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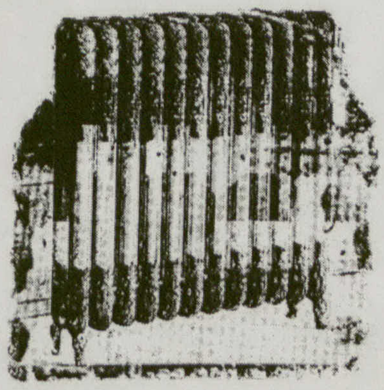

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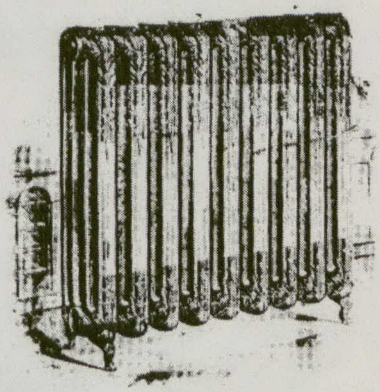

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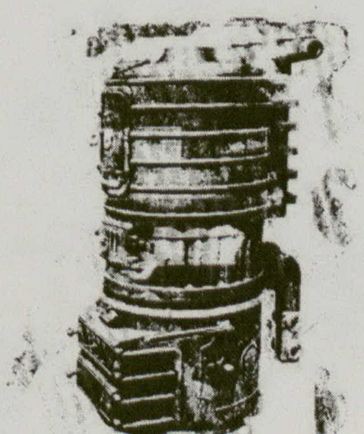

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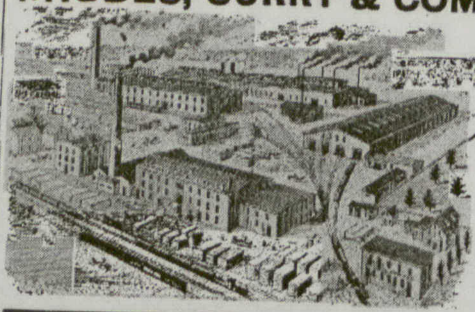

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ILLUSTRATIONS IN TEXT.

Views and Plans of Leighton House.

CONTENTS

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Fire Protection Engineering.

The Armour Institute of Technology, Chicago, has recently established a four years course in Fire Protection Engineering. Special instruction will be given three hours a week during the second year in the chemistry of fire protection, eight hours during the third and fourth years in fire protection engineering, and eight hours during the fall and winter terms of the fourth year in schedule rating, special hazards, underwriters' requirements and insurance practice.

Colour in Churches.

It is usual for writers about mediaeval architecture to speak with great sadness of the glories of the wall colouring, that time, assisted by whitewash, has caused to disappear. It is true that the small portions of frescoes that remain here and there have usually the peculiar softness of colour of a faded fresco. But it is not likely that the colouring was always so. And if it were —with the varieties of coluor and scale, the beauty, if there was any, must have been the beauty of a patch-work quilt ; interesting perhaps in part, but queer as a whole. But as a matter of fact, what remain in the way of wall paintings are hideous n their grotesqueness, regarded singly, and could give no real pleasure, or be of real value, except to an antiquary. The church, when it is scraped down to the stone, is really more suitable and more pleasing. The present generation owes a debt of gratitude to the vandalism of the past. The best architectural colour is the colour of stone, especially of old stone. This is equally true of wood. Looking up at a perpendicular roof of carved oak beams, whitened on the outer surfaces of the mouldings and darkened in the hollows, one thinks with horror of the fragments of red and blue and gold which are said to be visible to close inspection. What if the whole roof were to be covered with them ! The wtiters upon the church may regret, as much as they like, the loss of this ancient blaze of colour, but an architect is thankful.

Common Entrances.

A good arrangement, constantly to be met with in London, is a row of houses set back some distance from the road and having a common carriage drive. It is in fact a double road, as far as it goes ; or, when both sides of the street have the same plan, a triple road ; the public highway flanked by private entrances, which turn out into the public way at each end of the block and are divided from it by a railing of some kind and a row of trees. In one case at any rate, this plan is carried through the whole length of the street and makes a handsome street of it.

This is nothing more than the ordinary spacing of town lots, so common in Canada; where each lot, whether the houses are detached or in rows, is too narrow to admit of a carriage entrance from the street up to the front door; and where the building line is set back so far from the street that, without a carriage entrance, any one arriving or departing in a carriage must cross some fifty feet of pathway, exposed to possibilities of rain or snow. In the case of the London house, the kitchen department is in the basement and the garden is on the interior side of the house, so that the only use of the set back on the exterior side is as a set back—to remove the house from the public way. That the space should be occupied by a private driveway is no loss but a gain. In our cities, as the rear is usually occupied by the service department and a yard, the set back in front becomes the garden and an airing place for the family; but there are occasional variations in which the London plan would be the thing to aim at.

In order to have the best effect of privacy and to keep the street well marked, a wall is necessary, or at least a railing. A plain, low wall is better than anything that can be made of wood, and even better than iron for purposes requiring clear distinction; but the most beautiful form of street wall—which is something that should define without concealing, and that, while serving its purpose, should also serve for adornment—is a low wall with a railing on top.

Winter Foliage. There is great beauty in the mere trunk and branches of a well-shaped tree; and to have this before the eye in winter, especially when, seen through a window, the ramifications form, as it were, decorative pattern, running through the panes of glass and crossed by the sash bars, would be sufficient reason for having trees in a garden if there were no such thing as foliage. But when the time comes for the foliage to break out, it always seems to be a little better than we expected, and we look forward with regret to the time when it will fall again. As a matter of fact, the thing which particularly surprises us always is the abundance of the foliage. It is only by noting in one spring the extent to which the full sized leafage surpassed our expectations that we can be prepared for what to expect when summer comes again. This should be the cure for the discontent of winter; for the green gloom which we enjoy in summer would be an uncomfortable surrounding to a house in winter. But a green object that casts no gloom is as good in winter as in summer. What is wanted is an evergreen tree of some sort that does not grow too large and is not too funereal.

Japanese trees of this sort seem to answer every requirement except proof that they will stand our climate. They grow well in the north of England where it is very cold at times; yet it is not so much cold according to the thermometer as just beastly cold; and it is only thermometer cold that vegetation seems to mind, on the other hand, however, there is no protecting snow; but the sort of open winter that a few years ago decimated our hedges and climbers. Japanese ivy failed in that year when it was planted against a south wall; no doubt because its roots, when not protected by the cool covering of the snow, were beguiled by the sun to send up sap, only to have it frozen when the sun had passed. Ordinarily, Japanese ivy succeeds and the presumption is in favor of Japanese fir.

The peculiarity is, like other Japanese plants, a variegated foliage which relieves the gloom that is so unpleasant in other evergreens. A variety called Retinospora Aurea makes an excellent garden tree, in summer or winter. It does not grow too tall, has a fine close foliage, which makes good masses, but of a delicate texture. The tips of the leaves are nearly yellow for an inch or so, which brightens up the tree and gives its light and shade the *chic* effect of a piece of colored modelling which has had the tint wiped off the highest surfaces.

There is another Retinospora in which the foliage on the back part of a bough is of a very dark green, while the tips are of a very light, almost silvery, tea green. The effect of this is even more delicately beautiful than in the golden variety.

Table of Architectural Periods. The following is a convenient table of architectural periods drawn up by an English architect:

A.D.	Period	Sovereign	Date
1200	Early English		
1250	Early English / Gradual Change		
	Gradual Change	Edward I	1272
1300	Decorated	Edward II	1307
	Decorated	Edward III	1327
1350	Decorated / Gradual Change	Richard II	1377
	Gradual Change	Henry IV	1399
	Perpendicular / Gradual Change	Henry V	1413
1400	Perpendicular / Gradual Change	Henry VI	1422
	Perpendicular	Edward IV	1461
1450	Perpendicular	Edward V	1483
	Perpendicular	Richard III	1483
1500	Perpendicular / Gradual Change	Henry VII	1485
	Gradual Change	Henry VIII	1509
	Gradual Change	Edward VI	1547
1550	Elizabethan / Gradual Change	Mary	1553
1600	Elizabethan / Gradual Change	Elizabeth	1558
	Jacobean	James I	1603
1650	Jacobean	Charles I	1625
	Jacobean	Commonwealth	1649
1700	Jacobean	Charles II	1660

The steel work in Chicago's new postoffice has been given three or four coats of graphite, one at foundry, one at building and two coats after erection.

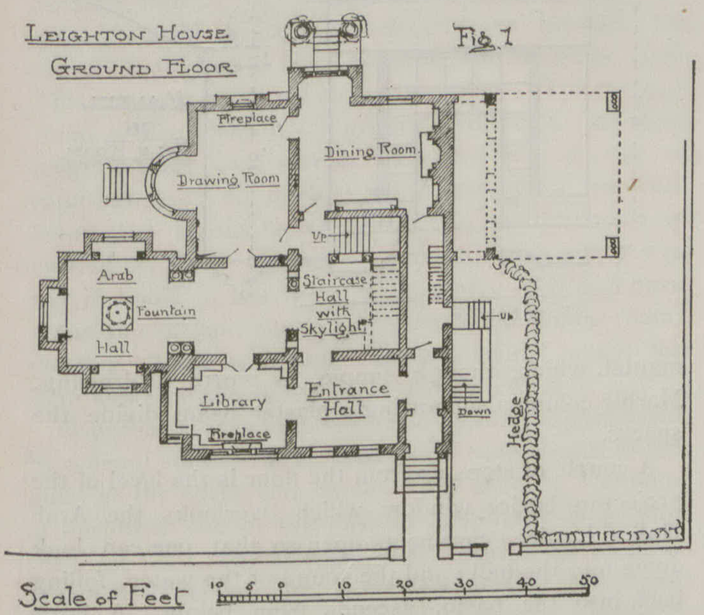
It is reported that the deposits of silica and gypsum near Truro, N. S., will be developed by a New York company. The ores will be shipped to the United States by water from either Bedford or Richmond, and from 100,000 to 150,000 tons a year will be mined and disposed of. Messrs. King, of New York, are said to be developing their plaster property at Hillsboro', Albert County, New Brunswick, which they have owned for a number of years. If the quarry turns out right it is expected that a large business will be done and their plaster mill in New York will be supplied directly from the quarry.

NOTES OF TRAVEL.—III.

Leighton House

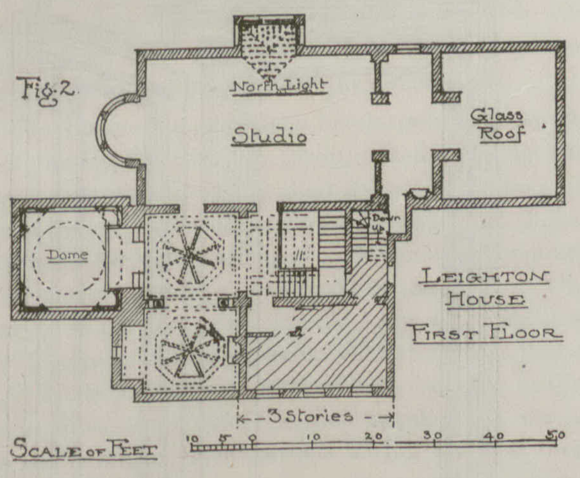
(Concluded)

The entire suite of halls is paved with mosaic work of marble. The openings, between the different parts, are finished with marble columns. This solidity is carried to the staircase, in which the steps of the first flight are of stone. This flight is contained by a stylobate wall, on which stand marble columns to take the staircase wall above; for the first flight of the stair is



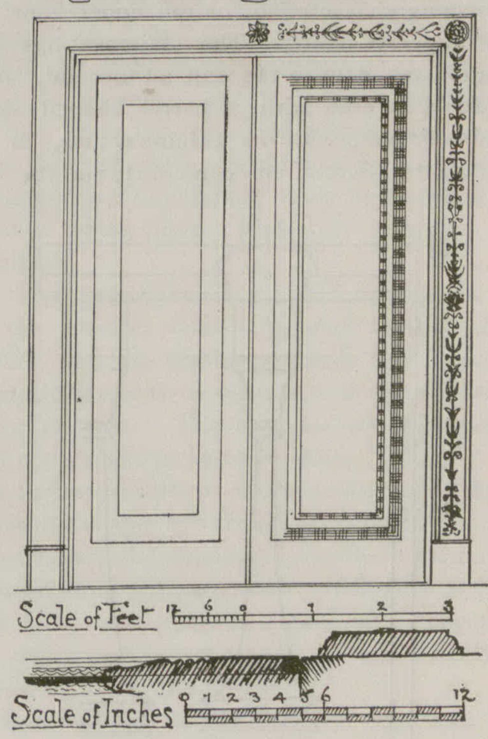
not within the staircase proper, but in a space beyond, which forms a sort of vestibule to the drawing room and dining room. The camparative retirement of the drawing room and dining room doors and of the bottom ot the staircase, and the retirement of the latter behind a wall and a screen of columns, are good points in the plan; and an appearance of spaciousness and dignity is given to the hall by the added size and richness.

The drawing room depends for its interest upon the



bow in the centre of the west side. These windows open down to the ground, and from the window in the middle proceeds a flight of stone steps, leading to the garden. The boundary of the garden is not more than fifty feet in this direction. The direction of its greatest extent is to the north, where the limit is practically out of sight. The garden is large and has trees which intercept the sight of what is beyond it. The window on this side does not seem to have been specially designed for looking upon the garden—not downwards at any rate. The window is four feet wide and the stool is not less than 3'. 6" high. The fireplace is under it; and no doubt, in winter, the branches of the trees, as seen through the window, would form a good decoration over the mantel; better if the sashes were barred, which they are not. But, unless there was some idea ot gaining wall space for large paintings on the east, with which a fireplace would interfere, the result does not seem to justify the arrangement. The fireplace opening is a semicircle, about 2' 6" in diameter, faced with white marble, inlaid with black in the form of an iris or rush-leaved plant, to decorate (rather thinly) the sides and spandrils. The mantel shelf runs into the window recess.

Fig. 4 Drawing Room Door



The wall of the drawing room are painted a deep red; the ceiling is white, panelled with moulded plaster beams; the wood work is finished with shining, though not glossy, black paint. This is the manner of finishing the woodwork throughout the house. It is rather sombre, but dignified; and in respect of its shininess has this point in its favour, that the diffused light within doors is better calculated to give effect to mouldings designed to catch light than to those intended to make shadow. The incised work of the door architraves, in the drawing room, is peculiarly indebted to the way in which the wood is finished. A first sight ot this incised ornament did not command admiration. Sunk patterns are but one remove from jig-saw work, and one might expect something better in Lord Leighton's "front room." But for some reason this ornament gave pleasure, and close inspection showed that the sinkings are not square, but pitched or curved. Stems are v'ed, but flowers and leaves are delicately and not monotonously curved and the shining surfaces reflect light like an intaglio. The flowers or rosettes, at the bottom, centres, and angles of the architrave are gilded. The panel moulding has a curious, delicate effect of being scored horizontally. Inspection showed that the mouldings are, at this member, subdivided by a number of small beads, which are run with a surfacethat waves on the plane of the face of the mouldings, producing horizontal bands of light and shade.

The Dining Room is trimmed in the same manner as the Drawing Room but not with the same detail. The gilding is here carried into the baseboard of which the top member is gilded. A gilded moulding also finishes the bottom of the wall beam of the ceiling. It is not a picture moulding, but is evidently introduced for the line of gold : the pictures are carried on brass rods below. The ceiling beams, which are deep and heavily moulded, are coloured a deep red, something near crimson in colour. The walls are deep red also—a paper with a small pattern, a little lighter than the ground. The panels of the ceiling are white.

Lord Leighton evidently valued light from above. All the ceilings in the rooms, are white ; and the distinguishing characteristic of the upper floor is the skylight in every ceiling. The staircase has a long panel in plaster, next to the wall all around, and the remainder is covered with a barrel shaped skylight. The staircase hall, with its columns, has, in consequence, all the effect of an open court; and the striking

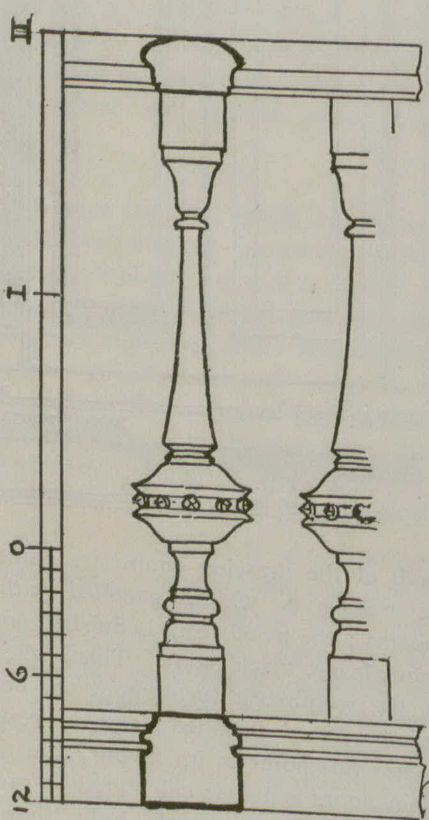


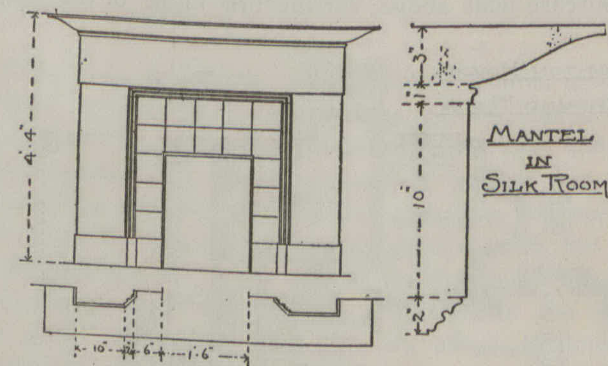
Fig. 6. Baluster

balusters (which like the rest of the woodwork are a shiny black) are shown to advantage.

The remaining room down stairs—the Library—has black bookshelves, to the height of the window stools, round most of the walls. There is a fireplace in green marble, under the window again · about as effectually tucked away out of sight as it is possible for a fireplace to be. Lord Leighton does not seem to have been of the same mind as the rest of the world who have adopted the Latin word for a fireplace, Focus, as the general term for an essential central point.

The most instructive feature in this little room of which the ceiling is as high as the other rooms on the floor, is its cornice, which must be of 3′ 0″ girth and has a good effect upon the proportions of the room. It must be remembered that there is a heavy base of book shelves.

Upstairs, the distinguishing characteristic is abundance of light. The double hall, between the staircase and the upper part of the Arab Hall, was evidently intended for the display of pictures. Each division has a skylight, in the form of an octagonal pointed dome, in the middle of the ceiling. The walls are hung with stuff of one colour : canvas of a bronze yellow in the northern division, and gold yellow silk in the southern. This latter division is dignified also with a marble

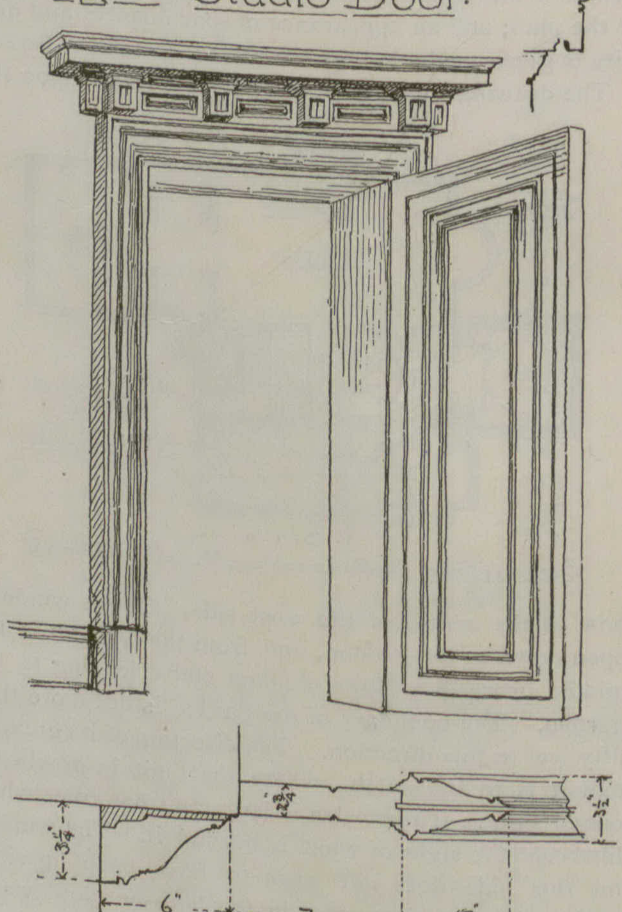


mantel, which, though simple, is worth a drawing. Marble columns supporting a plaster beam divide the spaces.

A couple of steps up from the floor is the level of the projecting lattice window which overlooks the Arab Hall. Latticed casements open so that one can look down into the hall ; and the sound of the water, falling back into the basin, ascends from below. A large plant standing upon the platform between the steps, shows well under the skylight, with the lattice work as a background.

The Studio is of course the principal room of the

Fig. 5 Studio Door



house in scale. Its finish is correspondingly bold. The main door in the centre of the Studio, which is shown above, is made a central feature by the vigour of its detail. The secondary door, to the middle hall, is subordinated by its flatness. The shaded section shown at the back of the section of the architrave, in the drawing, represents the whole projection of the artritrave in this door ; and its panel is similarly subdued.

The north light of the studio runs practically from floor to ceiling ; and, being in the form of a projection, has a hipped roof, which is also in glass, giving a vertical light. The original studio ended with the gallery, which is now a passage room between the large studio and a later addition with a glass roof. This addition is carried on iron columns. The passage room is also clear of the ground, but not to the same height ; there is a sort of well, (for the storage of canvases, etc., no doubt,) which extends a few feet below the studio floor ; below this the structure is carried on piers. It seems a pity that this space was not included in the lower floor, where it would have made an excellent pantry, adjacent to the dining room, opening off the back hall. There is height enough for both a pantry and the storage well above.

Over the passage in the studio is a gallery, approached by a small stair—which should have been shown in the plan, at the north end, by the little window. A door at the other end of the passage, communicating with the back stair, was evidently the entrance for models. It will be observed that, in connection with this, there is a side entrance to the back hall, at the ground floor ; apart from the kitchen entrance, which is by area steps to the basement.

W. A. LANGTON.

SOME LESSONS OF THE RECENT STRIKES.

As predicted last month the painters' strike in Toronto, like those of the other trades, has collapsed. The present season has witnessed the greatest conflict in the building trades that has ever been fought on this continent. The responsibility for the fight to a very large extent lies with the unions, whose demands were such that they could not be acceded to, and the employers were forced to organize for defence.

In Canada, public sympathy has largely been on the side of the contractor, the general feeling being that the workmen were pressing their demands too far. It is a pity that the men did not realize this fact before resorting to extreme measures and blocking commercial enterprises for the greater part of the year. They appear to have forgotten the old song which declares that "The mill will never grind with the water that is past." Neither will these strikers ever be able to give to the support and comfort of their families the money which they might have earned during the first three months of this season.

However, there is usually more or less silver lining to every dark cloud, and there is reason to hope that some benefits may accrue from the present disturbed conditions. The labor agitators have been discounted not only by the public but also in the eyes of the unions whose interests they are supposed to represent. In some instances they have been proven disloyal, even to the extent of asking for and accepting bribes to call off strikes which were instituted by their advice and direction. This should open the eyes of the unions to the character of some of the men who aspire to be their leaders and will no doubt lead to such a revision of regulations as will curtail the powers of the walking delegate. The unions have been taught that it is unwise to press demands which are out of relation to and not warranted by prevailing commercial conditions. To do so is to alienate public sympathy and court defeat. It may safely be asserted that an earlier appreciation of this fact would have saved the labor organizations connected with the building trades in Canada the very serious set-back which they have sustained.

The president of the International Typographical Union, in an address delivered at the annual convention of that body in Washington recently, advocated effort on the part of labor organizations in the direction of the better education of workmen and apprentices. He upheld the right of the employers as well as the workmen to organize, and suggested, correctly, no doubt, that such organizations might prove to be the mediums through which negotiations between employers and employees could more easily be conducted, and by means of which more satisfactory relations might be established.

If the labor organizations would approach the problem on the broader lines suggested in this address, they would find the employers ready to listen to their representations and to co-operate with them in securing necessary reforms. The interests of both classes are identical and should be so considered.

While the evil results of a long-sustained conflict are still so clearly visible this would seem to be an opportune time to look the situation squarely in the face and see if the policy of the past under which such strife and hardship have been suffered should not be superseded by one which would seek to improve the mental and mechanical ability of the artizan.

The effort to place all workmen on the same level, disregarding the widely varying standards of ability with which the Creator has endowed them, is one of the greatest errors of the union system as it exists to-day, and its abolition should form part of any system of reform which may be inaugurated. Workmen should be graded according to their ability and the rate of wages arranged to correspond.

Attention should be directed to devising means for improving the standard of workmanship, so that the presentation of a union card might be regarded as a guarantee of the competency of the workman. This important matter has hitherto received no attention whatever, but, on the contrary, employers have been made weary and disgusted by the repeated demands for shorter hours and more pay.

What is now wanted is a policy which will encourage workmen to make the most of the ability which God has given them, and teach them that by so doing they will achieve the highest measure of success in life, financially and otherwise. Such a policy would receive the approval and support of employers, would fit workmen to become themselves employers, and go far towards re-establishing the sympathetic relations which formerly existed between employers and their workmen, but which unfortunately have of late been in a measure destroyed.

A Chicago court recently decided that the owners of a building having a smoky chimney are liable for damages to persons whose property is injured by the smoke and soot. The award for damages was $1,500.

FINISHINGS IN WOODWORK.

By Fred T. Hodgson.

More attention is now being given throughout the country to the artistic finishing of houses and fine business structures, and more expert carving is done for the purposes named, the appearances indicate, than in the manufacture of furniture, which industry for a long time laid claim upon the greater share of this class of mechanical talent. The reasons for this may not be fully self-evident or patent, but it would seem that it is largely because the real value of hardwood in this direction had never been fully realized or understood in this country, and because, also, the real high art in decorative architecture is scarcely native to American ingenuity and talent, which is famous in other ways, since there are oriental splendors in building and interior display in the palace-like habitations of many a pagan, or uncivilized native, which would never have been deemed possible of execution by our own designers, however artistic their eye, or however deft their touch.

Processes and appliances for producing excellent results are known to many European workmen, in whose breasts the secret of such achievements is firmly locked. During the past few years many of these expert operatives in wood-carving have come to Canada, and their superior abilities have begun to manifest themselves in the wood manufacturing industry of this country, and latterly, to a very marked extent, so that a renaissance in wood-working may be fairly said to have resulted. The importation and employment of this class of talent led to a responsive sentiment in the the community, or such channels of it as evidenced a sufficiently refined or artistic taste to appreciate and encourage a sensible and utilitarian form of art, which was experiencing an important enhancement of its excellence, and now quite a pronounced stimulus has been given the industry of wood-work for house finishing.

Many of our native woods readily yield to the carver's tools and lend themselves to the artistic development of Canadian workmen, and many of our young native workmen have rapidly attained a state of proficiency as advanced as that of our foreign born fellow subjects.

The very finest workmen, especially those in the possession of some secret processes of doing difficult work, receive wages as high as $6 a day. The average pay of good wood carvers is from $3 to $4 a day. The process of ebonizing cherry wood, for instance is a secret known only to the workman who does it. Even the members of the firm in which he is employed have no right to ask what his secret is. The fact that he can get a finer, more ebony-like surface than any other man gives him a high value at once. Although the use of mechanical devices for carving wood are so much disliked by the best workmen, that sandpaper is forbidden, machinery is now used to cut away the rough parts of a bit of carving. A peculiar tool driven by steam power eats out the wood wherever it goes, and thus a skillful man blocks out in a rough way as much work in a day as 20 men could have done formerly.

The delicacy and lightness of wood carving, and the good pay which fair workmen receive for it, have already attracted many Canadian apprentices, who, untrammelled by union rules, are making rapid headway, and promise to surpass the foreigners.

Oak, cherry, birch, walnut and maple are the favorite woods used for interior finishing, oak and cherry being the most popular. The latter of these is now becoming very scarce, while there appears to be no limit to oak. Red oak, when properly finished, makes very handsome work and is quite popular in some localities. The heart wood of beech, when skillfully treated, has a beautiful appearance, and it is a matter of surprise that it is not more generally employed in hardwood finishings. Perhaps, when birch and maple get scarce, beech will have its innings.

BY THE WAY.

The expeditious manner in which the construction of the King Edward Hotel, Toronto, was pushed through by the contractors, Messrs. Illsley & Horn, has been the subject of much favorable comment. It is a subject for particular regret therefore that the firm have not been rewarded by a substantial profit, such as their energy merited. On the contrary they lost so heavily by the transaction as to be obliged to ask the indulgence of their creditors.

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Some of the persons who incite and engineer strikes of workmen as well as the workmen whom they represent, seem to be seriously afflicted with moral obliqnity. As an example, I would refer the reader to the case of one Samuel Parks, a walking delegate for the bridgemen's union of New York. Parks was arrested charged with accepting from the Hecla Iron Works the sum of $2,000, as blackmail for having agreed to call off a strike at the company's works, yet the bridgemen's union to whose interests Parks appears to have played traitor, is said to have re-elected him by a large vote as the union's walking delegate.

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Difficulty has arisen between the architect of the King Edward Hotel, Toronto, and the New York artist who designed and painted the mural decorations. The courts have been asked to grant an injunction to prevent any person other than the author of the paintings from making changes in them. The architect states that the panels were made too large for the spaces they were to occupy, and that in attempting to fit them in position the artist or the workmen deliberately cut the canvas, and in so doing mutilated the figures in the paintings. In an interview with a reporter the architect is reported to have said that the contractors for this work seemed to think that anything was good enough for Canada. The significance of this remark should not be lost upon Canadian architects who may be tempted to go abroad for skill which could probably be found at home. Some of our Canadian artists have done creditable work in the line of mural decoration, and the question is asked why was not the opportunity given them to submit sketches for these panels? It would have greatly added to the interest of this costly building if, as far as possible, it had been given a distinctively Canadian character, instead of being made a replica of the great hostelries of the United States. One of the charms to the traveller is to be brought into contact with distinctive national characteristics, as exemplified in architecture, social, customs, etc., differing from those to which he has been accustomed.

THE PORTLAND CEMENT INDUSTRY.

Up to the middle of the 18th century it was believed that the hardest hydraulic limes were made from the hardest and purest limestones. In the year 1756 Mr. John Smeaton, an Englishman, in course of certain experiments found that this was not true; that on the contrary hydraulicity was due to the presence of clay matter in the limestone.

A few years later this gentleman was entrusted to rebuild the Eddystone lighthouse. In this structure he used an hydraulic lime made by calcining a rock containing a certain percentage of clay material. So this beacon of the channel "stands to-day not only as a guide to ships that pass in the night, but also as a monument to mark the starting point in all that we know concerning hydraulic cement."

Three-quarters of a century passed and scarcely any advancement was made. Manufacturers and engineers seemed satisfied with the natural hydraulic cements. However, a surprise was in store. In 1824 Mr. James Aspdin, a brick-layer, of Leeds, England, reasoned: "If the degree of hardness and hydraulicity are proportional to the amount of clay matter present, why not add clay to limestone and calcine the mixture?" Experimenting along this line he hit upon a mixture which, burnt at a higher temperature and ground to a powder, formed, when mixed with water, a cement much harder than anything yet produced. Noticing strong resemblance in point of color and texture between his cement and the colitic limestone from the island of Portland, he named the former Portland Cement. He may also have been influenced by business reasons, because this Portland rock had for centuries been in favor as a building stone, being the material used in the construction of many famous public buildings, including St. Paul's Cathedral, London.

Following this a number of works were built in the Medway and Thames district, but, owing partly to the rule of thumb methods used in mixing the raw materials, and partly to crude and imperfect machinery, the products were seldom of the best quality.

The burning was done in a kiln not very unlike the ordinary lime-kiln we see in this country. It consisted of a barrel-shaped shaft about 35 feet high, and 10 feet at its greatest diameter. A few feet from the bottom were placed iron grates, and on these grates alternate layers, composed of coke and bricks of the dried mixtures, were dumped down from an opening near the top. This mass was fired at the bottom and allowed to burn itself out, which required usually three days. After cooling down, the residue consisting of underburnt material and clinker, was drawn off at the base and assorted. This kiln, with improvements tending towards economy, was used entirely until 1884, when Mr. Deitch patented a shaft-kiln which could be worked continuously. Since then other forms of continuous kilns have been built, each giving satisfaction on account of their economy. But the greatest advance came with the advent of the rotary kiln invented by Mr. Ransome, of England, in 1887.

For years England held a monopoly in cement manufacture and exported much. However, this was not to last. In spite of high walls built around the factories, foreigners grasped the secrets of the business.

The Germans, always true to their characteristic national method, which is to develop systematically and patiently the details of a general principle, made no exception of this case. The English had discovered that a superior cement could be made from calcium carbonate and clay; the German determined by chemical means the exact proportions required, and by using the calcimeter could gauge the mixture very closely before burning. They also discovered that a small percentage of plaster of Paris added to freshly ground cement had the effect of making it slow in setting.

Mr. LeChatelier, a Frenchman, in 1887, was the first to give the world a theoretical formula of the chemical composition of cement. He held that it consisted of a tri-calcium silicate together with a slightly variable amount of tri-calcium aluminate.

This stood until 1897, when Messrs S.B. and W.B. Newbury, of the United States, preparing silicates and aluminates of lime synthetically, found that cement was a mixture of tri-calcium silicate and di-calcium aluminate, expressed thus:—

$$X\ ({}_3CaO.\ \ SiO_2) + Y\ ({}_2CaO.\ \ Al_2O_3).$$

From this we deduce the formula that the percentage of lime = 2.8 × percentage of silica + 1.1 × percentage of alumina. This is the formula used by most cement chemists to-day as a standard for a well balanced clinker.

THE INDUSTRY IN THE UNITED STATES.

Before 1871 no Portland cement was made in America. In that year Mr. D. O. Saylor, of Coplay, Pa., who had been manufacturing a natural hydraulic cement, succeeded in making a low grade Portland cement by burning a mixture of pure limestone and argillaceous limestone which abounds in that locality. Since then Mr. Saylor and his successors have improved and enlarged their factories and to-day these mills along with thirteen others which have since been established within a circle of fifteen miles' radius, are producing a high grade of Portland cement at figures probably lower than anywhere else.

What is known as the dry system is used entirely here. The argillaceous limestone being a little low in lime has a small percentage of pure limestone added to it. The chemical composition of both ingredients is carefully determined, then after being measured in automatic weighing devices and intimately blended by being ground to an impalpable powder, the mixture is burned in rotary kilns.

The success reached by these manufactories in the Lehigh Valley broke the prejudice of engineers against the home-made article, and the demand soon grew greater than this region could supply.

A few factories were then built in New York and other states, but it was in Michigan that the industry was next to establish itself strongly. In this state nearly every lake and marsh rests on a substratum of marl. This is a soft, putty-like material consisting of nearly pure calcium carbonate. In Michigan the color is bluish, but in other places it is as white as snow. It was found that a mixture of this substance with clay could be effected and that the resulting slurry could be easily burned in rotary kilns so as to make a first rate clinker. Several works were at once erected, and although the operators at first saw many dark days in meeting the new conditions, they have ultimately triumphed. And to-day ten large plants turn night and day, during all but the coldest month, successfully producing a high-grade cement.

THE INDUSTRY IN CANADA.

In Canada manufacturers have been awake, and in spite of their being handicapped in respect of the item of fuel, the industry has grown within the last few years to such an extent that now Canadian factories can almost supply the Canadian demand. As yet the manufacture is limited to Ontario. In this province as in Michigan there are many beautiful deposits of marl and clay, so the wet process is used throughout.

Beginning at the west there are several plants located about Owen Sound. Some of these have met with a fair amount of success and have turned out a good quality of cement, but the systems used are more or less cumbersome and as yet no great quantities have been produced. Next year, however, a new plant situated at Durham is expected to reach a considerable output. This factory has nine rotary kilns. All the machinery is electrically driven by power generated from steam.

Farther east, at Lakefield, there was last year erected a plant of three rotaries. The works here are entirely driven by electricity furnished at a power house on the Otonabee River. The mill is small but very efficient and produces a good cement.

About ten years ago the Rathbun Company, of Deseronto, began manufacturing Portland cement at Strathcona. Here there is a large bed of pure blue clay. To this clay they added about 75 per cent. of marl which is brought by the Bay of Quinte Railway from Marlbank. Both these ingredients are very pure, and when properly mixed and ground were found to make a splendid cement. The burning was at first effected in intermittent kilns, but lately in continuous kilns. They now use one Deitch and two Calborgs. This company observed great care and at length produced a brand of cement that is not excelled anywhere. But as Strathcona is 40 miles away from the marl deposits and the system is rather expensive, the works here have ceased to grow. The heart of the industry in the Bay of Quinte district has been transferred to Marlbank, where the Canadian Portland Cement Company has lately built a most modern plant.

Near Marlbank there is a deposit of white marl averaging 97 per cent. calcium carbonate. This extends to about 35 feet in depth. Under it again there is a bed of soft blue clay varying from 10 feet to fifteen feet. It is thus seen that if nature did not intentionally plan the great manufactory now thriving there, she certainly made things very convenient, for there is no waste of raw materials.

The style of kiln now used in all modern plants in America is known as the rotary. It was invented fifteen years ago in England, by Mr. F. Ransome, who experimented in the Medway district with it. In his hands, however, it proved a failure, and in England the idea was abandoned. But a foreigner, this time an American, caught the idea and developed the details in such a way that to-day it is the best style of kiln extant, and during the last three years English engineers have been coming to America to learn the secrets of rotary kiln construction.

This kiln is a steel cylinder from 60 to 100 feet in length and from 5 to 8 feet in diameter. Mounted on roller bearings the kiln is slightly inclined with the horizontal. A large gear surrounding the shell about half way from either end, gives the kiln its motion. It has been found advantageous to have the gearing that drives the kiln connected with a variable speed countershaft by means of which the operator can vary the speed from ½ revolution per minute to two revolutions per minute. This kiln is lined with fire bricks to within 20 feet of the slurry end. This part is fitted with channel irons placed two feet apart and running parallel with the longer axis of the cylinder. At the elevated end a smoke-stack is built to carry off the waste gases.

At the lower and opposite end a 7 inch iron pipe enters through the centre of the hood. This pipe furnishes the kiln with fuel which at the present time consists of bituminous coal, dried and ground to a powder. The coal is prepared in a separate department. First it is conveyed from cars to rotary dryers, then crushed in crushers and ground in tubemills in which flint pebbles take the place of steel balls. From the tubemill it is conveyed to tanks with hopper bottoms, placed in front of the kiln. A screw conveyor driven by a speed regulator draws it from this tank dropping it into a syphon where an air blast drives it into the kiln. It burns immediately on entering the kiln, giving a temperature of about 3000° F. in the hottest zone which extends from 5 ft. to 25 ft. back.

The slurry which is pumped into the kiln at the elevated end slowly winds its way to the lower end. As the kiln revolves the slurry is carried up at first by the channel irons, and when a certain height is reached, it falls to the bottom passing through the hot gases which at first carry off the water vapor and later the carbon dioxide. After passing beyond the reach of the channel irons, it is dry enough to stick to the bricks till it reaches the top, and this operation is repeated once for each lineal foot the material travels. By the time it reaches the hottest zone it is thoroughly dried, but not completely calcined. In this zone the calcining is finished and a chemical combination takes place between the basic and acid elements of the semi-fused materials forming clinker. The clinker then rolls out of the hood in particles varying in size from a pin-head to a hickory nut. The advantages of this system of burning may be summed up as follows: (1) The slurry does not require to be dried and moulded into bricks before entering the kiln. This saves much labor, time and expense. (2) The burner has complete control of the process of burning. He has three variables at his command; he can vary the feed of the slurry, and coal, and also the speed of the kiln. By means of blue glasses he can see into his kiln from either end and watch the whole operation. (3) No raw material gets past the hot zone because the burner can distinguish the raw from the burnt, and when he sees raw material from the front end he adds heat or slows his kiln.

An objection is raised by a few to this system of burning. They hold that where so much coal is used to make the clinker, a great deal of ash from the coal must enter into the clinker. These persons lose sight of the fact that the greater part of the ash is silica and alumina, which acts as clay, and is in no wise objectionable, because it can be counteracted in the raw mixture.

However, we must admit that although the rotary kiln is the best kind known, it is still a very wasteful machine. In most mills the gases pass out of the smokestack at 1500° F., and the clinker passes out of the other end at a still higher temperature. Hence, at a glance one sees the tremendous loss of energy involved. Here lies the reason why too much coal is used. This fact is claiming much attention now and we may expect radical improvements soon.

ARTIFICALLY COOLING THE CLINKER.

The scheme, which is by no means satisfactory, but is looked upon as one of the best extant, is Mr. Mosier's system. This is installed at Marlbank. The Mosier cooler is a cyclinder 20 feet high and 8 feet in diameter. One is sufficient to cool the clinker from two kilns. It stands in front of the kilns, and as the clinker drops out of the kiln hood an elevator lifts it to the top of the cooler. It falls inside and strikes cones or discs which surround a cast-iron pipe running up through the centre. Cold air is forced out through openings in this pipe, and as the clinker falls from disc to disc it is cooled. At the bottom the cold clinker is drawn off into a dump-car, which is hoisted to large bins above the grinding machinery in the grinding department.

GRINDING THE CLINKER TO CEMENT.

Before the car of clinker is dumped into the bin above the ball mills, about 1½ per cent. of Plaster of Paris is added. If it were not the cement would, as before mentioned, be too quick in setting. The clinker is then fed into each ball-mill by an automatic disc feeder.

The finishing grind is done in No. 16 tubemills, lined with blocks of flint instead of blocks of wood. Flint pebbles are used here.

Every few hours samples of each mill's grind are sifted, and if there is more than 5 per cent. residue left on a sieve of 10,000 meshes per square inch, or more than 20 per cent. on a sieve of 40,000 meshes per square inch, the feed of the mill is reduced.

At the end of every twelve hours an average sample of the grind of that period is made into briquettes, having a section of one square inch. These are made by mixing cement with about 21 per cent. of water in the case of neat briquettes, and a less percentage where a mixture with sand is used. Two of these are broken at the end of 24 hours, during which time the briquettes have lain in moulds in a moist atmosphere. The remaining ones are then placed in water. Two more are broken in each of the following periods, three days, seven days, twenty-eight days, and three months, to determine their tensile strength, which must surpass standard specifications. A sample of cement made at Marlbank this summer taken at random, ran as follows:

1 day, 275	lbs. per	square	inch.
7 days, 630	"	"	"
28 days, 925	"	"	"
3 mos., 960	"	"	"

From this same sample pats are made, which being set in moist air give the time of both initial and final set, and after being placed in steam for twelve hours, and then in water for the same length of time, prove by their condition at the end of the test whether or not the cement is sound.

All the leading Canadian manufactories go through this elaborate system of tests. Engineers need no longer entertain fears and doubts as to the quality of their work. Canada produces as good Portland cement as is furnished by any country in the world.—Percy F. Balfour, in Queen's Quarterly.

THE DOME.

Prof. Baldwin Brown recently read a paper before the Edinburgh Architectural Association in which he sought to vindicate the title of the dome to a place among the architectural forms suited to a Christian church. He pointed out that the main characteristic of the dome in general was its embracing, uniting quality, and said it was important so to employ it as to obtain from its full value as a unifying element in a composition. The employment of the dome as a mere roof, as in the multiplied domes of later byzantine churches, such as St. Mark's at Venice, or the series of cupolas along a rectangular aisle, as in churches of the West of France, was not the way to secure all the advantages of that most beautiful and expressive feature. The dome, wherever it appeared, lent distinction to a building, and it had been rightly pronounced to be on the whole the most satisfying to the æsthetic sense of all architectural forms. The real power of the dome was, however, only exhibited when it was made to exercise an influence far beyond the limits subtended by its own circumference, and brought into harmony the complex elements of a subdivided plan. The pantheon of Hadrian at Rome, the starting point of the development of dome construction in the modern world, completely embraced the spaces of the plan it surmounted, but this plan was that of a regular unbroken circle. The Christian builders desired to use the dome for their own purposes; but such a plan as that of the Pantheon was not suited for a Christian meeting-house. One of the most interesting chapters in the whole history of architecture was occupied with various experiments made by early Christian architects to adapt the dome to plans suited to the requirements of congregational worship. Their efforts to overcome the difficulties which presented themselves were sufficient proof that they recognized the dome as a form not only beautiful in itself, but expressive of Christian ideas, and this was a consideration too often lost sight of by the Mediævalists of to-day, who, as the discussions connected with the new Liverpool Cathedral had shown, were still dominated by the ideas embodied in the Gothic revival of the first half of the 19th century.

ARCHITECTS' FEES IN RELATION TO FIRE INSURANCE.

It would seem to require no argument to show that when appraising the owner's loss on a burned or partially burned building the insurance companies should include architects' fees, which item entered into the original cost of the building upon which the insurance is based In Canada this item is included in the owner's claim and is allowed by the insurance companies, but in England there appears to be no recognized practice with regard to this matter.

Enquiry has recently been made by Mr. T. Myddleton Shalcross about the practice of eighteen or twenty of the principal British fire insurance companies in respect to the payment of architect's fees. He has ascertained that some of the companies refuse to pay architect's fees incurred in the reinstatement of fire damage, notwithstanding that premium has been paid upon architect's fees, originally incurred, as part of the cost of the building insured; that other fire insurance companies only pay fees in cases where they have been separately mentioned and described in the policy; and, again, that other fire insurance companies always pay such fees whether or not they are separately described in the policy. Those who think they are insured against fire would do well, therefore, says Mr. Myddleton Shalcross, to inquire from their assurers how the matter stands in their own particular cases, as otherwise, should a fire occur, they may find themselves uncovered to the amount of several hundreds of pounds in respect of their premises. For example, in the case of a building costing, say, £10,500, including architect's fees, and totally destroyed, the owner might find himself only able to recover £10,000, and have to bear the loss himself of the remaining £500, or, in the alternative, have to be satisfied with an inferior class of work in the reinstatement of the premises, i.e., work performed at the will of a builder without the direction and control of an architect, and there would, of course, be a similar result in case of a partial destruction of the premises pro rata.

ABSORBENCY OF CLAYS AS AFFECTED BY DRYING.

Mr. H. J. Cambie, in a paper recently read before the Canadian Society of Civil Engineers, gives the results of a curious and important observation upon clays. It appears that a portion of the Canadian Pacific Railway passes through a valley almost without rainfall, through the bottom of which flows the Thompson River. Above the river are high clay bluffs, forming the edge of a sort of table-land, some 200 ft. above the river. When irrigated, this clayey tableland is fertile, producing several crops of hay a year, and the farmers utilize it for that purpose, irrigating it with water from the river or its tributaries. Since irrigation of the land began, some forty years ago, there have been many land-slides. One of these, a few years ago, carried a tract of about a hundred acres directly across the river, forming a dam 75 ft. high, and completefy blocking its course; and another recently damaged the railway. In consequence of the latter, suit was brought by the railway company to prevent the farmers from irrigating their fields, on the ground that the irrigation softened the clay subsoil, allowing the ground to slip. This view was confirmed by experiment, the experts, of whom Mr. Cambie was one, finding that while ordinary clay, in the moist condition in which it is usually found in the ground, will not absorb any more water, and is only superficially affected by washing, clay that has once been so completely dried as to lose its cohesive property absorbs water like a sponge until some 60 per cent. of its weight has been added, when it falls into a liquid mud, nearly as fluid as water. Even when the clay has not become powdery by drying, but has taken the form of indurated lumps, it will soak up the water until converted into fluid mud. As the clay of these hayfields exists, to a great extent, in the form of such dry lumps, it seems probable that copious irrigation through the season might liquefy it, so as to allow the ground to slide; while the objection that the clay on the immediate bank of the river was not affected appeared to be answered by the fact that this clay, being constantly kept moist by the water of the river, preserved its solidity.

A COLOSSAL STRUCTURE.

Mr. McKim, the well-known architect, is said to have designed a Stadium of larger area than the Colosseum at Rome, to be erected on the athletic field at Harvard College. This structure will resemble a continuous stand following the two long sides of a football field and one of the short sides. The length of the arena enclosed will be no less than 450 ft., and the extreme length of the whole building as viewed from the road that crosses Harvard Bridge will not fall far short of 200 yds. In other words, the stadium will be about equal to the Colosseum in length, but will afford a larger arena. The plans of the Harvard stadium show a design as remarkable for simple elegance as for constructive ingenuity and economy. The frame work will be of iron girders, the facing of concrete blocks. The vast iron skeleton within will be entirely concealed under a mask of yellow white that will present, with practically the same effect as solid stone, all the familiar aspects of a Roman amphitheatre. Tier upon tier of seats will rise to a height of 100 ft., affording seats for 24,000 spectators on ordinary occasions, for 40,000 in an emergency. Behind and above the topmost row will run a roofed gallery supported on light pillars; this is designed to provide a sheltered promenade and to give a necessary architectural finish to the building as seen from within.

The exterior aspect of the stadium will be on lines that the form of the interior makes inevitable. A colonnade of three super-posed galleries surmounted by a heavy cornice, unadorned by superfluous embellishment, will give simplicity and severity to the outward aspect of the building. The height being about two-thirds that of the Colosseum, the massiveness of the piers, or rather of the appearance of the piers, will also be somewhat less.

NOTES.

The Royal Institute of British Architects have this year awarded the King's gold medal to Mr Charles F. McKim, a distinguished architect of the United States.

Mr. R. F. Gagen, of Toronto, and Mr. Wm. Hoper, of Montreal, have been appointed Commissioners to get together as representative collection as possible of paintings by leading Canadian artists, living and deceased, for the approaching Dominion Exhibition in Toronto.

An Act has just passed the Prussian Parliament which empowers local authorities to forbid any form of conspicuous announcement that impairs the landscape or any placarding of private premises whether relating to the premises conducted therein or not. The Legislature of the state of Massachusetts has passed a similar Act. So far as known no legislation on this subject has yet been enacted in Canada, but it is to be hoped that on this important subject public opinion here will not lag behind that of Great Britain, Germany and the United States, all of which countries have recognized and sought to abate the evil. Unfortunately the mischief which such legislation aims to prevent has already to a large extent been done, as witness the glaring announcements on barns, etc., on the principal lines of travel all over this continent. Particularly is the evil manifest on the outskirts of towns and cities.

According to the Engineering Record over-exposed blueprints can, in many cases, be restored by immersing them in a bath of weak ammonia, using about two spoonfuls of ammonia to a tumblerful of water. This will cause the print to turn first purple then pink and after a time nearly white. When it has reached the pink stage, rinse the print and immerse in a bath composed of water, 1 tumblerful, muriatic acid, 1 teaspoonful. The blue color will then return much brighter than before, but this time the lines will be white and clear. Wash thoroughly before drying. Stains on tracings caused by blueprint water can, also, be removed, according to the American Machinist, by painting the spot with a camelshair brush dipped in a 10 per cent. solution of oxalate of potash. This same solution may be used for making white lines on blueprints. Almost any alkali will bleach a blueprint, but this solution will turn the blue to a pure white.

PROPOSED STANDARDS OF FIRE RESISTANCE.

The executive of the British Fire Prevention Committee, having given their careful consideration to the common misuse of the term "firepoorf," consider the term "fire-resisting" more appicable for general use, and that it more correctly describes the varying qualities of different materials and systems of construction intended to resist the effect of fire for shorter or longer periods, at high or low temperatures as the case may be, and they advocate the general adoption of this term in place of "fireproof."

Further, the executive, fully realizing the great variations in the fire-resisting qualities of materials and systems of construction, consider that the public, the professions concerned, and likewise the authorities controlling building operations, should clearly discriminate between the amount of protection obtainable or in fact requisite for different classes of property. For instance, the city warehouse filled with highly inflammable goods of great weight requires very different protection from the tenement house of the suburbs.

The executive are desirous of discriminating between fire-resisting materials and systems of construction affording temporary protection, partial protection, and full protection against fire, and to classify all building materials andsystems of construction underthese three headings. The exact and definite limit of these three classes is based on the experience obtained from numerous investigations and tests, combined with the experience obtained from actual fires, and after due consideration of the limitations of building practice and the question of cost.

The executive's suggested minimum requirements of fire-resistance for building materials or systems of construction will be seen from the standard tables appended for—I. Fire-resisting floors and ceilings. II. Fire-resisting partitions. III. Fire-resisting doors, but they could be popularly summarized as follows: (a) That temporary protection implies resistance against fire for at least three quarters of an hour. (b) That partial protection implies resistance against a fierce fire for at least one hour and a half. (c) That full protection implies resistance against a fierce fire for at least two hours and a half.

The conditions under this resistance should be obtainable, the actual minimum temperatures, thickness, questions of load, and the application of water can be appreciated from the annexed tables by all technically interested, but for the popular discrimination which the executive are desirous of encouraging—the time standard alone should suffice.

It is desirable that these standards become the universal standards in this country, on the Continent and in the United States, so that the same standardisation may in future be common to all countries, and the preliminary arrangements for this standardisation are already in hand.

STANDARD TABLE FOR FIRE-RESISTING FLOORS AND CEILINGS.

Classification.	Sub-Class.	Duration of Test at Least.	Minimum Temperature.	Load per Superficial Foot Distributed.	Minimum Superficial Area under Test.	Minimum Time for Application of Water under Pressure.
Temporary protective class	A	45 mins.	1500° F.	Optional	100 sq. ft.	2 mins.
	B	60 mins.	1500° F.	Optional	200 sq. ft.	2 mins.
Partial protective class....	A	90 mins.	1800° F.	1 cwt.	100 sq. ft.	2 mins.
	B	120 mins.	1800° F.	1½ cwt.	200 sq. ft.	2 mins.
Full protective class.......	A	150 mins.	1800° F.	2 cwt.	100 sq. ft.	2 mins.
	B	240 mins.	1800° F.	2½ cwt.	200 sq. ft.	5 mins.

STANDARD TABLES FOR FIRE-RESISTING PARTITIONS AND SINGLE DOORS, WITH OR WITHOUT FRAMES.

Classification.	Sub-Class.	Duration of Test at Least.	Minimum Temperature.	Thickness of Material.	Minimum Superficial Area under Test. For Partitions.	Minimum Superficial Area under Test. For Doors.	Minimum Time for Application of Water under Pressure.
Temporary protective class.	A	45 mins.	1500° F.	2 in. and under	80 sq. ft.	20 sq. ft.	2 mins.
	B	60 mins.	1500° F.	Optional.	80 sq. ft.	20 sq. ft.	2 mins.
Partial protective class.	A	90 mins.	1800° F.	2½ in. & under	80 sq. ft.	20 sq. ft.	2 mins.
	B	120 mins.	1800° F.	Optional.	80 sq. ft.	20 sq. ft.	2 mins.
Full protective class	A	150 mins.	1800° F.	2½ in. & under	80 sq. ft.	25 sq. ft.	2 mins.
	B	240 mins.	1800° F.	Optional.	80 sq. ft.	25 sq. ft.	5 mins.

FAILURE IN A BUILDING CARRIED ON COLUMNS.

Some interesting and instructive data are given in the appendix to a recent report by Sir Wm. Garstin of the Public Works Department of Egypt regarding the failure of a four storey prison building in Cairo, and the method employed to repair the same. The ground, first, and second floors provide accommodation for 250, and the third floor for 200 persons. The corridor-wall of the top floor is carried by two cast-iron columns, one above the other, having a total height of 35 feet 6 inches, and transmitting a load of 58 tons to the stone base of the columns. The building is founded on a float of pozzuolana concrete, 4 feet in thickness, laid at permanant infiltration level. This form of foundation was adopted because the excavation showed that the whole area covered by the foundations had at one time been a deep depression which, many years previously, had been filled up with earth, stones, and rubbish.

The infiltration water prevented the excavation being carried any deeper to get to the virgin soil. As there are no cracks in the outer walls of the building, it may be assumed that this float of concrete is intact.

Soon after the completion of the building, cracks appeared in the brick cross-walls of the top storey. Starting at floor-level, where this wall rests on the corridor-wall below, the cracks followed a straight line drawn from this point to a point where the ceiling meets the corridor-wall of the top storey, which is carried on the columns.

These cracks were evidently caused by the columns settling, and on investigation it was found that the base-flanges of some of the columns were cracked. On stripping the asphalt off the stone bases these also were found to be cracked, and the failure was therefore attributed to the crushing of the stone. It appeared also that the base-stone had been dressed hollow, which would have the effect of throwing the pressure on the outside of the base-flange, and would account for its being cracked. It was further observed that the stones were saturated with damp, which made them soft. This was the result of the water used in swabbing down the ground floor finding its way to the stone, through the joint between the asphalt and the cast-iron column. By calculation it was found that the base-stone, which was of limestone and measured 2 feet 8 inches square by 1 foot 6 inches in depth, was overloaded, as it was exposed to a pressure of 590 lbs. per square inch, whereas ordinary samples of this stone are crushed at a pressure of 3,000 lbs. per square inch, giving a factor of safety of only 5. This explanation of the failure was not very convincing. That the stone should have crushed when only loaded to one-fifth of its laboratory crushing-strength, even although it was weakened by being saturated with damp, seemed doubtful. New stones 3 feet 6 inches square by one foot 6 inches in depth were ordered from Trieste, and new columns from England. Tripod shores on wide timber bases were erected round the columns, and gypsum tell-tales showed that the movement continued. Much deliberation was given to deciding on the best means of supportiug the superstructure (a load of 58 tons) while the thirteen columns and base-stones were changed. No risks could be run which would endanger the lives of between 400 and 500 people who inhabited the building. The result of this forethought was so satisfactory that during the work no change was found necessary either in shoring or in the method of working.

The shoring consisted of a pair of A-frames set up under the girder carrying the gallery at first-floor level. Their feet were let into timber bed-plates, 2 feet 4 inches by 1 foot 2 inches, with a tightening-wedge under each foot. These wedges were especially useful in loosening the shoring before removing it. Under the bed-plate and directly below each foot were inserted iron folding-wedges working between iron plates. The lower plates rested on a bed of cement concrete 12 feet by 12 feet by 3 feet 6 inches in thickness. This bed of concrete was necessary to distribute the pressure, all of which came on new filling, 10 feet in depth between the concrete foundation and the bottom of this concrete. The pressure on the earth was thus reduced to less than ½ ton per square foot.

The longtitudinal rolled joist (1 foot 2 inches in depth) at the first-floor level not being stiff enough to carry the weight between the A-frames when the column was removed, iron joists which bore on the A-frames were packed in under the flanges of the saddle-piece between the upper and the lower column. Also vertical shoring with tightening-wedges was carried up to main girder carrying the top-story corridor-wall. The upper columns were thus relieved of their weight during the operation. All the shoring was braced across the building and tied to the main walls. To avoid vibration as much as possible in tightening up the wedges when transferring the load to the shores, two 50-ton hydraulic jacks were set up between the A-frames and the base-stones. These took the first lift. A piano wire was stretched between the main walls, touching the columns, to enable the vertical movements to be recorded.

On excavating to put in the cement-concrete for the first column, the cracks in the base-stone, which were little more than visible on the surface, were found to be wide enough at the bottom of the stone to allow of the insertion of the fingers of the hand up to the palm. Wrought-iron straps were quickly fixed round the stones to prevent them opening further, and shoring was erected under the longitudinal girder of the first floor at the edge of the pit. A boxing of 1½-inch boards was made round the pit, to prevent the earth-filling from falling in while the concrete was being rammed. The concrete was allowed to set for 7 days before the shores for changing the columns were erected. When all was in place the wedges on the first and second floors were driven hard with a sledge-hammer. The jacks were then worked until a slight rise (1/32 to ⅛ inch) was observed on the wire. The iron folding-wedges under the A-frames were then driven hard. Stone-cutters with chisels then cut away 1 inch clearance under the column, which was thus left suspended by the bolts of its upper flange. The jacks were next slacked, when a drop of 3/32 inch to 3/16 inch* occurred. After a short pause to let the shores settle down to the weight, the rest of the base-stone was cleared.

The main cause of the failure was then discovered. The stone had been levelled by means of wooden wedges, which were left in place, and had been grouted with pozzuolana mortar. The grouting in some cases had not even touched the underside of the stone at the centre, and in all cases the bed was found to be hollow, so that the whole weight was supported on the wedges and an outer margin of about 6 inches in width where the mortar could be rammed under with a trowel. Consequently the stone had broken into four pieces. There was not much evidence of what might strictly be called crushing, and the dip of the stone in breaking and settling into the hollow gave the appearance which was attributed to faulty dressing, and accounted likewise for the flanges of the column becoming cracked.

The old base-stone having been cleared, the old column was removed, and, in order to provide clearance for getting in the new stone and column, the top course of the rubble masonry under the stone (about 6 inches in depth) was demolished. The new Trieste stone base was then slung into place, by means of a lewis and differential blocks, without being set, and was left about 6 inches below its ultimate level. The new

*These figures represent the maximum and minimum observations taken on the thirteen columns.

column was then slung and bolted up permanently into its place. A wrought-iron plate, 1 inch thick and planed on its upper face, was laid between the stone and the base of the column. The stone base was next raised on wooden wedges so as to leave only 3/8 inch to 1/2 inch clear below the column. After the stone had been levelled, a grouting basin in brick masonry in cement was built round it, at a little distance from it, the walls being 8 inches higher than the bottom of the stone. Neat cement grout was introduced under the centre of the stone by means of a 2-inch pipe. The grout was under a head of 4 feet or 5 feet. In this manner the space under the centre of the stone ought to be as well filled as any part. By having a head on the grout a flow was established from the centre to the outside of the stone, which carried with it the air and cement scum. The basin was filled up by this means, thus throwing 8 inches head on the grout, which allowed the water in excess to rise to the surface. The horizontal portion of the pipe was not withdrawn.

Thin steel wedges were used to force the wrought-iron plate against the base-flange of the column, and the 3/8-inch space under the plate was grouted with neat cement under about 4 inches head. After setting for 7 days, the wedges under the stone, as well as the steel wedges, were withdrawn, and the shoring was removed. The drop on removing the shoring varied between nothing and 3/32 inch. The greatest collective drop on any column, adding all the movements together, was less than 1/4 inch, the mean drop of the thirteen columns being 5/32 inch and the least drop 3/32 inch.

NOTES.

In setting cut stone work in England lime mortar only is used. Cement is never used for that purpose, as it stains the stone.

Flatted work will sometimes require a coat of size before gilded work is put upon it, as at times there is a little suction. This would draw the size and cause imperfect gilding.

The City Engineer of Winnipeg has submitted an estimate to the city council for the construction of a railway connecting Winnipeg with the city quarries, at a cost of $138,425.

The report of the building inspector shows that in proportion to size, Westmount's activity in the building line has been more marked than that of Montreal.

The assets of the Holywood Paint Company, of Hamilton, have been purchased by the McLennan Paint Company, Limited, of Buffalo, who will continue the business.

Instead of the iron fireproof curtains generally used in French theatres, one made of sheet aluminium has been adopted for the opera house at Besancon. It is one-fifth the weight of an iron curtain of equal dimensions.

Dr. J. M. Woodbury, commissioner of street cleaning in New York, proposes to manufacture paper bricks from the dry city rubbish, of which 90 per cent. is waste paper. These bricks are intended for fuel and Mr. Woodbury estimates that private consumers could purchase them for 4 cents a cubic yard.

A meeting of the Executive Committee of the National Master Painters' Association of the United States and Canada, was held in Toronto in the early part of last month, to consider arrangements and outline the programme for the annual convention, which will meet in Toronto next February. A very interesting meeting with a large attendance is looked for.

A machine for splitting laths for plaster work has been introduced in Great Britain. It is said to turn out in a day as many laths as would in the ordinary course be produced by 20 skilled men. The advantage of split as against sawn laths is said to be that they are tougher (following the grain) and have a rougher surface, so that plaster adheres more firmly.

The launching of new cement manufacturing companies in Canada goes merrily on. Hardly a month passes without witnessing the granting of charters to new companies in this line. In every case, if we may believe the statements of the promoters, there is going to be millions in it for the stockholders, but our opinion is that if the manufacturing capacity continues to increase at anything like the ratio witnessed during the last two years, there will soon cease to be a fair profit in the business for anybody. Admitting that the demand for cement has increased at a truly wonderful rate, it is nevertheless being outstripped by the growth in manufacturing capacity.

The master and journeymen carpenters of Halifax agreed to submit their differences as to scale of wages, to a board of arbitrators composed of the County Judge, the President of Dalhousie College and a representative of the Trades and Labor Council. The arbitrators have concluded that 25 cents an hour be paid to first-class workmen only, the men to be entitled to the new scale of wages from the first of June. The decision as to who are first-class workmen is to rest with the foremen of the several firms who, it is agreed, shall not be members of any union. The day shall be nine hours, and all who cannot rate as first-class men are to receive the old rate of 12 cents per hour. The dicision has been accepted by all parties concerned.

Nothing probably has exasperated the average architect more often or more thoroughly than the average mill company's book of stock designs of doors, mouldings, balusters, railing, newels, etc. Just why it is necessary to turn out such abominations, when it would not cost them a cent more to produce something along correct lines, artistically speaking, is one of the unsolved problems of the day. Did they but realize that these things all have their legitimate effect upon the public taste, especially those who seldom rub up against architects, possibly they would revise their books and get out something equally pleasing to the critical taste of the architect and the untutored ideas of their customers, who must certainly be easily pleased, judging by the stuff they continue to buy and use.

In answer to a correspondent the Painters' Magazine says it depends to a great extent on the composition of the plaster as to whether a new or "hot" wall can safely be painted. We have seen walls that were painted in less than two weeks after being finished, and yet with only two coats of lead, zinc and oil paint they did not spot or streak in the least. A wall that we do not know anything about is always safest to paint after a year or so, but as people will not wait, it is best to take the precaution of giving a coat of strong vinegar direct to the plaster. Let this stand two days, then prime with pure lead and raw linseed oil, adding a trifle of japan. Over this, when dry and hard, give a coat of glue size, which will save at least one, probably two coats of paint and will prevent spotting or discoloration.

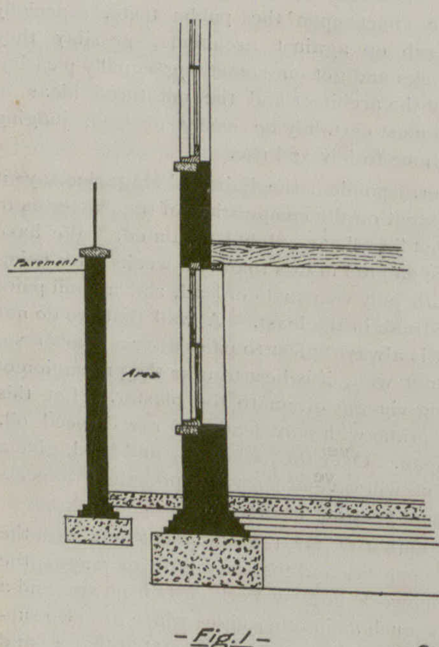
The Iron Age is authority for the statement that, with the same number of hours per day and the same rate of wages, the erection of steel framework in New York costs from two and a half to three times as much as in other cities which are also supposed to be cities of high building costs. It is stated that a hand riveter who could easily average 250 to 300 rivets a day contents himself in that city with 80. In other cities, on straight work, a good man finishes up 80 an hour. The pneumatic riveter, which has proved such an annihilator of time in other cities, finds something different in the air of New York, and strikes a slow gait. The same tool in the hands of a man elsewhere will drive 1,500 to 2,000 rivets in a day, and only 250 to 300 in New York. The claim is, in fact, made that structural erection in New York costs $15 to $18 per ton, against $6.50 to $8 per ton in other large cities. This is a "condition and not a theory," and must be faced alike by employers and by the men themselves.

Tensile tests of wrought iron bars, showing the effect of overstraining followed by intervals of rest, were made at the Watertown Arsenal upon four kinds of wrought iron: Common Refined, Best Puddled, Burden's Best and Norway. One test on each kind was made in the ordinary manner. With the other specimens an overstraining load was applied, ranging from 25,000 to 45,000 pounds per square inch, followed by an interval of no load, after which the loading was resumed until rupture was reached. The gain in the elastic limit produced by the overstraining loads was well shown throughout the series, and ranged from 2,000 to 6,000 pounds per square inch. It was also apparently shown, although these effects are not so well marked, that the greater the magnitude of the overstraining load and the longer the interval of rest between the two loadings, the greater was the gain in the elastic limit. No effect of the overstraining load upon the contraction of area was apparent.—Engineering Record.

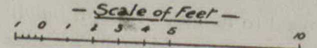
NATURAL LIGHT TO BASEMENTS.

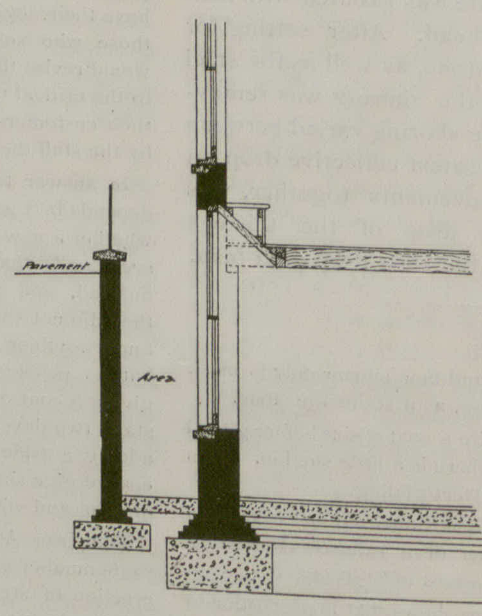
An inexpensive means of providing additional light to a basement room is given in the sketches accompanying this article by B. Wand, reprinted from the Builders' Journal. Fig. 1 shows a basement room abutting upon an area and looking out upon a dead wall. The ceiling-line of this room is practcially level with the pavement, and in the figure the window is kept to its full height—at a height which would, as a matter of fact, necessitate the threading of a short length or rolled steel joist, or some other contrivance, through those ends of the floor joists which run above the window openings.

In Fig. 2 is shown precisely the same room, area and wall, but with the window carried well above pavement-level, and giving the room a very considerable increase of natural light. The floor-joists are trimmed at the window openings just as they would be for a fireplace, the trimmed space being filled in with pieces of 3in. by 2in. or other light stuff to carry the lathing and plaster or matchlining with which the soffit is to be covered. Fig. 3 shows (a) the trimmed space with filling-peices

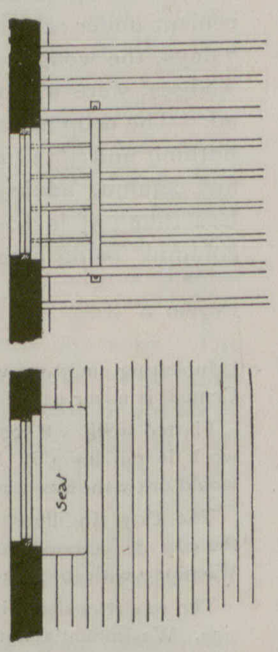


— Fig. 1 —





— Fig. 2 —



— Fig. 3 —

and (b) the floor when laid. The objection to this mode of dealing with a floor has been that small bulkheads are formed over those portions of the floor beneath which come the basement windows; and this is met in my plan by the provision of window seats, which in their turn entirely cover the bulkheads. It may still be objected that these window seats would in themselves be unsightly; but when I say that I have seen them just as described in one of the finest block of flats in London—Albert Court, Knightsbridge —I think that that contention also is met. As a matter of fact, neatly panelled, and finished to match the other work in the room, they form quaintly attractive features, which the tenants contrive to render still more attractive by rugs, cushions and general " drapery."

In the plan I have shown the trimming is applied to a floor with wooden joists running from front to back of the building; but with joists thrown across, or with concrete or any other kind of floor, the idea is just as easy of adoption. In the case of shop property the bulkheads might not be objected to, or, if they were, countering or show-casing might take the place of the window seats. Where an area is covered with pavement lights the same idea is practicable so long as the lights are on private ground and no objection is made by the local authority to their being raised to a level with the added height of the windows. They could then be thrown back at an angle from window head to pavement level, or built square out from the head with a return to pavement level, the prisms being arranged to throw the light right back into the room; and, either way, a considerable increase of light would be obtained.

SANITARY CHARACTERISTICS OF MADE GROUND.

Architects and house owners should be interested in learning the results of an investigation recently conducted by Dr. W. G. Savage and Mr. J. H. Sugden, bacteriologists for the Corporation of Cardiff, Wales, to determine to what extent made ground should be regarded as a menace to the health of the occupants of houses built thereon, and how far local authorities are justified in passing by-laws prohibiting the use of such ground as building sites. The following deductions are made based on a long and careful examination :—"The refuse as deposited contains a very large number of organisms, many of which are in the main different from those met with in ordinary soil. These made-soil organisms, as they may be called for convenience of reference, rapidly diminish in number under the conditions under which they are placed. This diminution goes on for the first two or three years. After two or three years, however, the ordinary soil organisms begin to invade this material, and apparently thrive abundantly in the rich organic material available to them. This causes a marked increase in the total number of organisms present in the soil, and the total number remains large, until in quite old soils a diminution is again met with. These soils begin to lose their special bacterial content after two or three years, and from that time begin to take on the characters of ordinary soil."

NOTES.

One of the features of the modern house that makes or unmakes its finished elegance is the plumbing and all care and attention given to that branch of the house will prove profitable. So rapid have been the strides toward betterment in plumbing fixtures during the last few years that not everyone is familiar with the high grade sanitary appliances which are sold to-day. The James Morrison Brass Manufacturing Company, Limited, of Toronto, have for years been the designers of many of the improved appliances used by plumbers and their line of equipment for every purpose to-day represents the highest attainment in manufacture. Anyone who is interested in modern plumbing would find the catalogue of the Morrison Company of interest and value.

—THE—

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Registrar - - W. R. Gregg, 94 King St., Toronto.

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Lawrence Munro - - - - - - Hamilton
John Gemmell - - - - - - - Toronto
Henry Simpson - - - - - - - „
J. W. Siddall - - - - - - - „

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

OFFICERS FOR 1903.

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1st Vice-President - - - J. P. Ouellet, Quebec.
2nd Vice-President - - - J. S. Archibald, Montreal.
Secretary - - - - Prof. S. H. Capper, Montreal.
Treasurer - - - - - A. H. Lapierre, Montreal.

COUNCIL.

Jos. Venne - - - - - - - Montreal.
H. Stavely - - - - - - - Quebec.
A. Raza - - - - - - - - Montreal.
D. R. Brown - - - - - - - Montreal.
J. W. Carmichael - - - - - Montreal.
J. E. Vanier - - - - - - - Montreal.

Auditors—L. A. Amos and Jos. Sawyer.

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R. G. Kirby, 1st Vice-President.
John Hoidge, 2nd Vice-President.
David Williams, Treasurer.
Messrs. Clay and Holmes, Auditors.
John Scott.

Messrs. Nelson, Weller, Crang, Martin, Smallwood, Logan.

John M. Gander, Representative on Technical School Board.
James B. Thomson, Representative on Exhibition Board.

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John Nutkins, 1st Vice-President.
John Whittaker, 2nd Vice-President.
Geo. S. Gould, Secretary-Treasurer.

Wm. Tytler.
Thos. Jones.
Ed. Martyn.
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VANCOUVER BUILDERS' EXCHANGE.

BOARD OF DIRECTORS

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A. E. Carter, Secretary.
H. A. Bell, Treasurer.
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C. P. Shindler
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MASON BUILDERS' EXCHANGE.

BOARD OF DIRECTORS:

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W. F. Lee, 2nd Vice-President.
Edward Cass, Treasurer
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J. Malcom.
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A. T. Davidson, Secretary.
William Alsip.
Angus Brown.

MONTREAL BUILDERS' EXCHANGE.

BOARD OF DIRECTORS:

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C. W. Hughes, Vice-President.
G. J. Shepard, Secretary-Treasurer.
John Wighton.
H. R. Ives.
James Paton.
N. T. Gagnon.
Joseph Lamarche

CHAMBRE SYNDICATE DE LA CONSTRUCTION.

(French Builders' Exchange.)

83 St. James Street, Montreal.

BOARD OF DIRECTORS.

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G. Menard, 1st Vice-President.
T. Charpentier, Jr., 2nd Vice-President.
Alcide Chausse, Treasurer.
N. T. Gagnon, Secretary.
Felix Sauragean.
L. Z. Mathieu.
H. Contant.
E. Z. Cote
Louis Payette.

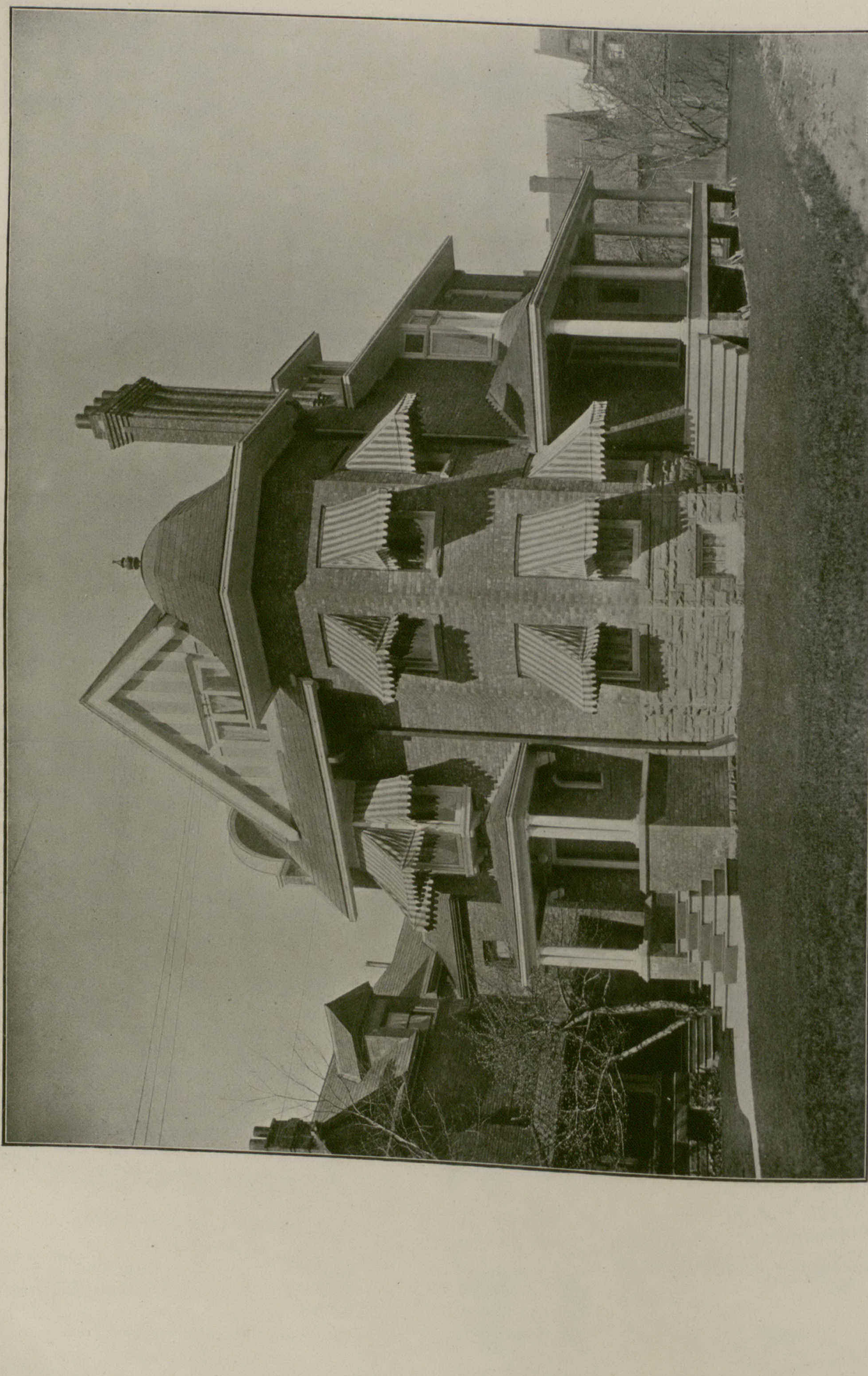
VICTORIA BUILDERS' EXCHANGE, VICTORIA, B. C.

BOARD OF DIRECTORS:

W. D. McKillican - - Chairman
E. W. Whittington - - Secretary
Thos. Catterall - - - Treasurer

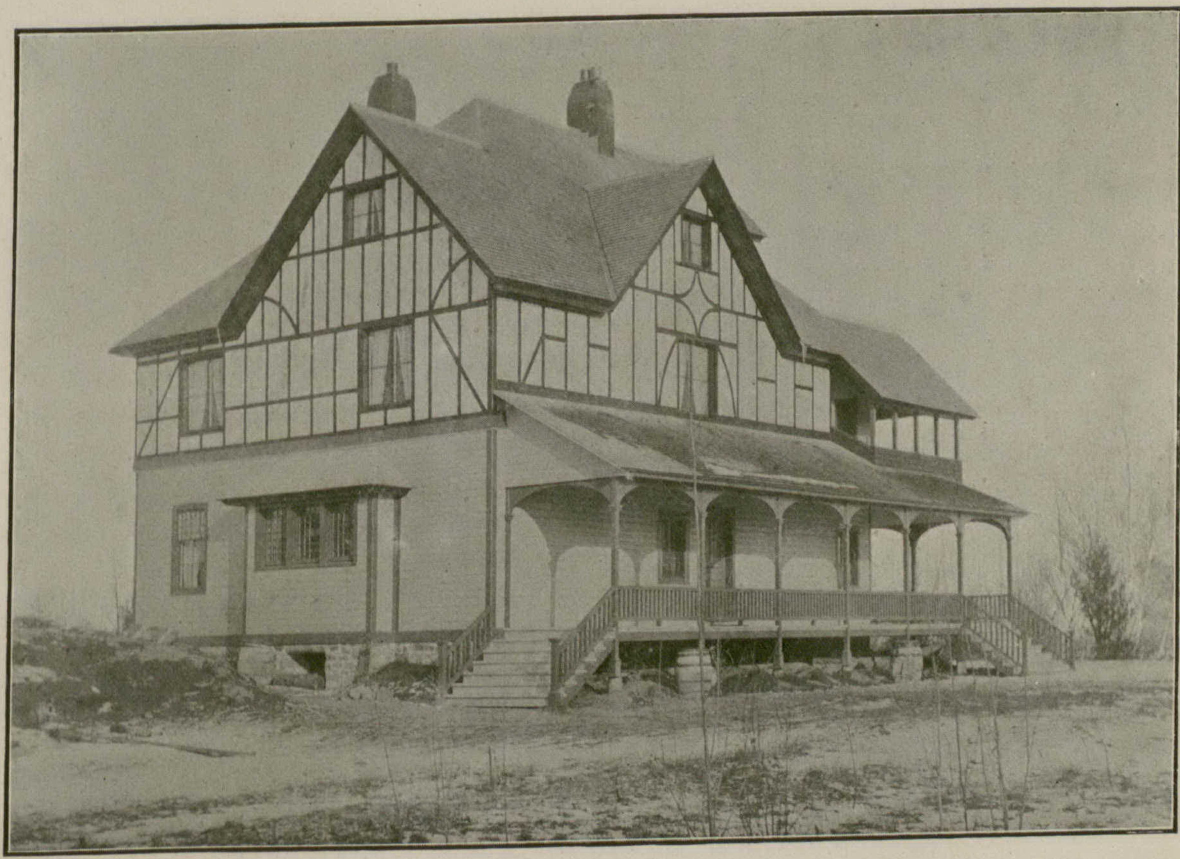
NOTES.

The demand for hand-molded brick is increasing in the East. The machine-made brick now sells at from $6 to $7 per thousand while the hand-molded brick readily bring $10 a thousand. Many brick yards are adding to their hand-molding facilities. It is contended that machine-made brick chip easily at the corners and disintegrate more readily under the action of fire when used for furnaces and boiler linings than the hand-molded product.—Brick.



DESIGN FOR HOUSE AT COLLINGWOOD, ONT.
J. W. SIDDALL, ARCHITECT.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903

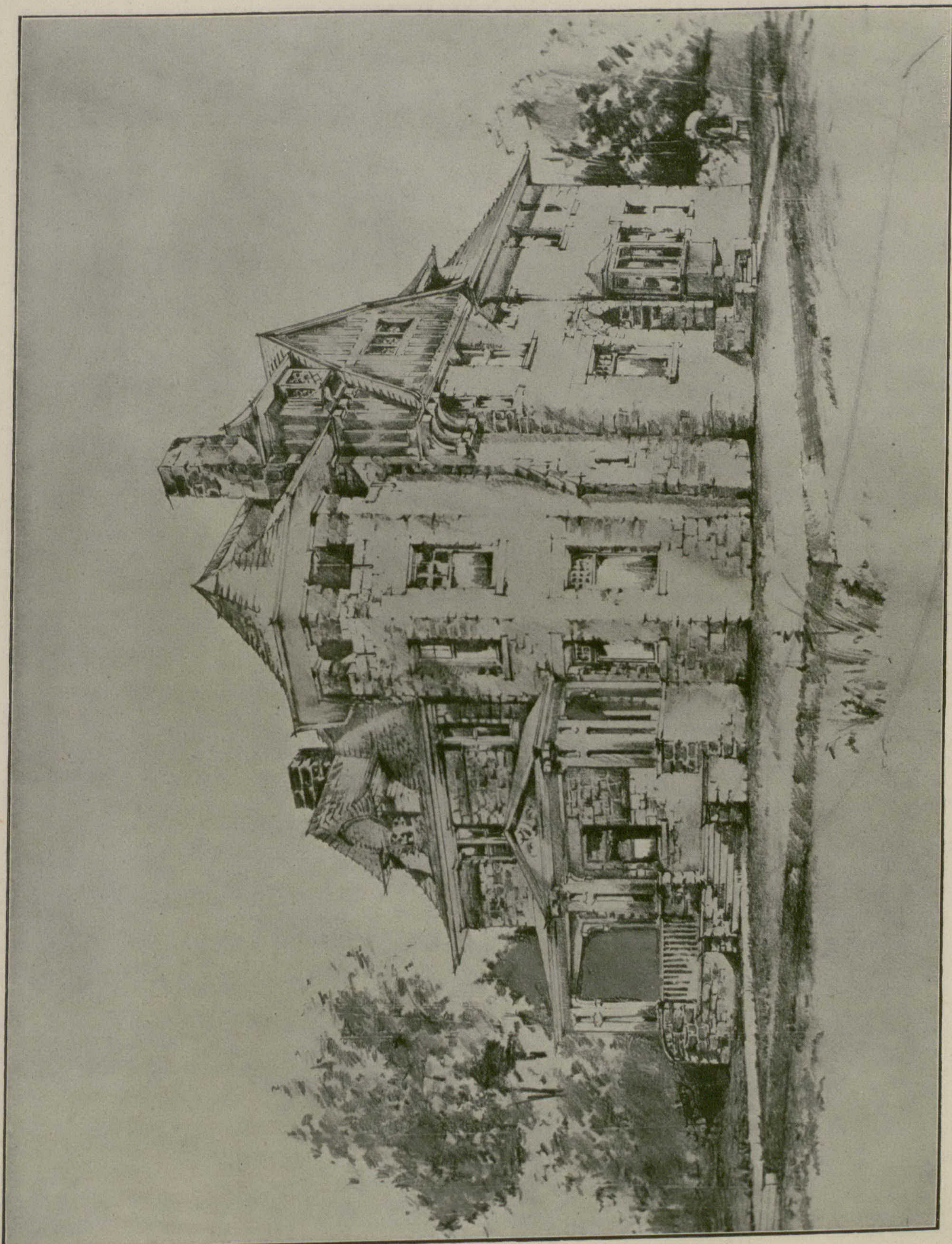


STUDIO RESIDENCE FOR J. C. PINKEY, HUDSON HEIGHTS, QUE.
W. H. WATTS, ARCHITECT.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903

HOUSES IN MAITLAND PLACE, TORONTO.
J. W. SIDDALL, ARCHITECT.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903

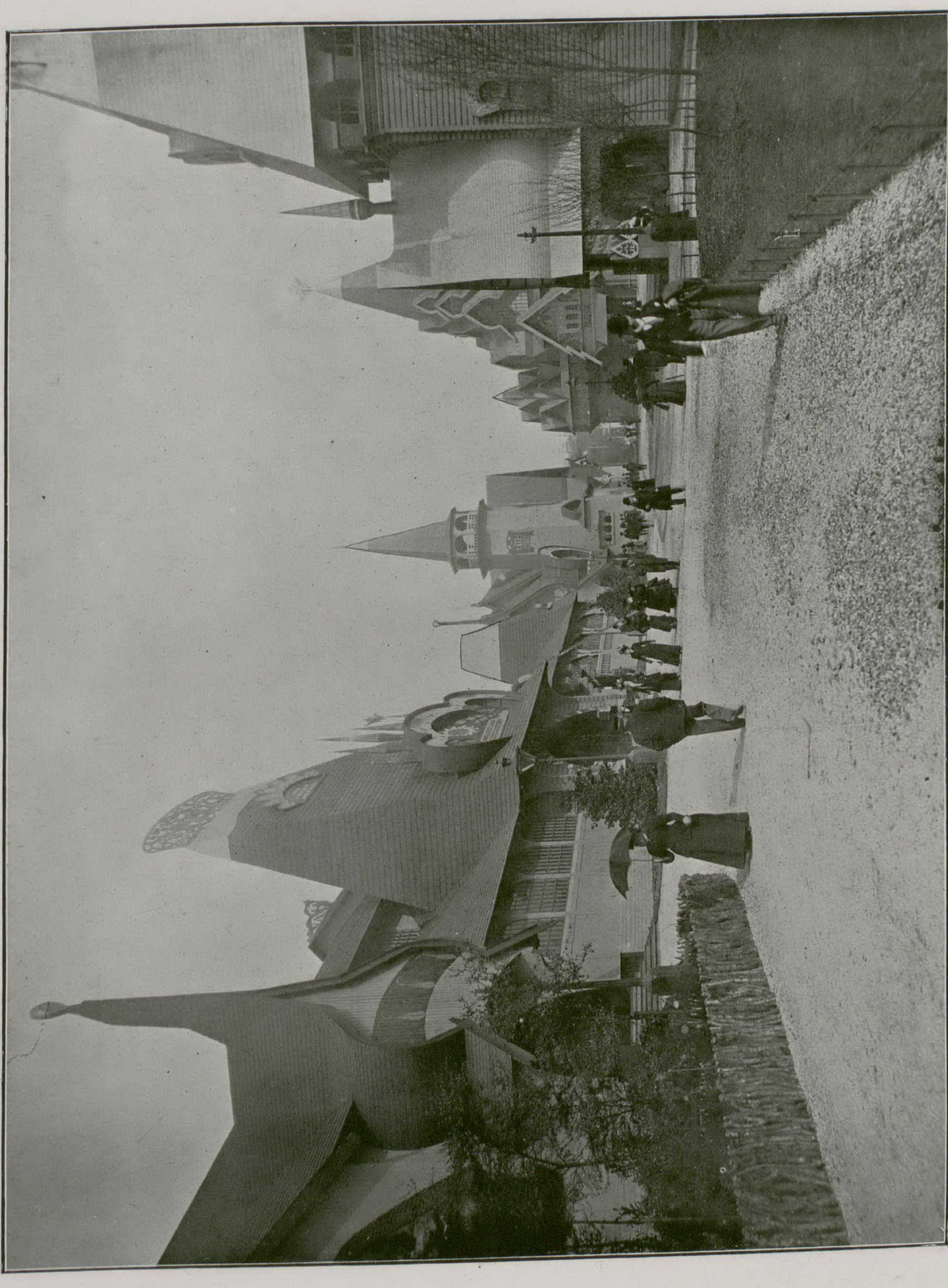


HOUSE IN JAMIESON AVENUE, TORONTO.
J. W. SIDDALL, ARCHITECT.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903

New Retable Embroidered Dossal, Wings, Altar and Altar Frontal, Rochester Cathedral Lady Chapel
A. H. Skipworth, Architect.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903



Buildings in Russian Section, Glasgow Exhibition.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
AUGUST, 1903

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