and of sense of color only equalled by that of the Venetians. He bought the painter's pictures, and, more, he distributed many throughout the art-schools in England as examples, and now reiterates praise no less sincere if more reticent in expression.

The exhibition, then, of drawings and water-colors by Prout and Hunt, now gathered at the rooms of the Fine Art Society in Bond Street, by help of Mr. Marcus Huish and the kindly loans from some forty and odd owners, is organized in pursuance of the art principles and enthusiasms dear to Mr. Ruskin's soul, and fundamental to his teaching of many years. We may not all accept as inevitable the judgments of this critic; we may indeed differ widely from many; we may think that he has sometimes appeared to found principles upon a quicksand of opinion that the next tide of emotion has shifted; yet, taken altogether, there is no given teacher who, from practical work and profound study, has more right to talk to us about texture, and color, and light, and shade, pencilling and brush-work, than Mr. Ruskin; and, above all, there is now no one better able to discourse on the old story of "eyes and no eyes," and to show how much may be missed for want of intelligent and loving observation, whether of art or nature. In the letterpress of the catalogue of this exhibition

[1] The Under Secretary of State for the Fine Arts has just given orders to seek out and collect all these drawings of detail.

there is an amount of sound sense and discriminative criticism which would supply a dozen juvenile aspirants to the post of mentors to the public on art matters; and the friends of Mr. Ruskin must mark with satisfaction the regained balance of expression, not often marred by those super-emotional touches which detract from the dignity of criticism. We have dwelt thus long upon the right of Mr. Ruskin to be listened to, because, although he has always a surrounding of unreasonable and cliqueish disciples, there is also a danger just now from the reactionary band of "anti-Ruskinites" who forget the debt owed to the most faithful and poetic critic England has yet had the good fortune to possess; and thus between blind admirers and equally obstinate detractors we run equal chance of committing stupid injustice.

To a large section of exhibition-goers the show of pencil drawings by Samuel Prout will be quite a revelation of his power. All the showiness and crudity and sacrifice of true detail which often marred the artist's water-colors is conspicuous by absence from the beautiful drawings here gathered. Moreover, the range of subject is considerable — not only market-places beneath the shadow of cathedral towers, thronged by a busy crowd of vendors and buyers, or the façades of Gothic churches or fretted gloom of their rich interiors, but sketches of Rhine valley, with the broad windings of the river beneath its mountains, and Italian Piazze, views in Rome and Venice, and water-falls in Switzerland. Certain qualities of a great artist are notably impressed upon one by a sight of these collected drawings: the sense of scale, and power of suggesting depth and distance, the fine feeling for adjustment of opposing and converging lines of composition, carried into minutest detail in the architectural drawings, and the seizure of accidental conditions favorable to artistic effect. Messrs. Redgrave, in their usually solid and justly worded volume on modern English artists, have accused Prout of sacrificing precision and truth to picturesque effect; but the drawings before us show no such tendency. The observation might with more truth be applied to Prout's colored drawings, which are truly designated, when compared to his pencil work, "mechanical abstracts, made absolutely for the support of his household, from the really vivid sketches which, with the whole instinct and joy of his nature, he made all through the cities of ancient Christendom without an instant of flagging energy." The writers above named point out that Prout's architectural drawing lacks the "imitation" and the "knowledge of construction" which mark the well-trained pupils of the elder Pugin. But if sometimes a little shaky in line, they were never wrong in the most important truths, and in character supremely right. One might apply to Prout a word of criticism passed by Mr. Hamerton on the French etcher Méryon: "He has the Gothic sense of the multitudinous."

There are some points of approach and divergence in the life of these two artists, Prout and William Hunt. Both were sickly as lads, and this delicacy, apparently an obstacle to a successful career, led to the choice of a profession for which nature had designed them. Samuel Prout was born in 1783, at Plymouth, where Haydon was the companion of his school-days. When out nutting among the hedgerows, as a child of five, he had suffered from a sunstroke, and the after effects left him too delicate for his father's business. He came to London while still a lad, did work for Britton, author of Picturesque Beauties of England, and copied drawings by Turner, Cotman, and Mackenzie, to attain greater correctness and firmness of outline, exhibited in the Royal Academy when twenty-one years old, and some ten years later was made member of the Water-Color Society. Hunt, on the other hand, was born in 1790, a Londoner, in the then noisome purlieus of Long Acre, within influence of the poisonous strata of St. Martin's burial-ground, raised many feet above the footway by overcrowded burials. He too, and no wonder, was a delicate child, and the quiet profession of art was thought better for him than work at his father's tin business. He was apprenticed to John Varley; got some oil pictures hung in the leading exhibitions before he was eighteen; received, moreover, a helping hand and wise counsel from Dr. Munro, like so many other young artists. In 1812 he exhibited at the Water-Color Society's Gallery, which then admitted oils, and later was admitted as Associate in 1824, when the body gave itself exclusively to the art of water-color painting.

Prout, born in green Devonshire, never, strange to say, attained to the right drawing of trees and foliage; while Hunt, though cockney born, loved to paint the most rustic of figures and the most simple objects in Nature's treasure-house, birds' eggs and berries, wild blossoms and fairy fungi. Both artists worked after an unscientific and healthily enthusiastic manner, not fashionable in these self-conscious later days, and, delighting in art for its own sake only, lived to an old age without ostentation, laborious to the last. — *The Architect.*

NOTES ON IRON-WORK.[1]

BY GRAHAM SMITH, ASSOC. M. I. C. E.

The branch of science which enables the engineer to determine the theoretical amount of strain in the members of any proposed structure may be said to appeal directly to ordinary intelligence, and to be on the whole simple. The science, however, depends upon data and conditions, the exact influence of which can never be determined in actual practice. It is proposed, therefore, in this paper, to consider briefly some of the practical questions which affect theoretical deductions, and the design, efficiency, and economy of iron-work structures generally. The precise conditions under which iron-work will be constructed and worked being indeterminable, it becomes necessary, among other matters, to have some knowledge of workshop practice and routine in order to determine the proper limits and importance to assign to theoretical results.

In taking out strains it is usually assumed that each member has a normal length, whatever the amount of strain to which it is subjected, and that its conditions are the same as they would be were it free to turn in a plane about its extremities. Both of these assumptions are to a certain extent erroneous. So far from any bar having a normal length, that is, being perfectly rigid, it may be taken for granted that directly any piece of iron is subjected to a tensile or compressive strain its length is varied accordingly. Likewise no member of any structure is perfectly free to turn in a plane about its extremities; were it so, each junction would have to be made with an absolutely frictionless pin. In English practice junctions are frequently made with innumerable small rivets, which render them, to all intents and purposes, rigid. In America, however, pin connections are employed to a very large extent, and undoubtedly with pins and eyes properly proportioned efficient joints may be made. By a simple arrangement of parts theory can be more closely approached than with our complicated systems with riveted joints.

Variations in the temperature of the atmosphere likewise materially affect the strains in iron structures. When constructing an iron bridge a camber is given to it, so that when loaded it may assume a straight line, instead of exhibiting signs of apparent weakness by sagging. While testing the bridge it is usual to measure the camber as the load is put on, and it is not uncommon to find that on a warm day the camber is greater than it was the evening before, notwithstanding that a larger amount of load has been put upon it. This anomaly is due simply to the sun warming up the top flanges, and causing them to extend, whilst the bottom flanges have not extended to a similar extent, owing to being protected from the sun by a platform or the load upon the bridge. It has been ascertained that a variation of temperature in iron of 15° Fahr. will produce the same effect as one ton actual load per square inch. Therefore a change of 82.5° Fahr. will produce the same effect as 5.5 tons per square inch actual load, which is greater than the amount of strain supposed to be put upon any bar when under its full working load. Now, although the difference between the extremes of temperature in this country may be estimated at 82.5° Fahr., the extreme temperatures only act during a short portion of each twenty-four hours; and so, owing to the mass of iron and other circumstances, the temperature of the structure is seldom the same as that of the atmosphere; consequently the iron it not affected to the full extent just mentioned. There are, of course, many positions which will at once suggest themselves where the temperature is tolerably uniform throughout the year, and where accordingly no provision need be made for expansion and contraction due to changes of temperature. In exposed positions in this country an allowance of $\frac{1}{16}$ of an inch in each 100 feet should be made if it is wished to eliminate strains, which, it has been shown, may be of considerable amount. Edwin Clark has placed it on record that half an hour's sunshine has more effect on the tubes of the Britannia Bridge than the heaviest rolling loads or the most violent storms.

Questions of the foregoing nature having been considered, and the strains upon the various members of the proposed structure having been determined within reasonable limits, it becomes necessary to arrange the material to meet them. It is in doing this properly and economically that the art of designing iron-work consists. In all designs every endeavor should be made to employ iron of such dimensions and weights that it may be easily procured in the open market, and require only such workmanship as can be cheaply and readily performed. By attention to these points economy will be more surely attained than by the saving in the weight of iron which may be effected by adhering more closely to theoretical refinements. As an instance of this it may be stated that the actual weight of a plate girder is always very much in excess of its theoretical weight, and it is rarely the lightest form of girder which it is possible to design to carry a load. It is yet generally the most economical type to adopt for small spans, owing to the uniformity of its parts and the simplicity of its manufacture. While mentioning plate girders it may be well to state that although the theoretical economical depth of all girders depends upon their description, the loads to be carried, and a variety of other circumstances, the depth of a plate girder is often fixed by one consideration alone, and that of a practical nature quite beyond the control of the designer. It is simply the fact that plates cannot be rolled at ordinary rates over 4 feet 6 inches in width, so that the maximum depth of ordinary plate girders is fixed at 4 feet 6 inches. If this depth is exceeded it becomes necessary to plate the web vertically, which will enhance the cost of the work to an extent exceeding the saving likely to result from conforming more nearly to any greater depth which theory might dictate. In arranging the flanges, although theoretically the section of metal should be reduced at certain points, it is generally desirable, when a limited number of girders are to be made from one design, to keep the plates as nearly uniform in thickness as possible, rather than to vary their thickness so as to approach more closely to the amount of metal required to meet the strain.

[1] A paper read at the Mitcham Meeting of the Association of Municipal and Sanitary Engineers and Surveyors.

However, where a large number of girders are to be constructed from the same design, the plates may be varied in thickness without increasing in any way the cost of the work, as the plates can be ordered in batches from the rolling mills and relegated to their respective girders in the manufacturers' yards.

At one time much of the iron employed for girder and bridge building came from Staffordshire; consequently, specifications were prepared in such a manner that iron from this district might comply with their stipulations. These specifications have been copied and recopied even up to the present time, notwithstanding that Staffordshire iron is now rarely put into ordinary iron-work, for the reason that the sizes of the iron supplied from this district are small when compared with those from the north country. This is owing to the Staffordshire mills working with plant which was put down many years since, whilst the iron-works in the Cleveland district are provided with more modern machinery and improved appliances. A South Staffordshire plate to cost the ordinary market rate must not be over 4 cwt. in weight, 15 feet in length, and 4 feet in breadth, and about 30 superficial feet in area; whereas Cleveland plates can be procured without additional cost up to 21 feet in length, 4 feet 6 inches in width, and 12 cwt. in weight, providing the area does not exceed 56 superficial feet. Although plates from the latter district may be obtained possessing as great a tensile strength, both with and across the fibre, as those from Staffordshire, they are not as a rule equal to the latter in toughness. Extra care should therefore be taken to test and thoroughly ascertain the quality of the iron, as it is sometimes very brittle. No attention whatever should be paid to "brand," as it is no criterion by which to judge of the qualities of iron usually employed for the construction of ordinary iron-work. A very fair specification for girder iron is 20 tons per square inch and 6 per cent elongation with the fibre; 18 tons per square inch and 3 per cent elongation across the fibre for plates; 22 tons per square inch and 9 per cent elongation for L's and T's; and 24 tons per square inch and 15 per cent elongation for rods and bars. These elongations ought to be taken on a testing section of uniform width for a length of $6\frac{1}{4}$ inches. In a length of $6\frac{1}{4}$ inches there are one hundred sixteenths of an inch, so that each $\frac{1}{16}$ elongation after testing represents 1 per cent. In preparing all samples for testing they should be drilled out of the plate angle or bar, and be either chipped or slotted to the required dimensions, and all tool marks carefully filed out, and the parallel portions should run in with curves of large radii to the portions through which the pin holes are drilled. In the event of there being the slightest shoulder at either of these points, it will have the same effect as a nick in the iron, which will generally render worthless the test for both tensile strength and elongation. With a little experience the quality of a plate may be determined to some extent by breaking the corner off over an anvil, and by inspecting the punchings from the plates. If the iron is brittle and untrustworthy, the punchings will show cracks in all directions if the punch be working as ordinarily with a little clearance, whereas if the iron is good and reliable slight cracks only will be perceptible, all running in the direction of the fibre. Whilst these workshop tests can be carried out in the manufacturer's yard by the inspector during the progress of the work, all tests requiring to be made with hydraulic presses or steel-yards should be conducted by independent authorities, such as Mr. Kirkaldy. After the material has been tested and passed, and the structure put together, it becomes necessary to apply a proof load, which consists of gradually placing on the structure a weight somewhat exceeding its working load. This is requisite in order to ascertain if the workmanship is up to the proper standard. It must, however, be always remembered that a proof load is no test of the strength of the structure or the quality of the material. If the iron is hard and brittle, it will give less than a material of more desirable quality, and the structure will apparently be stronger, but it is needless to state that such is not the case. Again, any part may be on the point of breaking, and yet not yield sufficiently to materially alter the deflection. Likewise, although a structure may stand the application of a proof load at the time of testing, it does not follow that it will stand repeated applications of loads of even less amount than the proof load. Fairbairn's experiments, carried out many years back, demonstrated this fact. He found that when the strain on the iron of a beam was between six and seven tons per square inch, the beam sustained an unlimited number of applications of the load producing this strain; but when the load was increased so as to put a strain of from eight to nine tons per square inch on the iron, the beam failed with a comparatively few applications of the load.

THE RESTORATION OF ST. MARK'S.

THE following is, I have reason to believe, the text of a report sent by the Minister of Public Instruction to the Minister of Foreign Affairs on the subject of St. Mark's, at Venice, and which will be transmitted for information to General Menabrea, the Italian ambassador in London: —

"The erroneous reports in England regarding the restoration of the Basilica of St. Mark's, at Venice, have given occasion to meetings held only after our Government had taken an active interest in those restorations, and, examining the question well, had decided to change the system followed. From what I am about to relate, your Excellency will perceive that those meetings had no *raison d'être*, inasmuch as the necessary instructions to secure the integrity of that Basilica had already been given some time ago. It is, indeed, too true that it was intended to rebuild the principal façade in the same way in which the northern front has been reconstructed under the Austrian Government and the southern under our Government, following the plan prepared by Austria, and perhaps if the administration of the Basilica had remained in the hands of the Ministry of Grace and Justice, that intention would have been carried out, inasmuch as works had already been commenced at the principal doorway and at the southwest angle according to the old system. But it is also true that when the Ministry of Public Instruction became aware of the danger which thus threatened the magnificent façade of that monument, and perceived that if it did not claim to itself the administration it would not obtain the fulfilment of its intent of seeing it restored in a proper manner, it hastened to demand that the funds assigned to that monument should be transferred to its estimates. This was done at the beginning of this year, and my ministry, having been legally authorized to provide directly, let no time be lost, but wrote in the month of May last to the Prefect of Venice to summon the Commission for the Preservation of Ancient Monuments to examine what had been done up to the present time, and determine clearly what might be necessary, studying well the questions of preservation and restoration, and laying down exact regulations as to the course to be followed for the future. The commission has already commenced its work, and this ministry awaits its resolutions to examine and submit them to the Superior Council of Fine Arts. And further, this ministry, to guard against any possible mistake, also ordered a thorough inspection of the Basilica, and the results having been a confirmation of the statements as to the many errors committed in the restorations, categoric order was given, which was instantly obeyed, and is still in force, that no further works should be executed by the *fabbriceria*, either in the reconstruction of the mosaics or in any of the decorative parts of the Basilica. From this your Excellency will perceive that not only have the English meetings no *raison d'être*, but it is demonstrated that the memorial they would make to our Government is, to say no more, superfluous. It is not necessary to enter further into details. I limit myself simply to giving your Excellency the more important particulars it is well you should possess, that you may communicate them to our ambassador in London, and I am persuaded that they will be sufficient to reassure affrighted souls, and demonstrate that if the love of art and the reverence for the memories of the past exist in England, that love and that reverence are not wanting in Italy, and that the Government, interpreting the general sentiment, has acted in the matter in accordance with its duty." — *Rome Correspondence London Times.*

MODERN IMPROVEMENTS IN COLOR.

THE Hindu arranges colors for a fabric with the same certainties of intuition that a bird weaves his nest or a spider its web. His blues and greens are harmonious in their combinations as those of nature herself, while the "educated" Englishman is now introducing every species of atrocity in form and color wherever he goes, ruining the beautiful native manufactures by instructions from this superior "stand-point," forcing the workers to commit every blunder which he does himself at home, in order to adapt their fabrics to the abominable taste of the middle classes in England. Even the missionaries, male and female, cannot hold their hands, but teach the children in schools and harems crochet and cross-stitch of the worst designs and colors, instead of the exquisite native embroidery of the past. Arsenic greens, magenta and gas-tar dies, are introduced, by order of the merchants, into carpets and cashmere shawls; vile colors and forms in pottery, and bad lacquer-work, are growing up, by command, in China and Japan. There seems to be no check or stay to the irruption of bad taste which is swamping the whole world by our influence. The Japanese have even been recommended to make a museum of their own beautiful old productions quickly, or the very memory of their existence, and of the manner in which they were made, will be lost. It is commonly supposed that the taste of the French is better than our own, and the pretty, the bizarre, the becoming, may indeed be said to belong to their domain; but high art is not their vocation. A certain harmony is obtained by quenching color, as in the "Soupir étouffé," the "Bismarck malade," the "rose dégradée," the "Celadon" of Sèvres china, all eighth and tenth degrees of dilution; but pure color, like that of Persia and of the East generally, they never now dare to dip their hands into. The gorgeous effects of their own old painted glass, the rose windows of the churches at Rouen, and in many other towns of Normandy, are far beyond their present reach. The stained glass of all countries in Europe, indeed, belonging to the good times, is a feast of color which none of the modern work can approach. At the present day the pigments used, we are told, are finer; the glass is infinitely better rolled, all the manufacturing processes have made wonderful progress, as we proudly declare; only the results of it are utterly and simply detestable — the colors of the great modern windows in Cologne Cathedral and Westminster Abbey set one's very teeth on edge. The temptation to use a stone (if it had come under one's hand) would be frightfully great in front of that at the east end of Ripon. There lies before me an old Persian rug, all out of shape, and twisted in the weaving, but full of subtile quantities in color, perfect in the proportions of its vivid brilliancy, and a grand new Axminster carpet alongside, of faultless construction,

with a design as hideous as its colors are harsh. It is not only now with productions destined for the English market, but the degradation of art is beginning to spread all over the world. The standards of "instructed" European taste are vitiating the very well-springs of beautiful old work. The "mantilla" of Seville and the "tovaglia" of the Roman peasants are supplanted by frightful bonnets; the striking old costumes are disappearing alike in Brittany and in Algiers; in Athens and in Turkey they are giving way to the abominations of Parisian toilets for the women, while the chimney-pot hat is taking the place of the turban and the kalpac for the men. — *Lady Varney in the Contemporary Review.*

MARION COUNTY, INDIANA, COURT-HOUSE.

Indianapolis, December 22, 1879.

To the Editor of the American Architect:

Sir, — The case of Isaac Hodgson *vs.* the Commissioners of Marion County, a suit to recover $34,000 claimed to be due for services as architect of the court-house, was decided in the superior court, by Judge Elliott, in favor of the county. The circumstances giving rise to the litigation will, perhaps, be of interest to the profession. Two contracts were entered into between the architect and commissioners, — one in June, 1870, the other in September, 1872. When the contract of 1870 was made, the parties understood and intended that the basement and mansard stories were not to be finished, and in an estimate furnished by the plaintiff to the committee, the estimated cost of the court-house was $685,226. The contract of 1872 stipulated that Mr. Hodgson should receive for his services five per cent on the estimated cost. Afterwards, without any formal order of the board, the basement and mansard stories were finished, and other additions made, which increased the cost to $1,600,000. Mr. Hodgson will appeal to the supreme court, which is expected to reverse the decision of the lower court.

J. H. S.

NOTES AND CLIPPINGS.

The British Architect. — Amongst the papers in our office which were destroyed by the fire was a letter from the publishers of the *British Architect*, offering to the new Boston Draughtsmen's Association a free subscription to that paper.

Fall of a Roof. — The roof of the large building occupied by E. A. Thompson as an iron and steel works, in Pittsburgh, Pa., fell, December 28, burying beneath its ruins a number of men. They were extricated as soon as possible from the débris of fallen beams and brickwork, but nine of them were found to be seriously injured, two fatally.

Building Accident. — At Newburyport, Mass., the floor of the vestry of Belleville church gave way last week, letting quite a number of people, who were present at a sociable, down several feet. None were hurt, but all were badly frightened.

A Canadian Academy of the Fine Arts — The Governor-General of Canada is much interested in the foundation of a Canadian Academy of the Fine Arts. The objects in view are the institution of a National Gallery of Art, the holding of exhibitions in the principal cities of the Dominion, and the establishment of schools of art and design. A constitution has been drawn up, which limits the number of academicians to forty, and there are to be associates, honorary members, foreign academicians, and honorary retired academicians. The officers of the academy will be nominated in the first instance by the Governor-General. The first regular exhibition will soon take place.

Eight-Inch Party-Walls. — By a singular defect in the building law in New York, three hundred buildings are said to have been erected in that city during the past season with party-walls only eight inches thick; but it is believed that they will hold together long enough to allow the builders to sell them. Then they may tumble down about the ears of their occupants as soon as they please.

Sir William Boxall. — The death is announced in London, in his seventy-ninth year, of Sir William Boxall, R. A., F. R. S., an English painter, and ex-director of the National Gallery. He was born at Oxford in 1800, and entered in his twentieth year the schools of the Royal Academy. In 1829 he exhibited Milton's Reconciliation with his Wife, in 1830 Cordelia, and in 1838 Hope. On his return from a visit to Italy, in 1833, he devoted himself to portrait painting, a branch in which he continued. In 1851 he was elected an associate of the Academy and in 1863 a full member. He has been a constant exhibitor. Among his works are several illustrations for the Waverley novels. At the death of Sir Charles Eastlake in 1865 he was appointed director of the National Gallery, and in 1871 was knighted by the queen. Ill health obliged him in 1874 to retire from his position. Sir William was an honorary member of the Madrid Academy of San Fernando.

Prize for an Architectural Treatise. — It is stated that the jury has decided that no one of the architectural treatises presented in competition for the prize of 25,000 francs offered by the King of the Belgians is worthy of receiving the prize. Two of the jury, however, were in favor of awarding it to MM. Van Bemmel and Coulon, for their study of the Church of Villers.

The Power wasted at Niagara Falls. — The amount of water passing over Niagara Falls has been estimated at 100,000,000 tons per hour, and its perpendicular descent may be taken at 150 feet, without considering the rapids, which represent a further fall of 150 feet. The force represented by the principal fall alone amounts to 16,800,000 horse-power, an amount which if it had to be produced by steam would necessitate an expenditure of not less than 226,000,000 tons of coal per annum, taking the consumption of coal at four pounds per horse-power per hour.

Macadamizing. — The late Mr. Macadam, before the introduction of the two-inch ring and six-ounce weight for testing the gauge of stones, used to bid the stone-breakers use their own mouths as a gauge; if the stone would not go into the mouth it was too large for the road. While superintending the making of a road, Mr. Macadam one day perceived some stones of extraordinary size: his wrath was kindled against the stonebreaker, a canny Scotchman, whom he forthwith accused of having failed to test the stones. The man denied the accusation, and solved the mystery by opening his mouth, which was of enormous capacity and entirely bereft of teeth.

Topographical Map of Italy. — An immense topographical map of the kingdom of Italy, which has been eighteen years in preparation, has just been issued by the Royal Engineer Department. It consists of two hundred and seventy-seven sheets, and is the most accurate and detailed map of the peninsula ever published.

Temple at Terracina. — As archæologists are aware, the remains of a temple consecrated to Apollo may be seen at Terracina. Its columns are still standing, but they were hidden by some masonry thrown up at a later period. The Commission for the Preservation of Monuments, having called the attention of the Ministry of Public Instruction to the fact, has obtained an order for the demolition of the unsightly accretions referred to; and the ancient edifice, or at least as much of it as survives, will be seen.

Discoveries in Taman. — Some explorations undertaken in the Peninsula of Taman, in Russia, have produced interesting results. Between Temruk and the station Sennaia a tomb dating from the third century before the Christian era has been discovered. In it was found a gold collar ornamented with lions' heads, a crown of the same metal adorned with precious stones, having in the centre a swan with a cupid on its wings; a round gold brooch with a pin representing Venus holding a cupid in her arms, a collar of pearls, ear-rings, chains, rings, bracelets in gold, and silver vases. The tomb is probably that of a young girl.

The Tashkend Railway. — The London *Daily News's* correspondent at St. Petersburg sends some details as to the proposed railway from Orenburg to Tashkend. This purely strategical line will be 1650 miles in length, and will cost, according to the Russian journals, about £11,500 a mile, making a total expenditure of nearly £20,000,000. That it can pay interest on its cost within any reasonable period is impossible; but this is to be remedied by the guaranty of five per cent interest by a Russian railroad bank. Altogether, the scheme is not likely to tempt European capitalists.

Marine Foundations. — A great deal of ingenuity has been spent by engineers in the construction of the foundations of light-houses and other similar structures. In some of these the stones are laid in off-sets to a considerable height above the rock, with the object of breaking the sea; each stone in the face is dovetailed vertically and horizontally into the adjoining stones, while a further precaution is taken by bolting each stone to the course below it by bolts of yellow metal and galvanized steel. Such a mode of construction was adopted in the Wolf Rock Light-House, off Land's End, considered the most difficult erection of the kind on the British coast. The rock on which it was built is seventeen feet above low water. In another structure, well known, the Bishop Rock Light-House, which, Findlay says, is probably the most exposed light-house in the world, the same construction is employed, and as a rule, in most sea-rock structures, massive blocks, dovetailed and dowelled together, have been used. A notable exception to this mode of construction was the plan devised for building the Phare d'Ar-men. The rock, Ar-men, presented formidable difficulties; it was almost impossible to obtain a secure footing; an iron structure was out of the question, on account of the difficulty of landing large pieces of iron framing; and, to make matters worse, the rock was divided by deep fissures. The method resorted to was as simple as it was bold: it was decided to bore a number of holes thirty centimetres deep and one metre apart all over the site, and others outside, in order to hold ring-bolts necessary for craft and to fasten lashings. In some of these holes wrought-iron gudgeons were fixed for the purpose of fixing the masonry to the rock, and thus to make the construction itself serve to bind the different parts of the rock together. In addition to these gudgeons, horizontal iron chains were introduced into the masonry courses to prevent disjunction. The gudgeons were .06 metres square and one metre long, made of galvanized iron, and the lower masonry was of small undressed stones set with Parker-Medina cement. Here we find a very different principle of consolidation necessitated mainly by the difficulties of landing large materials and also by the rock cleavage. Of course the object of dovetailing and dowelling the blocks together is not only to insure strength, but to prevent displacement of the masonry by the force of the waves during construction before the superincumbent weight of masonry could be brought to assist. In some other instances the courses of the basement are divided into a number of keystone-like parts, each of which is secured to the underlying stones by granite plugs let into the adjacent courses. Iron and screw piles have now superseded, in several cases, the solid foundations we have been describing, as in the instances of the Fowey Rocks, Ship Shoal, and other structures in the United States; but the engineer of marine works will probably sooner or later have to resort to a method of building foundations under water in which the advantages offered by the combined use of concrete and iron must be acknowledged. The government works at Dover harbor, and the harbor constructions at Douglas, in the Isle of Man, are instances in which concrete blocks of large size have been successfully employed; and the question appears to be worth a passing thought, whether or not, by the use of iron in the shape of piles or pillars, together with chain-bond, smaller blocks of concrete might not be used with more economy in structures which have to withstand the force of the waves, or in places where the employment of large blocks would be attended with risk and difficulties. Blocks of Portland cement concrete might be cast or moulded into forms capable of being interlocked together in the same manner as the stones of Eddystone, the Bell, and Wolf Rock towers, and these could be secured to the rock by a system of iron uprights and horizontal bars, so that the structure may possess both vertical and lateral cohesion under the most trying circumstances. — *Building News.*