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THE testimony before the coroner's jury, in the case of the fatal fall of the scaffolding employed in the erection of the Music Hall, at Chicago, reveals no new facts. The structure, on the whole, seems to have been rather better than is usual in such cases; it was built for the masons, was of double width and of new material. Apparently it was the opinion of the contractor that the primary cause of the disaster was the breaking of a joist, three by twelve, extending from a pole of the staging to the wall, by the sudden impact of the heavy iron bedding-plate upon the foot-planks which it supported. The verdict in very general language pronounced the scaffolding to be "in an unfinished condition, and unsafe for the purpose for which it was used," but that the work at the time was in charge of an experienced and competent foreman, "who erred in judgment in the present case." The jury, which was composed of architects and builders, found fault with the scaffolding, which was reconstructing, on the ground that it would still be unsafe, and called attention to this fact as a warning against future accidents. It is to be regretted, for the sake of the precedent, that those gentlemen did not define the nature of the construction which they found so insufficient, — did not touch upon the alleged misuse in the present case, and advise as to the measures necessary to render it secure. It appears, then, that we can derive no practical lesson from this occurrence except a general warning to be more careful hereafter in the building and in the use of such stagings. Our impression is that more paternal governments, by an arrangement of fines and imprisonment applicable to such cases of disaster, manage to secure a greater immunity than we enjoy. The poor fellow whose temerity in this case was so terribly expiated would not have dared to risk a weight of five or six hundred pounds upon a barrow along any staging, instead of using a mason's derrick, if he had had before his eyes the admonition of a law providing such inconvenient penalties. That is to say, such a law so enforced would have created a habit of prudence which would have rendered such an accident extremely improbable.

THE board of volunteer censors, which generally hovers around any official whose place its members would be glad to fill, still keeps its attention fixed on the Superintendent of Buildings in New York, recently promoted from the position of Deputy Superintendent. Mr. Dudley has the reputation of being less of a politician than either of his predecessors, and in his performance of his duties as deputy he showed intelligence as well as faithfulness to the great responsibility imposed upon him; his promotion was advocated by the best builders of the city, and it would be a public misfortune to have him supplanted by a corrupt official of the old stamp. His theoretical training, and his relationship to the American Institute of Architects, through his father, Mr. Henry Dudley, an old and respected member, are all in his favor. It would be impossible for an officer necessarily clothed with so much arbitrary power as the superintendent, under the New York law, not to incur the ill-will of many persons, and we should not be sorry to see the struggle between the department and the cheap builders, which has recently taken place, even more frequently repeated. If they have raised up bitter and powerful enemies against its head,

that is all the more reason why insurance officers, architects, and friends of good building generally should keep themselves informed of the progress of affairs, and, if they find themselves in danger of losing the cooperation of a valuable official, should exert themselves in his defense. The exertion, even if unsuccessful, would have a salutary effect on the public mind, and would strengthen the hands of future incumbents by its promise of moral support, at least, in the faithful execution of their public trust.

THE manner in which the public is primarily responsible for the mishaps which befall itself is illustrated by the disastrous fire at Locust Grove on August 15, where four persons lost their lives. Fashion constrains people to congregate at certain places during two or three months of the year in such numbers that they can be accommodated only in large and necessarily complicated buildings, which, as they are occupied during only a portion of the year, must be cheaply built in order to return interest on the money invested. Moreover, fashion which creates throngs of people at one place this year may leave it deserted the next, so that from a worldly point of view it is hardly fair to expect that capitalists and the architects and builders they employ will use the more costly methods of fire-proof building which are so generally neglected in the more permanent buildings of our cities. The most that can be hoped is that, as the proprietors of the now dangerous wooden hotels at fashionable resorts grow wealthy, they will replace these wooden hotels by fire-proof buildings. Meanwhile it should be understood that every frequenter of these huge wooden caravansaries does it at his or her distinct peril; and a clause might well be inserted in life insurance policies declaring that even a temporary and accidental sojourn in such a building is a violation of the conditions under which the policy is issued. Had the occupants of Gunther's Pavilion and Hotel been abed and asleep how many of them could have escaped during the fifteen minutes between the beginning of the fire and the total destruction of the building?

CONSIDERABLE interest has been aroused in Boston, a city generally well awake to municipal matters, by a letter of Mr. E. H. Derby to the mayor in regard to the disposal of the city sewage. As is well known, an extensive and thorough work of drainage is now under way, by which the waste of the city proper is to be gathered in a great intercepting sewer and discharged into tide-water at Dorchester Bay. To reach the deep-water outlet the sewer must cross the Neponset River, a navigable stream, by an inverted siphon, and a recent decision of the Harbor Commissioners requires this to be kept at such a depth that the cost will much exceed the anticipated outlay. A pumping station is already building at the head of the siphon, and it is a natural question whether the cost of pumping with that of the siphon and the sewer beyond might not be better expended in irrigating the large sandy tracts in the vicinity than in pouring the city refuse into the harbor, from which, as Mr. Derby says, it will soon have to be dredged again at great cost. With the head of thirty-seven feet given by pumping, which will be necessary in any case, the extent of waste land which can be irrigated is unlimited, so that the experiment might, it would seem, be tried under exceptionally favorable circumstances.

THE opinion till lately held by engineers that, however it might be with inland towns, sea-board cities did best to empty their drainage into tidal waters has recently been much modified by the unfavorable experience of London, which, after carrying its sewage twenty miles to obtain an unobstructed outfall, finds that it cannot be got rid of; that a vast "sewage section" merely moves to and fro in the river, depositing filthy silt with a rapidity which has become alarming. That a similar result would be probable in Boston is indicated by the experiments of the commissioners with floats set adrift at the proposed outfall, which moved back and forth for days, most of them being ultimately deposited on the flats which form a large portion of the shore. Independently of the silting up of the harbor, the prospect of the pollution of the water and the inundation of the flats with filth is sufficiently unpleasant to make us consider seriously whether, even at increased expense, the restoration of organic refuse to the land is not the best course in all cases, as it is

proved to be with inland towns. The brave determination of the English to have their rivers clean at any cost has led them into endless experiments, the results of which will guide us in carrying out such an undertaking with a fair prospect of success. The proper plan would undoubtedly be to combine the "intermittent downward filtration" system, applied to the higher portion of the land, by which a small area is made to purify a vast quantity of sewage, itself being greatly enriched thereby, with a system of direct surface irrigation for the low lands, which would serve as a safety valve for storm-waters, and form a sufficiently fertilizing application for certain crops. That the plan is feasible is beyond a doubt; that it would be immediately profitable is unlikely, although it would certainly prove so ultimately; but it is far more satisfying to the imagination, at least, than the other mode of disposal. On the one hand we contemplate the image which Victor Hugo draws: "These fetid streams of subterranean slime which the pavement hides from you, do you know what all this is? It is the flowery meadow, the green grass; it is marjoram and thyme and sage, the satisfied low of huge oxen at evening, the perfumed hay, the golden corn, bread on your table, warm blood in your veins, health, happiness, and life;" and on the other the frightful picture of the wreck of the "Princess Alice" in the Thames, where hardly one of the wretched victims was able to swim to shore, for the reason, it was supposed, that the poisonous sewage in the water took away their strength, and they died helpless.

WHEN, three or four years ago, the first portion of the Museum of Fine Arts in Boston was finished, it seemed only too probable that the building had been planned on so large a scale that generations must pass away before the need for the whole building could be felt. Two years, however, brought such an increase of treasure that it was necessary to build the second section, which has been finished only some three or four months, and yet very little vacant space is to be found within the building. One of the latest additions to its collections has been made by the transfer to the Museum of the architectural models and casts belonging to the architectural school attached to the Massachusetts Institute of Technology, — a transfer which was arranged when the scheme for establishing a museum of fine arts was first considered. This collection now occupies a large room in the northeast corner of the building, where it is admirably lighted, and, though far from filling the space allotted to it, makes a creditable display. It is by no means a complete collection, even of the casts that are ordinarily found in architectural museums. It gives the impression that its specimens have been gathered together not on any fixed scheme, but rather in accordance with the whim of the collector; for this reason, although it is perhaps no less valuable for the purposes of architectural study, it is certainly more individual. The place of honor is to be occupied by a full-size cast of the Porch of the Caryatides of the Temple of Minerva Polias at Athens, in humble imitation of the full-size casts at the South Kensington Museum, at the Crystal Palace, and at the Ecole des Beaux-Arts. We trust, now that this collection is placed where it can do more public good than before, that its growth may be persistently fostered, not only by the trustees of the Museum and the corporation of the Institute of Technology, but by the profession at large. Many architects who have travelled or studied abroad have, we fancy, brought home more or less architectural casts, which in the lapse of years have outlived their value in their owner's eyes, and have long since been relegated to the tops of book-cases and cupboards, where their begrimed and dust-incrusted surfaces add nothing to the attractiveness of the office. Should the best of such, to the individual, useless lumber be contributed to the public architectural collections that are now forming in New York, Boston, Champaign, Ithaca, and elsewhere, they would be gratefully received by the trustees of the different institutions, who would probably be glad to give them house-room, and the casts would thus be placed where they would do the most good.

MEANWHILE, the rooms at the Institute of Technology have been left somewhat bare, and it is proposed, we believe, to replace the casts by a collection of more strictly practical value, that is, by specimens of building materials, woods, stones, irons, and bricks in their natural and manufactured states; by working models of the various sanitary appliances that are invented daily, water-closets, valves, basins, ventilators, etc.; by models of building appliances, and fixtures, scaffolds, elevators, roofing

materials, and the innumerable contrivances that go to make up a modern building. We imagine that there will be small difficulty in procuring sufficient material to fill the rooms, for inventors and manufacturers are quick to seize every opportunity to advertise their wares, and the matter probably will resolve itself into a question of elimination and selection. There is need of such a collection in every city, and there is small room to question but that students could derive from it a great benefit. But there is another need which is felt by the profession at large, — one which the Institute of Technology and other similar institutions could do much to remove if, in addition to establishing museums of building appliances, they would attach to them properly equipped laboratories, where the students could conduct researches into the qualities and characteristics of the materials with which they are to deal hereafter, and make, under the supervision of their instructors, an infinity of tests and experiments, which, simple and inexpensive in themselves, would, when properly recorded and attested, be of incalculable value. We do not mean to suggest that tests of the strength of gross materials should be attempted; these must be left for the Government to undertake. The class of experiments that could be made will suggest itself to each reader; it would be an ever-enlarging one, and individuals would always be found ready to suggest possible methods of solving new questions which they have neither time nor opportunities to put to the test themselves. In this way records could be obtained, and published, of the action of every valve, water-closet, fireplace, furnace, ventilator, paint, cement, or other article, under every variety of circumstance that would be encountered in practice.

As the world goes, men, while they would not, perhaps, be surprised to find amongst artist-architects visionaries who could hope for success only in building castles in Spain, would expect to find amongst engineers only clear-headed, practical men. But now and then schemes are put forward by engineers which are so seemingly wild and impracticable that they resemble more the fantastic imaginings of the professional romancer than the suggestions of men whose ideas are supposed to be conformed to the rigid laws of mathematics and mechanics. So much of romance seems nowadays to attach itself to the profession that the father of the future may well stand in dread of his too imaginative son running away from home to become an engineer. The idea of connecting two great oceans by any of the ordinary methods of modern engineering seems to be distasteful to some of the more original minds in the profession; for besides suggesting the various common-place means by which a canal proper can be built, plans have been brought forward, with more or less gravity, for varying forms of marine railways, and even for floating ships across suspended from balloons. Indeed, after the schemes of Mr. Toellner, of Moline, Illinois, and of Mr. Griffin, of Brooklyn, have been announced, it only remains for some one to propose to train water-spouts so that they will take up a vessel from the Atlantic and whisk it into the Pacific without damage or loss of time.

MR. GRIFFIN proposes to build an iron or steel canal which shall have a mean level of one hundred feet above the sea, since by following the line of the Panama railroad the other side can be reached at this level, only one cutting one hundred and sixty-four feet deep being necessary. To and from this aerial aqueduct vessels of all sizes are to be hoisted and lowered. Mr. Toellner, who has elaborated his scheme to a greater degree, proposes to build a stone trough, more or less V-shaped, lined with steel plates, between which and the stone-work layers of rubber are to be placed. The trough is to be large enough to receive a species of movable dry-dock provided with a multitude of steel rollers, and large enough to receive vessels of any size. The trough at each end is to descend into the sea, so that the dry-dock may be sunk in sections just under the vessel, which is to be supported within it largely by means of air-bags inflated by means of steam-engines. The trough is to be of such a grade that powerful locomotives can easily tow dock and vessel, the grade being essentially that of the Panama railroad. It has been left, however, for a French engineer, M. Gamon, to suggest and make calculations for the most gigantic and visionary scheme of the age. M. Gamon, in brief, proposes to connect the island of Newfoundland with Ireland by means of an embankment, which would contain some twelve thousand cubic miles of material, this material being obtained by excavating the whole island to a depth of one third of a mile.

WHETHER M. de Lesseps will ever succeed or not in building the inter-oceanic canal, a fact which seems to be more than ever open to doubt, because of the ill-success he meets in persuading capitalists to take up his shares, the discussion of the question, and the agitation which has arisen because of the uncertainty as to what position the Government may adopt toward M. de Lesseps and his scheme, have led the friends of that other undertaking in which Frenchmen and Americans are interested, the erection of the Statue of Liberty on Bedloe's Island, to regard with disquietude the report that Bedloe's Island has been transferred by the War Department to the Treasury Department as a site for a marine hospital. This transfer, which would be a serious mishap to a creditable enterprise which has received none too much encouragement in this country, it is foolishly suggested, was made as a visible sign of the displeasure which the Government is supposed to feel towards the French inter-oceanic canal scheme. The French Society in New York had hoped to raise a large part of the money needed to build the pedestal for the statue, which is to be America's contribution, by the sale of French lottery tickets, but there seems to be a State law which will prevent the realization of this hope. It is not improbable that the hand and head, which were exhibited at Philadelphia and Paris respectively, are all that will ever be seen of the statue, unless the opening of a world's fair in New York in 1883 may create a renewed interest in M. Bartholdi's enterprise.

AMERICAN DRAMATIC THEATRES. V.

OF the arrangement of aisles in theatres it is perhaps enough to say that they should be without steps (except in galleries, or in the Greek form, where they are unavoidable) and without steep inclines, or sudden changes of incline. They should be well distributed and proportioned in width to the number intended to use them, and should widen toward the exits. A central aisle in the stalls should be avoided, it being objectionable to the actor, who prefers to have in his direct and central front a group of interested faces, and not a blank open way. The disturbance incident to aisles is also better kept away from the centre of the house. Of course no movable seats, or obstructions of any kind, should be allowed in any passages; but that is a matter pertaining to the management. The present styles of tilting seats have a marked effect on the arrangement of a theatre; when not in use they occupy so little room that every row becomes a passage way; and, at the same time, they serve to check any sudden rush, and are not very easy to climb over or stand upon. Some of the patterns are extremely comfortable in use and effective

in appearance. The cut shows one of the best of these, originally made for Booth's Theatre, in New York, by the Messrs. Jackson, and used by the writer in the Providence Opera House.

In arranging seats for the proper view of the stage, it is not only necessary that they should be stepped high enough, one above the other, but they should be set as nearly as practicable with the backs at right angles to the line of sight; so that the spectator will not be obliged to keep the head turned to one side. Even when the seat steps

are moderately high, the modern bonnets and hats, and the marked variations of height of different persons, make it desirable where practicable to place each seat on a line that would pass between the two in advance; so that one will not be forced to look over the head of the person next in front, but will have the advantage of the rise of two steps. This disposition was made in the Providence Opera House with the Booth-pattern chair, and the seating gave great satisfaction at the time.

In endeavoring to perfect what may be called machine chairs, they have been, in many cases, made too complicated, and the parts too light and weak; the latter defect being partly the result of the sharp competition in prices. Where the working parts are too much elaborated they are apt, under the rough usage of a theatre, to be broken, or so injured as to work with too much noise. They cannot be oiled on account of the danger to clothing, and it is very important that there should be no sharp or rough places on which dresses may be caught. Seats cannot be made altogether easy for persons of exceptional size, but too much care cannot be taken to make them as comfortable as possible to the average occupant.

On the subject of acoustics it is not necessary to treat at great

length. No rules have yet been determined that will prove safe guides in all cases; although certain general principles have been established which may, if followed, guard against absolute failure, even though not insuring perfect success. Fortunately the ordinary form of a theatre has been proved by experience to be well adapted to hearing. In order to be certain of success in this respect it is only necessary to provide sufficient reflecting surfaces of wood, or other moderately resonant material; to avoid too great depth under galleries, and large open lobbies back of the different circles; also to avoid too great height or depth to the hall, and all excessive or extraordinary features of proportion or dimensions. Heavy draperies are bad in this, as in all places where clear, distinct tone is important; although a moderate quantity of upholstering for proscenium boxes has not been found objectionable. In large theatres the currents of air for ventilation should travel in the direction it is desired the sound should take. In the smaller houses, that we have chiefly under consideration, this is not essential. It is a noticeable fact that the old theatres in this country that have the best reputation for good acoustic qualities, are, almost without exception, lined or sheathed with pine boards, covered with canvas, glued on.

The ornamentation, both in relief and color of the hall, does not differ so essentially from similar decoration in other buildings as to require extended treatment here. It need only be noted that fine work has little value, and that great breadth of handling, with warmth and strength of color, with liberal but judicious use of gold-leaf on raised and rounded surfaces, are means, which, if skilfully employed, are likely to lead to success.

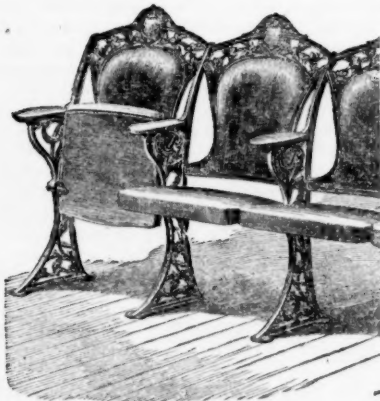
Red is a fine theatre color, and for its preference as a leading element in the treatment, many good reasons may be given. It is a good foil for most of the color effects exhibited on the stage. It has, in proper combination with gold and offset and strengthened by neutral backgrounds, a richness, warmth, and cheerfulness of effect eminently suited to enhance the attractions of places of amusement. It is a fine gas-light color, and wears well in the heat, smoke, and dust to which it is subjected, necessarily or otherwise. The Oriental splendor of the tints of the nasturtium would furnish fine motives for such a scheme of color. If the strong colors and neutrals are well balanced there is no fear of an injurious effect on good scenery; for the bad — let it take care of itself. Red adds a glow to the cheek of beauty, and thus counteracts the sallow effect of the yellow gas-light. All theatre tints must, of course, be studied by the light of gas, and different portions with special regard to the proximity of local lights.

The bulk of all decoration should be concentrated on the proscenium, the frame of the stage picture, and always before the eye. A good proscenium goes far towards making a handsome theatre. Second and third in importance are the gallery fronts and dome. The treatment of the wall surface may be simpler in character, and serve effectively as a background for the richer parts, and for faces and costumes. The upholstering of the seats must be taken into account in the scheme of decoration; for when the house is but partially filled they constitute a body of color that must not be disregarded. It is difficult to obtain a good idea of a theatre from a single point of view. The best position for the purpose is on the stage; and the result on the actor of this view is an important consideration. Any one of the profession would note at once the difference between a bright and cheerful prospect and one of cold and depressing architectural formality; and his acting would be stimulated or chilled accordingly.

With all the varying opinions concerning illumination it is doubtful if much progress can be made so long as we are restricted to that dirty, explosive, poisonous material — gas. The introduction of the electric, or any other safe means of lighting, will reduce all fire-risks in theatres to a minimum. Some improvement has already been effected by the prospective rivalry of the new agent; and gas companies that have long been furnishing the worst product at the highest rate, have suddenly found it expedient to give a much better illuminator at less cost. So long as gas is used the arrangement of one grand central ceiling light, or group of lights, in the dome, and smaller ones to show the local gold and color on balconies, with supplementary brackets on walls and under galleries, is perhaps as good a general disposition as any. All attempts to use indirect lights, or those concealed under glass, have proved unsatisfactory.

The gas-lights of entrances should be supplied independently of hall and stage; and the "cut off" should be under control from the front of the building only. All general supplies should be provided with "bye-passes," so that by no chance can any considerable number of burners be turned out entirely. In all parts of hall and entrances a sufficiency of oil lamps, protected by glass, should be kept burning during performances, to give a reasonable amount of light in case the gas be accidentally extinguished, in order to prevent any panic being caused by such an occurrence. There is no more serious addition to a panic than the sudden putting out of the lights; and, by an association of ideas perfectly natural under some circumstances, the same cause acting on an assemblage of people, generally strangers to each other and to the building in which they are gathered, may initiate, without sufficient reason, the very madness it would at other times increase. The expense of the lamps, or some similar safe device, is small compared to the added security it insures; and should with other matters of the same nature be enforced by law. J. A. F.

THE FRENCH EXHIBITION BUILDINGS. — Only the Pavilion of the City of Paris and the Chinese Pavilion are to remain on the Champ de Mars.



POWELL'S FOUNDATIONS.¹

MESSRS. BICKNELL & Co., and their successors, Messrs. Bicknell & Comstock, have, on the whole, laid the building world under considerable obligation by their enterprise and industry in the publication of technical books. One thing is, however, to be desired of them, that is, a more intelligent selection of the works they are to publish, a selection which would be best made by a well-trained and skilful architect or engineer, who could save them and their readers from being imposed upon by mangled excerpts cut from the works of familiar English writers and put forth as original matter, and by scientific information which would excite the laughter of a twelve-year old school-girl.

The book before us belongs, so far as Mr. Powell's work is concerned, to the worst class; the small treatise by Mr. Baumann, which is appended, is the only part which is of any value whatever, that is not already to be found in other books, much more clearly expressed, and in more condensed form. After an introduction and some pages of text, taken almost word for word from Dobson's "Foundations and Concrete Works," in Lockwood's (Weale's) little series, we have some "practical" directions and definitions such as the following: "A sheet pile is of half timbers in contact, filling the gaps between gauge piles." It would puzzle a novice to divine what that meant, whether the "timbers" were originally round or square, whether divided transversely or longitudinally, and whether ends, sides, or corners were to be placed in contact, but that is preferable to such totally misleading statements as this: "Timber driven into the earth . . . may be divided by calling all those that stand on solid foundations, posts, and those that depend on the friction of the earth and its constituents are piles." Or this, "In nearly all calculations that are made for pile-driving, the calculations are based on the soil being homogeneous all the way down." Or this "rule": "To find the set of pile at last blow—given: weight of ram, height the ram has to fall in inches, and the safe load the pile is required to hold in cwt. (of 128 lbs.) Rule. Multiply the weight of the ram by the height it falls, and divide the product by eight times the safe load which the pile is to carry."

Let us apply this valuable formula. The ordinary weight of rams, the author tells us, is 1,200 to 2,000 lbs. Let us take an average specimen to weigh 1,600 lbs. We desire the pile to carry about 5 tons, let us say 100 of these new-fashioned hundred-weights. We will take the fall at 25 feet, or 300 inches. Applying the formula,

$$\frac{1600 \times 300}{8 \times 100} = 600.$$

We are not informed whether the result will be in terms of inches or feet, so we can take our choice whether we prefer to have our pile driven 600 feet or 600 inches at the last blow.

Of course the instructed reader will detect the omission in the statement of the rule, which is intended to be a deduction from Sanders's formula; but those who have nothing better than this book to guide them will do best, as the author suggests, to "accept the judgment of experienced builders," "as it is difficult to find a locality to suit the formula."

After some liberal extracts appropriated from "Trautwine's Engineer's Pocket-Book," and some natural history about the worm called the *Teredo naealis*, which "has a revolving head like an augur," we come to this important advice, "And the foundations should be made so firm that no doubt will arise about their being insecure."

The next chapter is composed of portions of the New York Building Act, with slices of Dobson, and information about chimneys, which we do not quite recognize, but which reminds us strongly of a late series of articles in the *Building News*, interspersed with more "practical suggestions," such as speaking of squaring the angles in laying out the lines of a building, "Some masons have very large wooden squares for the purpose, which are far more preferable than deciding by sight." Of methods which are still "more preferable" than the use of the crippled and sun-warped mason's squares, there is no mention.

After some very incorrect illustrations of bond in brickwork, we have a little scientific instruction on the composition of Rocks, one of them, apparently, being Air, which "contains 23 per cent. of oxygen, the rest being nitrogen and carbonic acid." Another is granite, which consists of feldspar, quartz, and "little packages of mica;" then comes more Dobson and Trautwine, and some singularly useless and costly devices for keeping cellars dry. For instance, we are shown a section of a cellar wall, on the outside of which, somewhat above the cellar bottom, runs a "drain pipe," resting on a sheet of brick and asphalt, the latter carried up some distance on the outside of the cellar wall. "Drain-pipe" means, in ordinary language, a tight, glazed pipe, which, in this situation, would be just as useful as an iron bar, and no more. If he means drain tile, they are placed where they would be of the least use in keeping the cellar dry. It should never be forgotten that after the earth about cellar walls is settled, the water that comes into them rises from below, by the change in the level of the ground water after rains, and with such a device as this, the water would stand some inches deep over the cellar floor before it could reach the drain pipe or tile at all. It would be infinitely better, as well as cheaper, to

dig the trenches eighteen inches to two feet deeper than the cellar bottom, and fill in with dry, loose stone to within six inches of the cellar floor, or, for a heavy building, to lay a line of drain tile under the footings or just outside; but in any case the drain should be at the lowest point of the excavations, and should, in heavy, wet soils, be continued to some outfall.

After several pages more of quotations from the Building Act, we find some miscellaneous information, the value of which may be judged from one instance, where we learn that "1,000 laths will cover 50 square yards," and a few lines below are told that "1,000 laths will cover 666 square feet."

A few references to recent buildings in New York, which are of some slight interest, if true, and some favorable notices of Moen's Asphaltic Cement, "which I have looked into, and can recommend," of J. B. Cornell's area lights, "which are the best," and other inventions of ingenious and, let us hope, liberal gentlemen, close Mr. Powell's portion of the book.

To the young man or the amateur, who would like to learn something about the subject, we should say, buy Dobson's book, and get the Department of Buildings to give you a copy of the Building Act, and read them carefully, and you will know more than you can learn from a dozen books like this.

The educated architect, on the contrary, will find in Mr. Baumann's little treatise a theory and a narration of facts of singular interest. It would be an injustice to the author to quote any part of his work; it is sufficient to say that he finds reason, in yielding soils, to abandon the received modes of construction, and supports his argument by references to well-known buildings in a way which will command the deepest attention.

In brief, Mr. Baumann's theory is that the spreading of foundations in soft soils, by inverted arches or continuous footings is, as generally applied, wrong; and that the true course is to "resolve the building, upon its ground plan, into isolated parts, and independently apportion to each its proper share of foundation," and he supports it in a manner which, even through the ridiculous interpolations and improvements for which he is probably indebted to Mr. Powell's "revision," shows the well-instructed, observant, and thoughtful man, devoted to his profession, and willing to share his knowledge with others. There are not too many of this kind anywhere, and they are particularly rare, and particularly precious in this new country. We shall hope to hear often from Mr. Frederick Baumann.

THE ILLUSTRATIONS.

THE NATIONAL WALLACE MONUMENT, STIRLING, SCOTLAND.
MR. J. T. ROCHEAD, ARCHITECT.

THIS monument, erected in honor of Sir William Wallace, was finished about 1869, and stands upon the summit of the Abbey Craig. The whole structure is of stone, with external walls fifteen feet in thickness at the base, and decreasing to five and six feet at the top. The base is thirty-six feet square, and the total height of the masonry about two hundred and twenty feet above the rock upon which it is placed, the summit of which is something like five or six hundred feet above the plain below. The first floor contains a portion of the apartments of the keeper and a small museum, together with a straight stone staircase leading to that of the octagonal tower, which is placed at the southwest angle of the structure. This latter staircase leads nearly to the top, and from it are made accessible the three large rooms above the first floor. The rooms at present are bare and empty, but it is hoped that they may ultimately be used as museums in which may be deposited such curiosities and relics of Scottish history as circumstances offer. The crown of the tower is about fifty feet high, and covers an open platform from which is to be obtained one of the finest views in Scotland. The entire cost of the building, was about £12,000.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. THORP & PRICE, ARCHITECTS, NEW YORK.

This is one of the designs which were voluntarily submitted in the late competition.

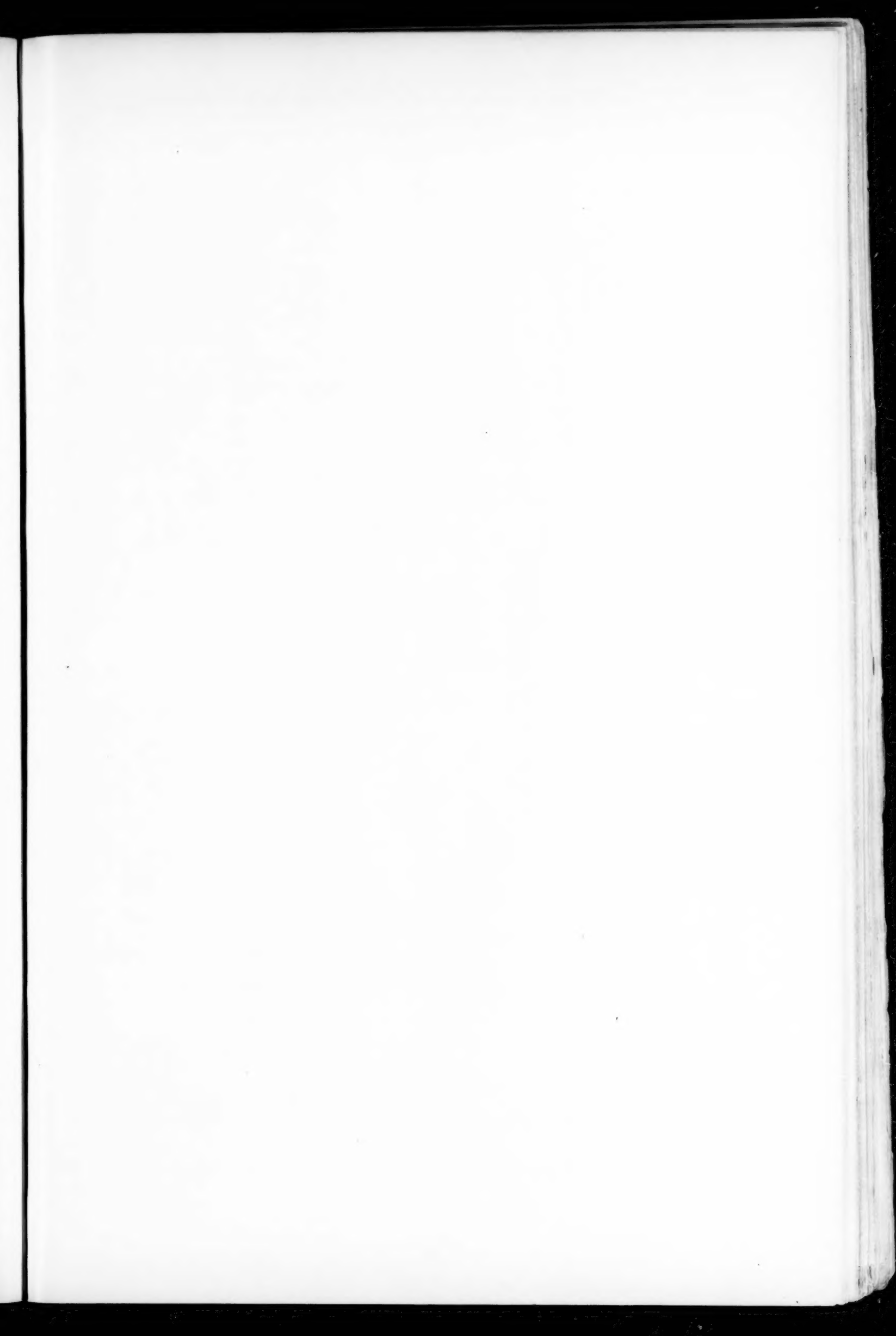
CORRESPONDENCE.

MOORISH ARCHITECTURE IN SPAIN.—THE MOSQUE AT CORDOVA.—THE ALHAMBRA.

GRANADA.

THE wave of architectural activity which spread out from Cairo in the wake of Mohammedan conquests reached at Constantinople a stern, warrior race, a building people by nature, whose instincts, like those of the Romans, tended to the construction of great buildings rather than to the ornamental aspect of architecture. Thus, as I have shown in a previous letter from Constantinople, the grand forms of Byzantine monuments were more congenial to them than those of the more refined and ornamental art of the Arabs; and where the latter asserts itself it is rather in the guise of flowery Persian, designs introduced through Asia Minor. Very different was the result of the Arabian influence on the refined and intellectual people who carried the Empire of Islam westward and across the Straits of Gibraltar, and there developed a purely decorative architecture. The industrious Moors laid in the Middle Ages the foundation of Spain's

¹ *Foundations and Foundation Walls*. With sixty illustrations. By Geo. T. Powell, Architect and Civil Engineer. To which is added a Treatise on Foundations, with Practical Illustrations of the Method of Isolated Piers, as followed in Chicago, by Frederick Baumann, Architect. Revised by G. T. Powell. New York: Bicknell & Comstock. 1879.



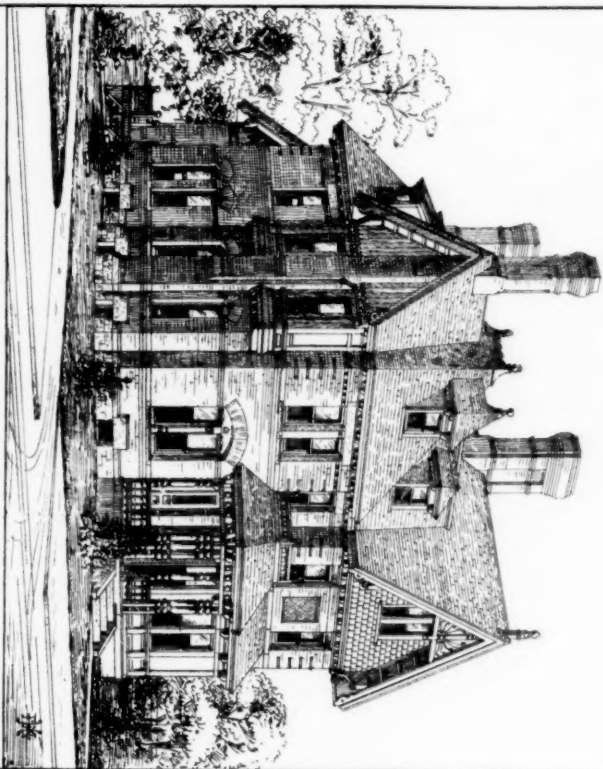


THE NATIONAL BELFRY MONUMENT

J. C. Del. 1870.



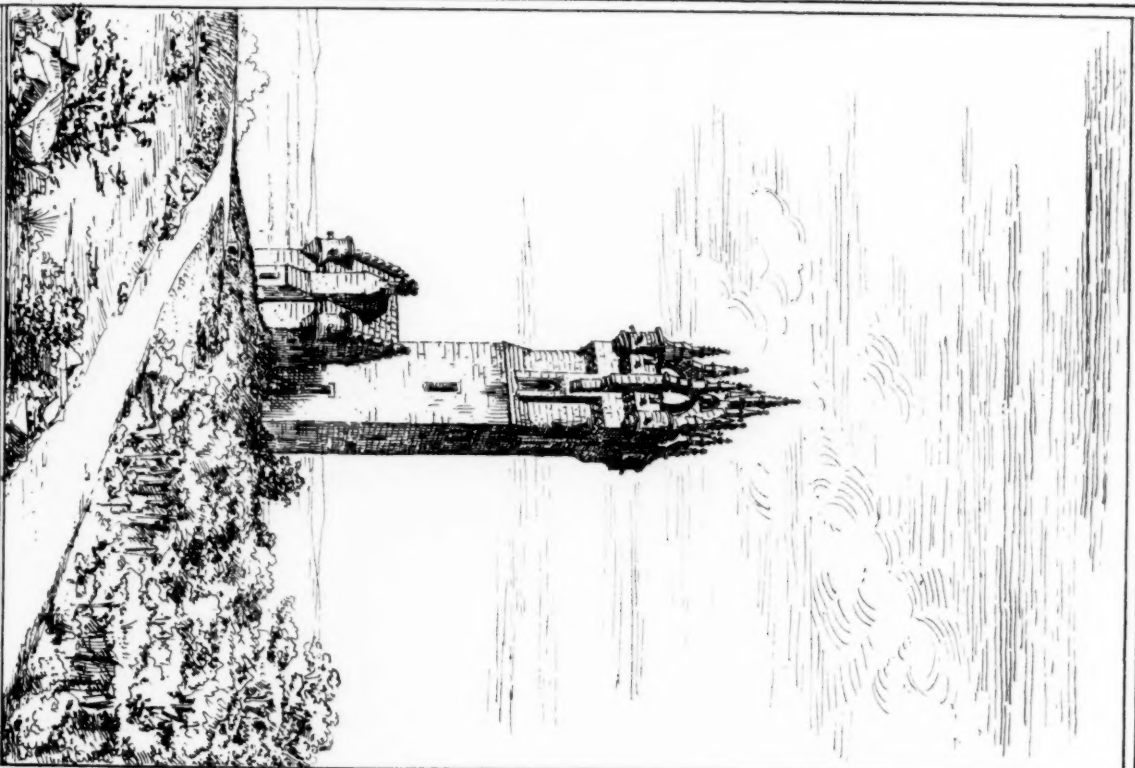
First Story Plan
Scale 1/4" = 1'



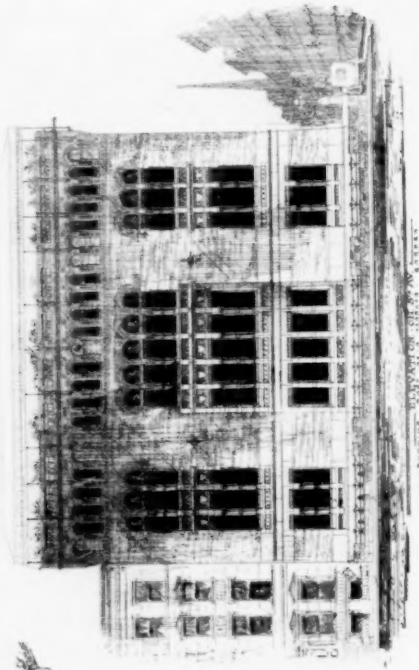
COUNTRY HOUSE AT NORTH CAMBRIDGE, MASS.

FRANK MAYNARD HOWE, ARCHT.

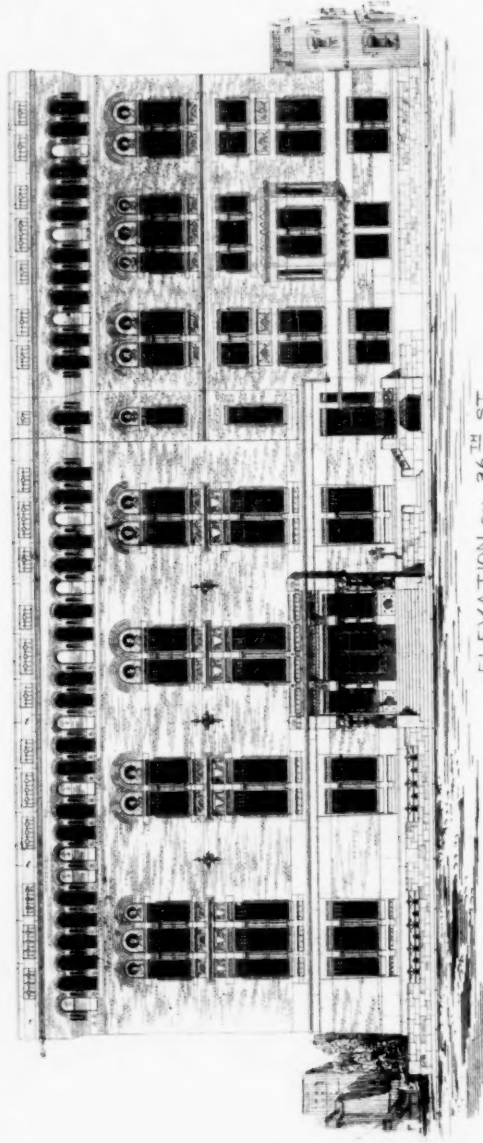
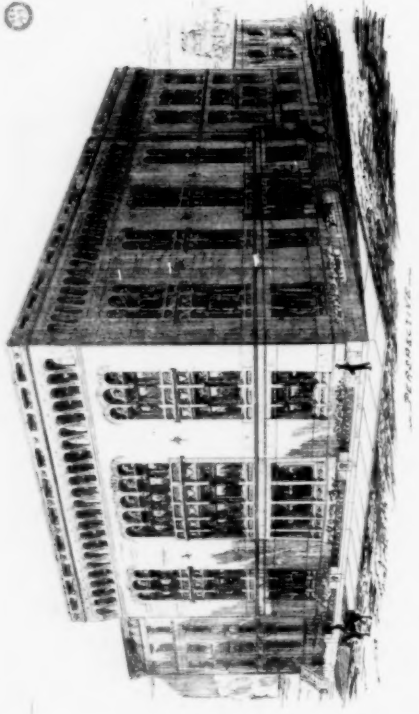
BOSTON.



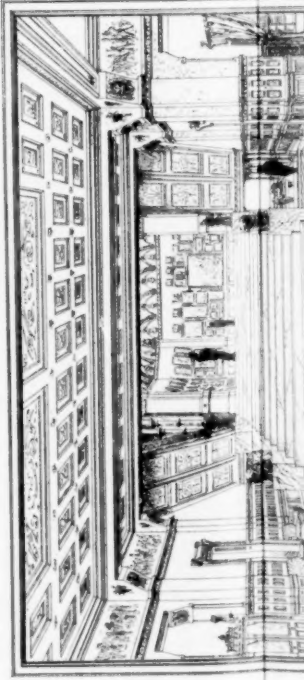
THE WALLACE MONUMENT • STIRLING, SCOTLAND.
From a sketch. FRANK MAYNARD HOWE, DEL.



DESIGN FOR
UNION LEAGUE CLUB-HOUSE
8th AVE. & 30th ST.
N.Y.

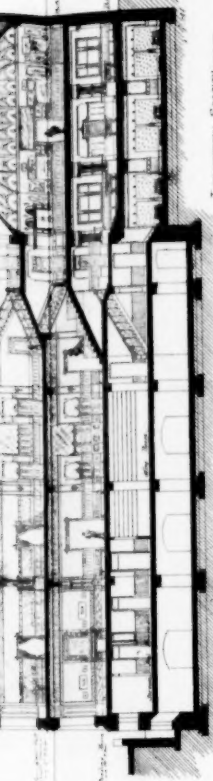


ELEVATION ON 36th ST.

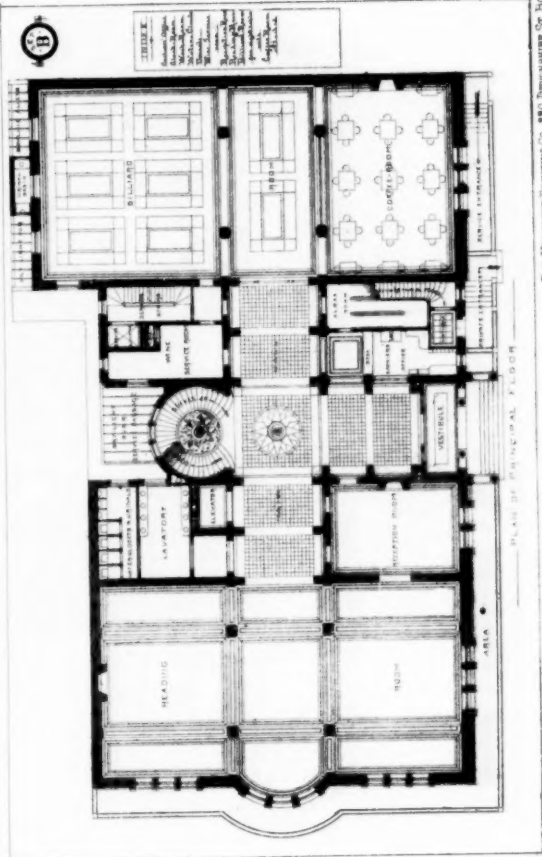
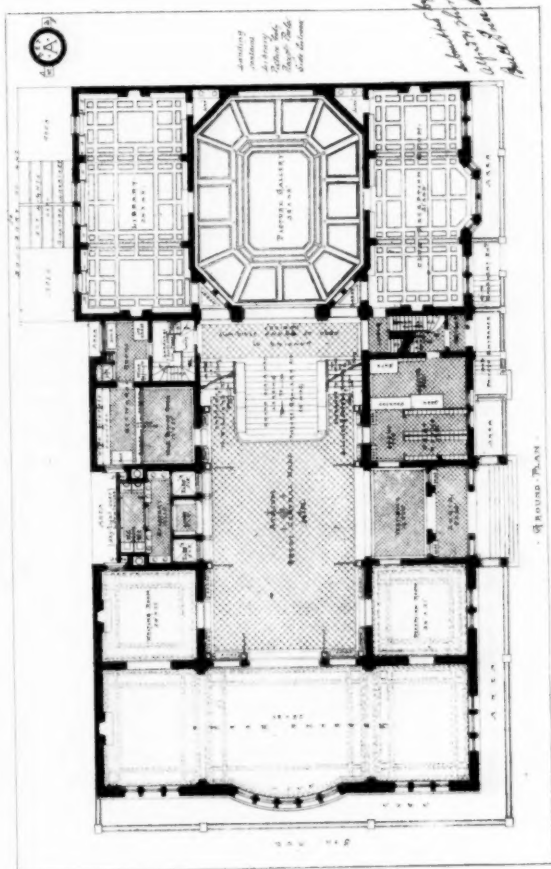
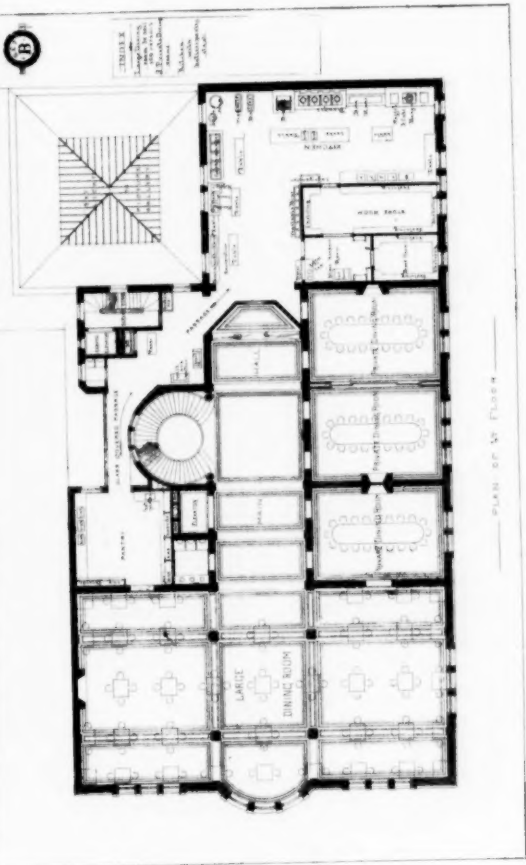
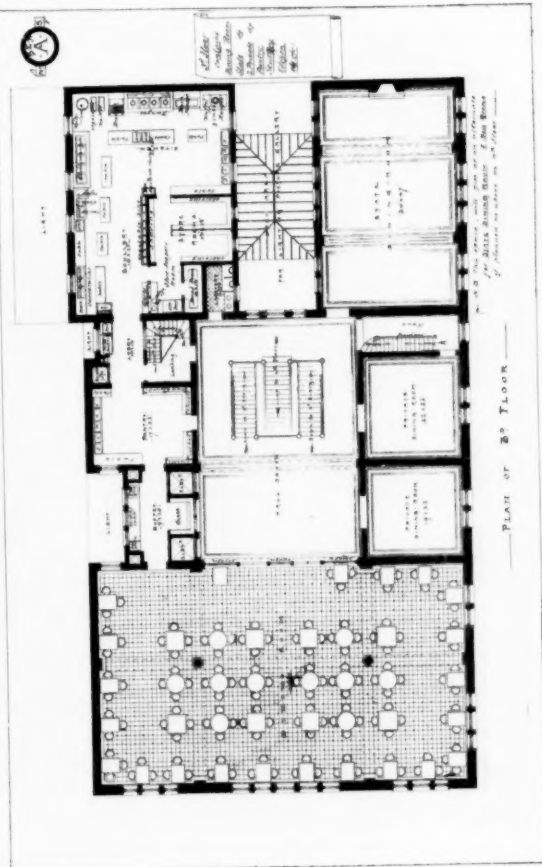


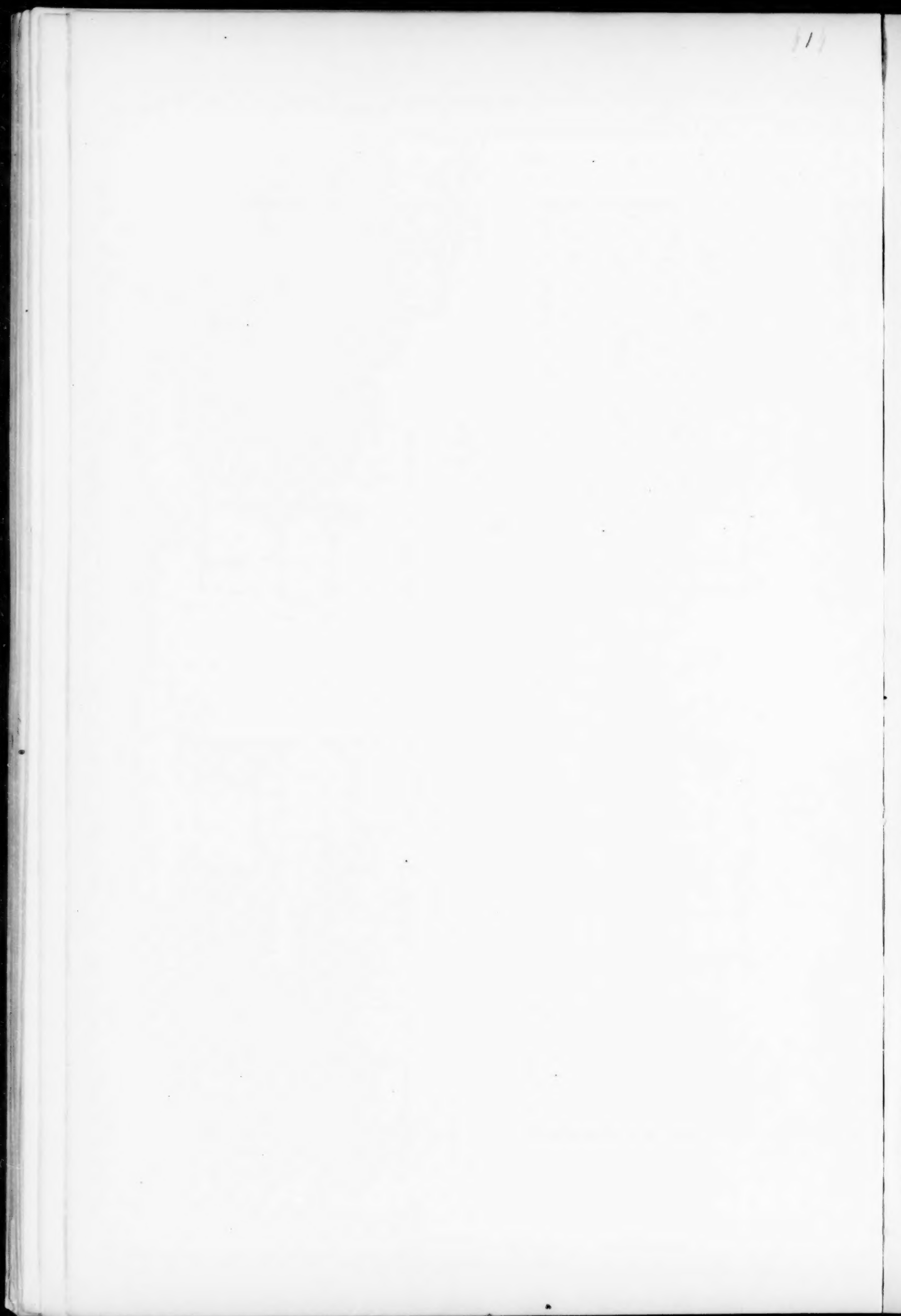


VIEW IN HALL SHOWING GRAND STAIRCASE, PICTURE GALLERY & BILLIARD ROOM



Longitudinal Section





power, and the revocation of the Edict of Nantes, and its consequences, find a parallel in the cruel and disastrous policy which drove, finally, from the country a people who had covered it with their artistic and industrial works. The traveller's admiration is divided between the remains of their exquisite art and their hydraulic science, to whose ingenious system of irrigation the best crops of Spain are still due. Yet the Moors do not appear to have been a true race of builders, and as the purer Arabian influence was withdrawn their characteristic art became principally one of decoration.

Although most of their earlier monuments have been altered or destroyed, one magnificent example is still left in the great Mosque of Cordova, which was built between the years 786 and 796 A. D., a century and a half after the Hegira. Of the Moors who invaded Spain in the beginning of the eighth century, and of the buildings then existing, little is known, though it is certain there were many remains of Roman work scattered over the land, which so materially influenced the invaders, that they substituted for the pointed arch, universal in the East, the Roman arch, raising the centre, however, and giving it the horseshoe form. In fact, the true Hispano-Arab work is so influenced by classic traditions that it is rather a form of Byzantine than of Arabian art. It was not until the growing power of the Kings of Castile and Leon forced the Moors, in the latter part of the eleventh century, to call in their co-religionists from Morocco, that the Arab influence gained the ascendant; this fresh infusion of African blood showed itself at once in a new style, whose tropical wealth of ornament reached, in the fourteenth century, a full development in the Alhambra Palace at Granada.

Emerging from one of the winding, narrow streets of Cordova, which, as in all Moorish towns, was purposely so built to shut out the fierce southern sun, one comes suddenly upon the great wall surrounding the court of the mosque. This is built, like most walls of that period, of *tapia*, a mixture of earth, sand, lime, and stone. By the main entrance, under a wide horseshoe arch, rises a tower, which probably resembled the Giralda tower at Seville, but which was clumsily recased at the end of the sixteenth century. Entering a spacious court with arcades on three sides, the view is charming; dense orange trees cast cool shadows in the brilliant sunlight; beyond the wall, with Eastern battlements, rises the dome of the cathedral, which, in the sixteenth century, was barbarously built in the middle of the mosque. Leaving aside for the time this Renaissance excrescence, enter the great central door. The effect is wondrous. On all sides a forest of columns stretches away into the sombre twilight. The mystery of woodland glades is amongst these countless arcades. Shafts of many marbles — jasper, porphyry, and verd antique — line the darkening vistas; only down the nearest aisle, in the far distance, a pale light falls upon a screen of white interlacing arches. Superposed open arches above the aisle arcades increase the bewildering mystery of the many aisles. Of the twelve hundred monolithic columns which were formerly here (several hundred have disappeared in modern alterations) some were sent from Constantinople, and the remainder were taken from Roman buildings in Africa, Spain, and the south of France. They are arranged in nineteen aisles intersected by thirty-three transverse smaller ones. The eight eastern aisles were added at the end of the tenth century, and though thus two centuries later than the eleven others, there is hardly an appreciable difference in style or work. The arches have keystones of brick alternating with stone, and this is one of the earliest examples of that alternation of colored courses which became in all countries a sure sign of Eastern influence. The double stories of arcades were probably a device to obtain the height which employment of the small Roman columns did not sufficiently give. There was without doubt originally a rich wooden ceiling, such as may still be seen in Cairo, which was afterwards replaced by the brick vaults now in place. Mr. Fergusson is at some pains to explain the original mode of lighting the mosque, and supposes that the upper part of the outer walls was an open arcade; but to one fresh from Cairo, it seems more simple and natural to believe it lighted from above by lanterns of lattice-work, which may still be seen in Egypt in connection with just such wooden ceilings as must formerly have roofed this building. This is the more probable, inasmuch as the light is at present admitted by wells left in the vaulting in the very places which would formerly have had especial need of light.

The simplicity which gives a peculiar grandeur to the main part of the mosque is heightened by the splendid decoration which is concentrated about the Mihrab, or sanctuary towards Mecca. The deep glow of the magnificent mosaics catches the eye from the most distant aisles, and fixes the interest on the sacred niche. This and the two chapels flanking it are enclosed by arcades whose elaborate intersecting and superposed arches are unique. That in front of the Mihrab consists of three cusped arches, whose sides are carried across the central keystones up to the sides of upper arches, supported upon a small order above the large columns. This produces a heavy complication, which would be more curious than beautiful were not the arches relieved by very rich alternate keystones, which gives the desired lightness of effect. The three chapels have each beautiful cupolas resting upon octagons formed by wide arches opening across the corners, and intersecting so as to give alternate penetrations for semicircular windows. These light the superb mosaics with which the vault and wall are covered, and which rival anything to be found at Ravenna or St. Mark's. The Mihrab itself is enclosed

in a square frame of golden Kufic inscription on a blue ground; while the horseshoe arch has deep keystones with green Byzantine scroll patterns on a background of red and gold. Within this arch is an exquisite little octagonal niche, with a mural cusped arcade, and covered by one huge stone carved into a ribbed shell. The equally beautiful vaults of the chapels on each side of the Mihrab are white-washed, but one still retains fine mosaics upon its walls, while similar ones are very likely hidden behind a Renaissance altar which now occupies the other. Excepting the Kufic inscription all the details of these mosaics are Byzantine, and workmen are recorded to have been sent from Constantinople to make them, the connection between the great Eastern capital and Spain being close in those days.

As if expressly to show how the Moors nationalized these Byzantine details, there stands near the Mihrab, among the pillars of the aisles, a curious chapel, whose ornamentation forms a connecting link between this mosque at Cordova and the perfectly developed style of the Alhambra Palace. It is a square room raised about three feet from the floor of the mosque, and is pierced to the north and south with a rich arcade. The ingenious vault is carried upon bold light arches which adjust an octagon upon the square. It is upon the walls that are first seen the profuse and complicated patterns in stucco which became the leading *motif* in the Alhambra decoration. These designs are as yet coarse, and lack the delicate refinement subsequently attained. Here, also, is seen the dado of colored tiles, henceforth a characteristic of Moorish work. This Villa-Viciosa chapel has given rise to discussion as to its use and date, but it is probably of the twelfth century, and was erected as a screen for the sovereign's devotions.

So annoying is it to have the vistas through the aisles of the mosque blocked up by the sixteenth century choir which was built in its centre, that little beyond careless abuse is given to this modern pile; but in spite of its impertinent intrusion it deserves attention as a most elegant piece of Plateresque architecture — which is the Spanish term (silversmith's work) for their development of the Francois I. and Cinque-cento style — an architecture which received such refined execution at the hands of the clever Spaniards of the sixteenth century, that it deserves a special notice. Passing out, then, from the twilight aisles of the mosque into the sunny court, fragrant with orange trees, and enlivened by the picturesque groups always gathered about the fountain, the violent contrast produces one of those powerful sensations which constantly electrify the artist in Spain.

There is comparatively little to interest the artist in Cordova except the Cathedral-Mosque, and so, with the key-note struck by the Villa-Viciosa yet fresh in mind, let us go on to Granada, and there examine the elaborate style which was developed from it in the fourteenth century. Traversing the snug little town of Granada, a broad carriage-way leads up the hill to the Palace of the Alhambra. Though steep, the way is far from tiresome, shaded as it is by magnificent elms, and cool with the waters of many fountains tinkling down the steep banks. However eager to see the far-famed architectural beauties of the palace interior, it is impossible not to pause a moment on one of the lofty terraces which surround it to let the eye range over the lovely view. Surrounding the steep, outlying hill on which we are standing, a wide fertile plain stretches far away to the hills on one side, while on the other the horizontal lines are gathered up into a grand sweep rising to the shoulder of a magnificent dome of snow, and this so near that the breeze from the snow-fields comes up to us fragrant with the flowers of the plain. The house-roofs and white walls of Granada are at your feet in the foreground. Passing now under the massive Moorish gate-tower, with its noble, pointed horseshoe arch, we are upon a large plateau surrounded with terraced walls and huge square towers of *tapia*. The first impression of this being the main court of a vast fortress is justified by the fact that such was the purpose of the walls and towers which, in the twelfth century, were built around the whole brow of the hill, and to which the famous palace was added a century later. Here, as at Cordova, a Renaissance design, not without decided merit by itself, brutally elbows its way into the elegant courts of a more national architecture, but here this palace of Charles V. remains unfinished as a monument of his folly.

The present entrance to the Alhambra courts is by a small door in a corner by the Charles V. building; but this humble entrance will be forgiven for the delightful surprise of thus coming unexpectedly into the largest of the Moorish courts. It measures 138 by 74 feet and the middle is filled by a long fish-pond, bordered by a square cut hedge. At the further end rises the huge square mass of the Tower of Comares. This is occupied by the celebrated Hall of the Ambassadors, which is preceded by a rich, narrow vestibule. The portico in front of the latter, with its slender marble columns, supports a double screen, so to speak, of elaborate stucco panels, and only the concealed brick arches are solid, the pierced surfaces of the spandrels being several inches apart, which thus allows the light and air to play freely through, and suggests the sentiment of refreshing coolness, the controlling principle in the design of the Alhambra. The long ante-room which divides this portico from the Hall of the Ambassadors is of great interest. A high dado of colored tiles, in small polygonal forms, and thus a kind of mosaic; walls covered with the most intricate and delicate designs in stucco still preserving pale tints of the once brilliant coloring of the walls; a circular wooden ceiling of Artesonado work, which consists of inlays upon alerce

(white larch, I believe), forming beautiful patterns, are the characteristics I jotted down on my first visit. To avoid detailed descriptions of what books and photographs can offer so much more attractively, I believe my readers will be grateful if I give them simply some of those notes, and thus spare their patience.

Beyond ante-room, Hall of the Ambassadors, a square of thirty-seven feet, with sixty feet to centre of flat polygonal dome, of Artesonado work. Dado of yellow, blue, black, and green tiles; above, wall covered to roof with stucco designs. Embasures of windows so deep as to form alcoves, from which magnificent views over the city and Vega (plain). Returning to large court, a small door leads to Court of Lions. Brilliant effects of sun and shadow upon delicate arcades surrounding it. The shape of the angular arches, fringed with stalactites, too uncertain, and they look weak and flimsy. Small projecting pavilions at each end, covered with brilliant blue glazed tiles, contrast with rich cream tint of the arcades. Ends of slender rafters delicately carved with shell-ribbed pattern. Scale of the Court much smaller than photographs suggest. From these porticoes open a series of halls. The two largest with unrivalled honeycomb or stalactite vaults; these of stucco only strengthened with reeds, yet nowhere cracked or dilapidated after five centuries. Five thousand pieces said to compose the vault of the Hall of the Two Sisters. Excepting in these fantastic vaults, feeling of surface, perfectly preserved, though there is not a scrap of wall left undecorated. This richness not oppressive, from evident ease of the *procédé*, i. e., a preparation of plaster run in panel-moulds, the cheapest and simplest of material for the designs. Alcove windows of this 'Hall of the Two Sisters' look down into the Patio (court), or Lindaraja, where Washington Irving spent so much of his time. Luxuriant shrubbery surrounds the fountain. On this lower level, are several other courts and the baths. The two-storied miniature court to the latter has been recently restored, as part of it fell in. The restoration was done by Don Rafael Contreras, who has charge of the entire Alhambra, and bit by bit is preventing the threatened ruin of these long neglected buildings. With rare intelligence he has refrained from making many restorations,—this Court of the Baths being in fact the only part where restoration of color has been attempted. Great care was taken to follow the very distinct remains of color, and the work has been conscientiously done throughout. In spite of this, after a careful examination of the decoration, I believe Contreras has missed a true restoration. Though throughout the various halls distinct colors remain upon the stucco patterns, something more than deepening and renewing these tints is necessary in view of the changes which time may have wrought upon pulverized pigments. Now the Azulejos, or glazed dado tiles, are original, and have certainly not changed, and this supplies a key-note with which any true restoration must harmonize. The present restoration forms a painful discord with these tiles. The latter have strong prevailing yellows, browns, and greens, which are manifestly out of harmony with the cold blues and vermilions found still upon the walls. To restore that harmony those cold blues must be greenish or green. I was confirmed in this theory on noticing a clever painter, who was at work on a picture of the interior of this court—with no thoughts in regard to its restoration,—unconsciously modifying these blues to exactly the bluish-green necessary. Another reason which renders it probable that time has changed the greens to blue is, that green being the favorite Moslem color after the fourteenth century, and much used by the Moors in tiles and stuffs, it is unaccountable that there should be almost no traces of green to be found on these richly colored walls,—the little which is left being a light emerald tint; so that it does not seem far fetched to suppose that the darker greens have changed. A chemist who would analyze these remains of color, and the influences to which they have been exposed, would throw valuable light on this subject. It is noticeable that the prevailing tones both of the dados and remaining colors are the same in all the halls. Every facility is given to artists wishing to work in the Alhambra, which thus forms a marked exception in a land where petty obstructions to extort fees habitually try the patience of the foreigner. Don Rafael Contreras has executed a set of careful chromo-lithographs of his proposed restorations, and they form part of the great government work (unfinished), "Monumentos Arquitectonicos de España." Owen Jones's work on the Alhambra is accurate for all lineal details, but chromo-lithography was in its infancy in his time, and his colored plates are worthless. His careful copy of the Court of Lions in the Crystal Palace manages to miss the real spirit of the Alhambra. Girault de Prangey's *Essai sur l'Architecture des Arabes et des Mores* (1841) is the standard work, on this style, which later writers have done little more than echo. R.

THE CITY-HALL INVESTIGATION: THE TESTIMONY CONCLUDED.

CHICAGO, August, 1879.

THE examination of witnesses by the Building Committee of the Common Council has occupied another week, and, as I write, is drawing to a close. The last member of the expert committee examined was L. B. Dixon, architect. He reiterated the statements of other members. With regard to the hollow piers, he asserted that they should be filled with concrete, or even sand, to make them settle with the other work. He thought the small piers should be rebuilt with bond-stones, as they were not strong enough. But when questioned as to his reasons, he said that they should be rebuilt because

the bond-stones were shown on the elevations, and were in the stone-cutters contract. In answer to an inquiry as to what calculations of strength he had made, he admitted that he had made no figures, and did not know the exact weight to be carried.

Further witnesses called by the committee were Peter Britton, superintendent of brickwork up to the time of the suspension of the work last winter; Mr. Jordan, assistant superintendent of the whole building, and head draughtsman under Mr. Cleaveland; Mr. Huber and Mr. Long, assistant draughtsmen; Mr. Reid, contractor for stone-cutting; Mr. Tapper, partner of Mr. Reed; Patrick Fanning, who figured on the stone-work; ex-aldermen Van Osdel and Cook, who were on the Building Committee up to May last; ex-Mayor Monroe Heath, James R. Willett, and G. P. Randall, expert architects, having no connection with the building; Mr. Cleaveland, and Mr. Kirkland, his successor.

Without attempting to give even a summary of this voluminous testimony, I will allude only to the substance of it on the various matters in dispute. Mr. Fanning contradicted the assertion of the experts that there were two sets of plans, and that he could not estimate on the correct ones. Jordan, Huber, and Long all testified that there was but one set, and that everything was explained to the bidders. Jordan gave the explanations.

With regard to the Mayor having overruled the architect, it was shown that he had done nothing but order out some thin stones in the granite water-table, and Jordan testified that there remained only three stones which were not as thick as the contract required. He produced his very complete record, showing the actual dimensions from measurement of every stone that had been delivered on the ground. He had been asked by the experts if there was any higher authority over Mr. Cleaveland, and he had said that the Mayor, by virtue of his position as Commissioner of Public Works, exercised a higher authority. The Mayor, he said, had never ordered materials to be used which Cleaveland had rejected.

As to the general quality of the cut-stone work the testimony differed, some contending that it was not equal to the best private work, and others that it was superior to most public works.

There was a general concurrence in the testimony that the brickwork was not up to contract, while some thought it was a good job, above the average, and sufficiently good for safety. But it was shown that most of the brick used were worth two dollars per thousand less than those called for, and Mr. Cleaveland thought that the brickwork was generally so inferior that the contractor should be charged with the difference in value.

It is pretty hard to tell from the testimony whether the long anchors so frequently referred to were necessary for the work, or whether or not they were used. Some claimed that they were, and others that they were not. They were not in anybody's contract, and Mr. Jordan said that Mr. Cleaveland had them sent to the building.

The history of the small outside pier and bond-stone matter, taken from a great deal of testimony, seems to have been as follows: Two bond-stones for each pier were marked on the drawings of cut-stone work. None were mentioned in the cut-stone specifications. The bricklayers' specifications called for bond-stones throughout the interior. The cut-stone contractors refused to make their stones deep enough for bond-stones when marked. A conference was had by the contractor, the Mayor, Mr. Cleaveland, and Mr. Jordan. It was agreed, by way of compromise, that every other course of the cut-stone in the piers should be deep enough to tie or bond the brickwork to the stone-work, from eight to ten inches, and that the bricklayer should not be called on to furnish bond-stones. In his case the extra thickness of outer stone-work must have equalled the spaces which he had to fill with brick, when bond-stones might have been used. In addition to this short stone bond, anchors were used in each course. The piers were built thus.

All the witnesses, except the expert committee and Mr. Kirkland, thought the piers were well built and strong enough. Only three of them produced any figures to demonstrate this, and these were Mr. Cleaveland and Mr. Willett and Mr. Randall, the expert architects called in by the Building Committee. Mr. Cleaveland demonstrated by figures that the piers as built had a large factor of safety. Mr. Willett, on examination, found that the larger portion of the piers consisted of Bedford stone. This stone had been tested by Gen. Q. C. Gillmore, who gave it a crushing strength of 11,750 lbs. to the inch. Mr. Willett found that a crushing weight on the stone alone would have to be 840 tons to the square foot. Taking a factor of safety of $\frac{1}{4}$ (which, by the way, happens to be Professor Rankine's factor for a *live load* on masonry), the safe load would be 105 tons to the square foot, or 403 tons to the whole of the stone-work, to which may be added the safe load on the brick backing of 52 tons. I cannot find any testimony to show what weight the piers will have to carry, but Mr. Cleaveland assured me that it is 140 tons.

The opinion of the experts that the last course of iron beams and columns set on the building should be painted, does not seem to be questioned. This, being, as your correspondent was assured by a member of the Building Committee, the only thing which the expert committee had recommended with any positiveness, will doubtless be carried out to the letter, and the rest of the work allowed to proceed without interruption. Fortunately, there has been no interruption thus far, for a majority of the Common Council could not be induced to stop the work.

The charges, in the main, have been practically an attack on ex-Mayor Heath and Mr. Cleaveland, both of whom have now retired to private life; and as they have both felt that a stigma had been cast upon them, they may now at least have the satisfaction of seeing all the facts brought to light, so that the public may see that they have performed their duty to the best of their abilities.

The Building Committee will report to the Council on August 18.

Since the above was written I have received the report of the testimony of Mr. Kirkland and Mr. Randall. Mr. Kirkland thought the small piers were not strong enough to carry the weight they would be called on to bear. He was of the opinion that the brickwork was the special bearing factor of the piers, and that the stonework was simply a matter of ornamentation. He thought a stone overlapping a few inches would have no bearing weight whatever. He placed no reliance whatever on the bearing capacity of the stonework. He took the whole thing, brick and stone, as a brick pier simply, and they would not carry safely over 40 tons. He considered that the large piers would be better solid than hollow.

Mr. Randall said that a compound wall was not so strong as one of either brick or stone. He thought, however, that the piers were abundantly strong to carry the weight of the building. He considered that the majority of the weight would be carried by the stone wall. He believed the walls were stronger now than they would be with the long bond-stones, it being admitted that the brickwork would settle between the bond-stones. He made the bearing capacity of the small piers a little less than Mr. Willett did. He considered it judicious to build the large piers hollow, as thereby the brickwork was allowed to dry more uniformly, and sufficient allowance had been made for safety.

THE BOSTON SOCIETY OF ARCHITECTS' PRIZES.

Boston, July 1, 1879.

PROF. WILLIAM R. WARE, Institute of Technology, Boston.

Dear Sir,—We have carefully gone over the work done by the students in the Department of Architecture during the past year, and have been impressed, as heretofore, by the quantity, variety, and general excellence of their drawings. The prizes given by the Society of Architecture for the best year's work we have agreed to award to Mr. Arnold W. Brunner, of New York, and to Mr. Cass Gilbert, of St. Paul, Minn. We desire also to mention with commendation the work of Mr. Herbert Warren, of Roxbury; Mr. Ernest G. Hartwell, of Waltham; Mr. Thomas O'Grady, of Boston, and Mr. Oscar E. Brandt, of Cincinnati, Ohio.

Mr. Hartwell is this year the only student of the department who graduates after taking the full four years' course of the Institute. His thesis on the Design and Construction of a Public Library, with its accompanying drawings, gives evidence of careful study and of an intelligent appreciation of the requirements of the problem. The committee regret that a larger number of architectural students have not taken the full general course.

EDWARD C. CABOT,
HENRY VAN BRUNT,
CHARLES C. CUMMINGS, } Committee.

SEMNAR, THE GRECIAN.

WHEN the famous Behram-gur was yet a babe his father, King Yezdegird, sent him for health and security into Arabia. The tyranny of Yezdegird had caused much misery to his subjects, and even his autocratic heart began to fail as one after another of his fair sons perished in early infancy. He feared the approach of a childless old age, of a time when there would be no filial hand to console him, and no stately son to inherit the greatness and the glory of his kingdom. Hence Prince Behram was sent to the land of Yemen, that by a change of place he might happily realize a change of that sad fortune which had consigned his elder brethren to their early graves. Prince Naoman travelled expressly from his own court to that of his suzerain, and received the royal child. On his return to Yemen he faithfully executed his trust, and though young Behram grew from a beautiful babe to a sturdy youth, Naoman was still full of anxiety for his welfare.

"This palace," said he to his son Menzer, "is too hot and scorching for the royal child, and the air of my other palace is too damp. Let us find an abode for him which shall pierce the clouds. There the young eagle may flap his wings and drink in the pure air of the empyrean."

Menzer sought anxiously throughout Yemen for a palace that would serve their purpose, but he sought in vain.

"No such castle exists," was the reply made to his inquiries by one who had travelled much, "and only one man on earth has the skill to construct such a habitation."

"Who is this wonderful architect?"

"Semnar," the Grecian," replied the traveller. "In his hands the granite becomes like wax, and he moulds it into a thousand varying forms of beauty."

"Hast thou seen his works, O traveller?" asked the prince.

"Many gorgeous structures have I seen that were devised by his fertile brain and skilful hand. Many regions acknowledge his genius, many kings have asked for his services."

"Go, then," said the prince, "and by entreaty or command obtain me the help of this architect for the erection of a palace for the

childhood of Behram-gur. Bid him give us of his best, and we will reward him royally. He shall have a robe of honor, a steed of state, seven slave maidens, and a hundred bags of gold if he builds that which we desire."

The traveller carried the message to Semnar, the Grecian, and delivered to him the gold and jewels which Menzer had sent as an earnest of his liberality. Semnar determined to undertake the erection of the palace of the childhood of Behram-gur, and received from Naoman and Menzer the statement of their desires. Then he retired to silent and solitary meditation, and remained secluded in his room for seven days, seeing neither the face of heaven nor the face of man. In that gloomy abstraction the power of his talent compelled the vision of the palace as it was to be, with towers that pierced the heavens, and foundations strong and stable as the great globe itself. The work of building began at once. Swarms of slaves dug deep the foundations, and soon the stately pile grew beneath the fostering eye of the architect. Higher and still higher grew towers of grandeur and pinnacles of pride, until at the end of five years of incessant toil the mighty structure was complete. Semnar, the Grecian, gazed with pride upon the work of his hands. Its fame spread through many kingdoms, and thousands came to see it. Poets sang its praises. The towers, they said, were like the houses of the moon; the dome was encompassed by paintings of the planets in their courses; the polished stone glowed like gold, and the cement shone like silver; the rays of the sun were reflected from it with a light as dazzling as that which beams from the eyes of the damsels of Paradise. Its hue changed with the varying hour. In the early morning-tide it glimmered like a faint pale sapphire; when the sun was high in the heavens it wore the dazzling aspect of the topaz, but as the evening shadows fell upon the earth it seemed in its white beauty like the spirit of the divinity brooding over the world. Thus sang the poets, who declared that it eclipsed the fame of the Garden of Eden, and that henceforth Yemen should be known as the Land of Khavarnak.

Semnar, the Grecian, was now to receive his reward. The princes sat upon their thrones in the hall of audience high in the towers. From the windows could be seen rich towns, fair villages, running streams, green forests, spreading meadow land, and every variety of landscape to please the eye and charm the fancy.

Naoman was now known as the Lord of Khavarnak, and the possession of this palace was the proudest jewel in his crown.

"We have desired," said Naoman, "to praise thy skill, O Semnar, in this palace, which will remain to the most distant ages as a monument of thy talent. Great has been thy skill, great thy toil, and great, therefore, must be thy reward. Fame will spread thy reputation to the four quarters of the earth, and history preserve thy name to future ages. Be it mine to reward thee in the present."

Semnar bowed to his princely patrons, and felt the gratification of talent that has won its way and received acknowledgment.

"We promised thee," continued Naoman, "a robe of honor, a steed of state, seven fair slave girls, and a hundred bags of gold. Was not this our covenant with thee?"

"It was, O Naoman," replied Semnar, the Grecian.

"In the court-yard below," said the prince, "there are forty steeds, and each is richly harnessed; and they bear as their burden a thousand bags of gold. Instead of one robe of honor we give thee seven, so that on each day of the week thou shalt be saluted with reverence by all our subjects. Besides these seven we give thee this one."

As he spoke Naoman descended from his throne, and taking the royal robe from his own shoulders he placed it upon that of Semnar, who, astonished at this munificent generosity, could find no words warm enough for his gratitude.

"We promised thee seven slave girls," said Naoman, not heeding his thanks. "We give thee four times that number of blooming maidens, each one worthy to be a houri of Paradise."

He clapped his hands, and a bevy of beautiful damsels entered the hall, and saluted with bashful confusion their new lord.

"O Prince," cried Semnar, "great, indeed, is thy munificence; never yet was artist so greatly rewarded. Many kings have I served, but none gave me so royal a guerdon. Had I foreseen such generosity I would have made the Palace of Khavarnak still more beautiful and worthier of the liberality of its lord."

This boast jarred on Naoman. It was a discord amidst the jubilant music of his pride.

"Is it possible, then," he asked, "to devise a palace more beautiful than this?"

Semnar, the Grecian, answered with the pride of talent, "In Khavarnak there are three colors, but I could rear a palace in which a hundred hues should combine in harmony. Khavarnak has but one dome, but in another seven domes should bulk against the sky. There are a thousand ways in which, were I building another palace, I could eclipse the glories of Khavarnak."

Naoman's brow darkened. His generosity was the offspring of his pride. He wished to give a matchless reward to the architect who had made him master of the wonder of the world. What if some rival monarch should, by the help of Semnar, the Grecian, build a structure of even greater magnificence? The thought was gall and wormwood to the proud heart of Naoman. He clapped his hands again and a eunuch appeared, to whom Naoman gave his whispered orders.

The thousand bags of gold were replaced in the treasury, the horses

were taken again to the royal stables, the damsels were conducted to the harem of Menzer. Semnar, the Grecian, thrown through the window of the hall of audience, fell, dashed to pieces, into the court-yard below. His death-cry mingled with the voice of the priest, who from the lofty mosque was calling the faithful to their evening devotions.

"Come, my son," said Naoman to Menzer, "the hour of prayer has arrived. Let us thank God that there is one unbeliever less in the world."

As they went to prayers the dogs were lapping the blood flowing from a shapeless mass that a few moments before had been Semnar, the Grecian. — *The British Architect*.

NOTES OF EXPERIENCE AND INEXPERIENCE.

SLIDING DOORS. — As we have mislaid a correspondent's letter in which certain questions were asked as to the hanging of sliding doors, we can answer only at random. Doors may be hung from the top or may travel on a track let into the floor, but in either case friction rollers, either Hatfield's or Collins's, should be used. We prefer the method of hanging from the top, because the unsightly rod or track let into the floor is avoided, and the carpet can be continued from one room to the other.

34. STONE. — What heating stove, to burn common hard coal, is best to heat a room about 15 × 15, in the clear? I am finishing up a house for an Eastern man, and he thinks some Eastern manufactured stove would be the best. If you or some of your subscribers will give me the information, it will be thankfully received.
A SUBSCRIBER.

35. WATER-COLOR PAPER. — Will some artist kindly recommend a good quality of paper (not too rough) for water-color painting, and state where it can be obtained.
R. B.

NOTES AND CLIPPINGS.

THE ALBERT MEMORIAL. — The London *Echo* says that a number of scientific gentlemen have been inspecting the Albert Memorial in London, because it was reported to be losing much of its pristine beauty under the trying influences of the London climate. If the fogs and rains had only been content to tone down the high color and glaring brand-newness of the metal-work and the mosaics, few would have been found anxious to interfere; but unfortunately it is the marble, in which has been executed the podium with its magnificent sculptured figures, in high relief, of the noted men of science and art throughout the world, together with the groups representing manufacture, trade, etc., and the larger groups typifying Europe, Asia, Africa, and America, that has been affected. It is said that the somewhat rough washing to which the monument is now and then treated has destroyed the originally fine surface of the marble, and has made it more susceptible to the attacks of the noxious acids and vapors of London, and, as the *Echo* naively adds, to the "carbonic acid evolved from the lungs of animals." The result is that the sculptures have the appearance of being executed in chalk rather than in marble. It is now proposed to clean the monument perfectly, and then treat it with the same transparent indurating liquid that was used lately for preserving the surface of Cleopatra's Needle, so-called, from atmospheric attacks. It is to be hoped that if the deterioration is as grave as the report represents, this course will be adopted, or else Mr. Bedborough may be encouraged to bring forward his unappreciated design for a crystal palace which shall enclose the Memorial altogether.

BRIDGING THE ENGLISH CHANNEL. — M. Venard de Saint Anne, the originator of the project for bridging the English Channel, promises to begin operations without delay. He estimates it will require seven months for experiment, and that 1,000,000 francs will suffice to pay the preliminary expenses. To raise the funds, he has laid the project before the French and Belgian Chambers of Commerce. Eighty-four of these have expressed themselves in favor of the project. He will visit England, shortly, to lay the matter before the English government. To span the deep water he has recourse to the tubular system.

QUIET ENJOYMENT. — It is amusing to learn that a case has just been tried before the Queen's Bench Division in which the plaintiff claimed that because a water-pipe, introduced into the house in the usual way, had burst and destroyed the plaintiff's property, he being the tenant of the building, the landlord was actionable for damages, in that he had covenanted to give him "quiet enjoyment." As might be expected, the plaintiff did not recover damages, the presiding judge dismissing the case with the remark that it was another added to "that class of cases in which losses happen for which there is no legal redress."

FIREWORKS AT ALOST, BELGIUM. — A few weeks since the authorities of Alost, in Belgium, on the occasion of some civic festival, allowed the town-hall to be illuminated, and a large piece of set-fireworks was attached to the tower and there discharged. As might have been expected, this piece of municipal wisdom was followed by an illumination which was not put down in the programme, for when the fireworks had burned out the tower was found to be in flames. The fire-brigade succeeded, apparently, in extinguishing the fire before serious injury had resulted, but unfortunately at two o'clock in the morning the fire again broke out, and before the firemen could subdue it the tower, which was built in the twelfth century and is said to have been a very fine example of the period, was totally destroyed.

THE GOVERNMENT TESTING-MACHINE. — The government testing-machine at the Watertown arsenal was exhibited lately to General Benét, chief of the ordnance department at Washington. A bar of iron, four feet long and five inches in diameter, turned down to 3½ inches diameter in centre, was broken by a tension force of about 500,000 pounds. General Benét was much interested in the workings of the machine, and regrets that no appropriation has been obtained to keep it in operation for important tests.

LARCH WOOD. — Any one who has undertaken to fell a larch tree, even with the help of the sharpest axe, has found that he had to deal with wood of very unusual toughness. How much the wood is used in this country we do not know, but it has such valuable properties that the tree deserves cultivation. It was well known to the Romans, who highly prized it for the sake of its low degree of combustibility. Caesar, in his Commentaries, speaks of it as *igni impenetrabile lignum*. Mr. J. Wheeler, in a treatise, on the Best Timber for Paving or Building Purposes, speaks of it in high terms, and Professor Koch, of the Berlin University, an eminent botanist, in his Dendrologie, commends its toughness of fibre and its power of resistance to moisture. The qualities of the larch are well known in the European countries where it is indigenous: in Switzerland, where the vine props made of it support the vines through successive generations, it is so highly valued that a piece of larch wood is worth more than a piece of oak wood; while in France it is used for water-pipes, as it resists decay almost equally well whether buried in the ground or exposed to air. The weight of larch per cubic foot is about thirty-two pounds, while oak (English) weighs about fifty pounds; oak will endure a strain, lengthwise of the grain, of three to eight tons per square inch, while larch will endure from two to five tons only; oak has a stiffness represented by one hundred, larch is represented by seventy-nine, yet larch, according to Tredgold, has a strength of one hundred and three, while the strength of oak is represented only by one hundred. Its color is honey yellow, and its grain has a silky lustre not unlike satin wood and is straight and free from large knots. Still, in spite of its strength and durability it shrinks and warps a great deal unless it is seasoned with perfect thoroughness. Brown, in his Forester, calls it "decidedly the toughest and most lasting of all the coniferous trees."

THE INTER-OCEANIC CANAL. — It is said that not only is Nicaragua ready to open negotiations with the United States to bring about the construction of a canal through its territory, but has already undertaken to build one, and already has part of a ship canal ready for business. It only remains to complete the improvements at the Machura rapids and build the locks about the Castillo rapids to make a connection between Lake Nicaragua and the Atlantic. The ground between the lake and the Pacific has been carefully surveyed, the distance being about thirteen miles.

PROTECTING IRON FROM RUST. — A new process for protecting iron from rust has been invented by M. Dode. It consists in coating, either by means of a bath or a brush, any objects in cast or wrought iron (freed from the damp they may contain) with a composition of borate of lead, oxide of copper and spirits of turpentine. This application soon dries on the surface of the iron, and the objects are then passed through a furnace, which is heated from 500° to 700° Fahrenheit, according to the thickness of the articles under treatment, so as to bring them to a cherry-red heat when passing through the centre of the furnace. At this point the fusion of the metallic pigment takes place; it enters the pores of the iron, and becomes homogeneously adherent thereto, covering the objects with a dark coating, which is not liable to change under the action of the air, gases, alkaline or other vapors, nor to scale off from the surfaces to which it has been applied. — *Popular Science Monthly*.

INCOMBUSTIBLE WOOD. — M. M. P. Folbarri claims that he has discovered a method by which wood of any kind can be rendered incombustible. It becomes, as it were, petrified without any alteration in appearance. Intense heat chars the surface, slowly and without flame, but does not penetrate to any extent, and leaves the fibre intact, whereby in case of fire the firemen would have no occasion to fear that the materials on which they tread would give way beneath them, if this operation has been undergone by the wood composing the staircases, floors, etc. The following chemical compound is said to produce the result: Sulphate of zinc, 55 lbs.; American potash, 22 lbs.; American alum, 44 lbs.; oxide of manganese, 22 lbs.; sulphuric acid of 60°, 22 lbs.; water, 55 lbs.; all of the solids are to be poured into an iron boiler containing the water at a temperature of 45° C., or 113° F. As soon as the substances are dissolved the sulphuric acid to be poured in little by little, until all the substances are completely saturated. For the preparation of the wood it should be placed in a suitable apparatus, and arranged in various sizes (according to the purposes for which it is intended) on iron gratings, care being taken that there is a space of about half an inch between every two pieces of wood. The chemical compound is then pumped into the apparatus, and as soon as the vacant spaces are filled up it is boiled for three hours. The wood is then taken out and laid on a wooden grating in the open air, to be rendered solid, after which it is fit for uses of all kinds, as ship-building, house-building, railway carriages and trucks, fence-posts, wood paving, — in short, for any kind of work where there is any liability to destruction by fire. — *Building News*.

THE HANGING GARDENS OF BABYLON. — Mr. Rassam's excavations on the Mujelibi Mound have proved that this was the site of the famous hanging gardens, for in its ruins he found wells, aqueducts, and ponderous masses of stone, all proving that the building had been erected, as the Greek writers say, to imitate mountain scenery. The stone used was a black basalt, which is formed only in the Armenian hills, and the immense masses must have been floated down the river. In a mound to the south of the mass of city ruins, called Jumjuma, Mr. Rassam discovered the remains of a rich hall or palace, with columns composed of enameled bricks and mosaic; the cornices were of painted brick, and the roof of rich Indian black wood. From the position of this palace or banqueting hall it would appear to have been situated on the bank of the river, and was probably the site of the state festivals and banquets. The inscriptions found there prove the edifice to have been erected by Nebuchadnezzar, and probably beautified by his successors. — *The Athenæum*.

SWISS DRAWING INSTRUMENTS. — A practical mode of protecting Swiss drawing instruments from rust is to coat the warm metal with a very thin lacquer of shellac dissolved in alcohol.

GLASS PIPES. — Captain John B. Food, of Jeffersonville, Ind., has taken out a patent for making glass water, sewer, or gas pipe. It can be made of any size, having even a diameter of six feet; the thickness of the glass varying from half an inch to an inch and a quarter, according to size.