PAGES

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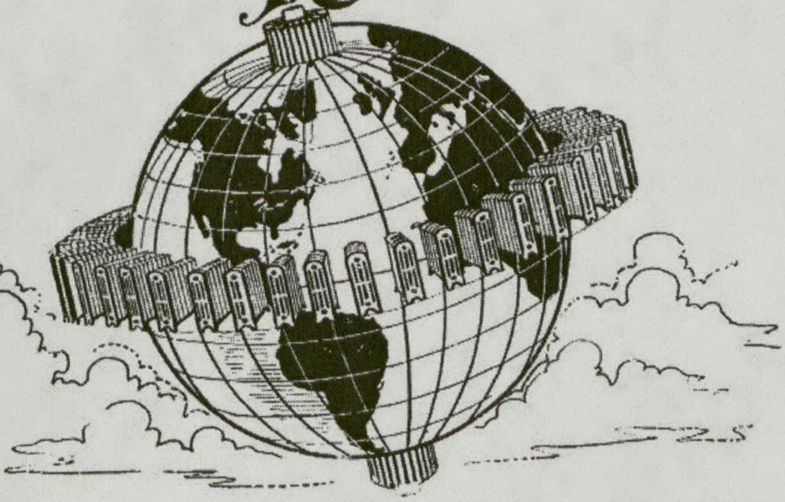

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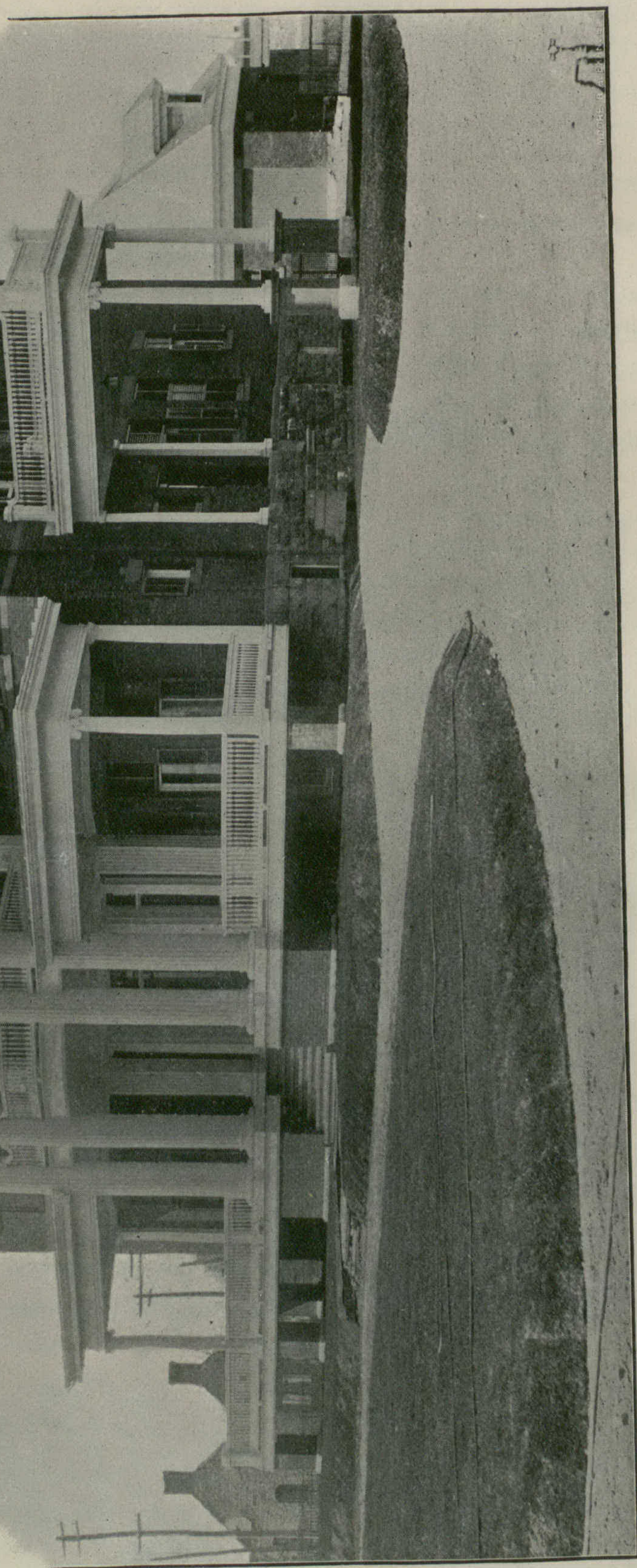
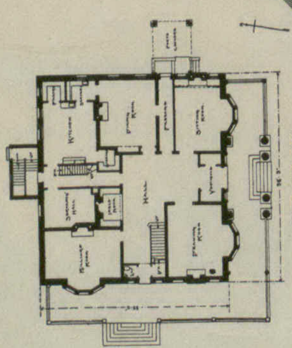


"STANDISH HALL," RESIDENCE OF MR. E. B. EDDY, HULL, QUE.

MESSRS. BAND, BURRITT & MEREDITH, ARCHITECTS.



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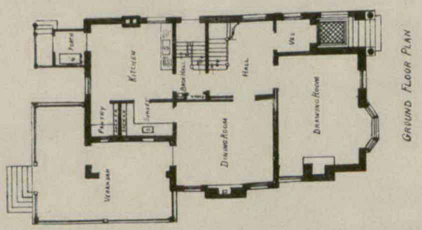
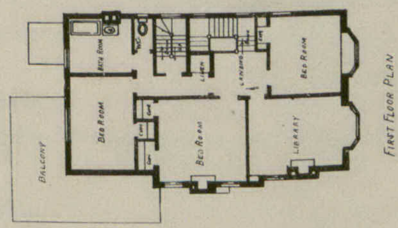
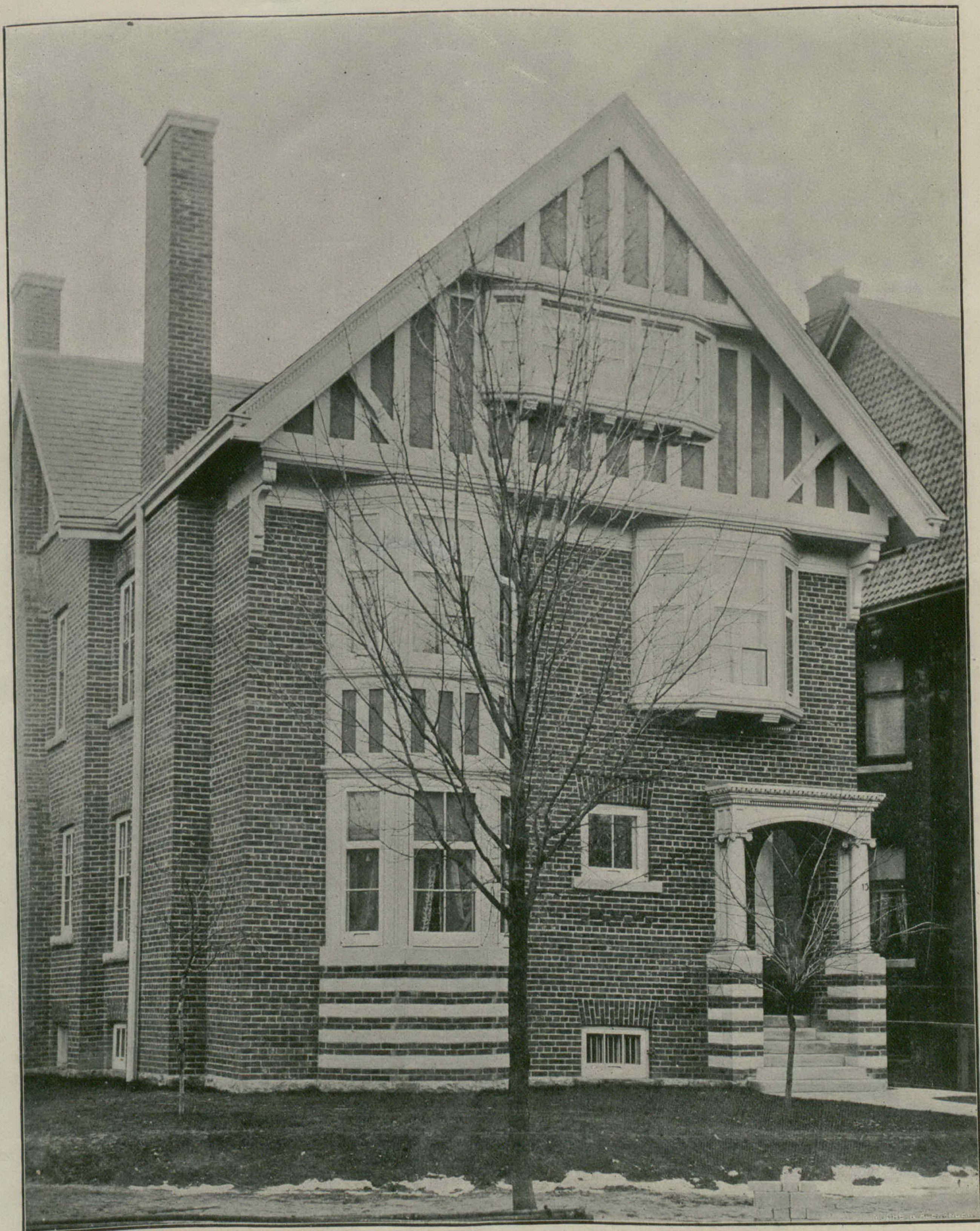
SEPTEMBER, 1901







RESIDENCE OF MR. W. P. GUNDY, 13 MAPLE AVENUE, TORONTO.

MR. F. S. BAKER, F.R.I.B.A., ARCHITECT.

SUPPLEMENT TO
CANADIAN ARCHITECT AND BUILDER
SEPTEMBER, 1901

The Canadian Architect and Builder

VOL. XIV.—NO. 165. SEPTEMBER, 1901.

ILLUSTRATIONS ON SHEET.

"Standish Hall, Residence of Mr. E. B. Eddy, Hull, Que.—Messrs. Band, Burritt & Meredith, Architects.
Residence No. 13, Maple Avenue, Toronto.—Mr. F. S. Baker, F. R. I. B. A., Architect.

ILLUSTRATIONS IN TEXT.

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Two Photogravure Plates.—Fine Art Galleries, Glasgow.

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SPECIAL CONTRIBUTORS.

PROF. S. H. CAPPER, R.C.A., Department of Architecture, McGill University, Montreal.
MR. W. A. LANGTON, Architect, Toronto.
" EDMUND BURKE, " "
" S. H. TOWNSEND, " "
" FREDERICK G. TODD, Landscape Architect, Montreal.
" R. A. L. GRAY, Electrical Engineer, Toronto.
" W. H. ELLIOTT, of Messrs. Elliott & Son Co., Toronto.
" J. C. B. HORWOOD, Architect, Toronto.
" A. F. DUNLOP, R.C.A., Architect, Montreal.

A Commendable Idea. The women's patriotic organization known as the Daughters of the Empire is to be commended for its wisdom in deciding to erect a permanent memorial of the approaching visit of the Duke of York. It was at first proposed to erect a temporary floral arch, but wiser councils prevailed, and the intention now is to construct a permanent gateway at the Bloor street entrance to Queen's Park. This gateway will consist of stone pillars in combination with wrought iron work of suitable design. This method of procedure is preferable to that of the manufacturers who are expending a considerable sum on a temporary structure which will disappear immediately after the royal visit.

Effect of Prices of Materials on Building. ENQUIRY among architects goes to show that while the present building season has been an active one and on the whole satisfactory, many projects have been abandoned temporarily at least on account of the high price of lumber and some other materials which enter largely into construction work. Persons who contemplate building frequently forget that the present is a period of high prices for all other materials as well as those employed in building. It is scarcely possible to purchase an article of any description to-day as cheaply as five years ago. Why then expect to get buildings put up as cheaply now as then? The advance in prices is due to a strengthened demand, or in other words to increased prosperity. Vastly more money is being made by all classes this year than five years ago, hence the purchasing power is increased. Most persons contemplating the erection of buildings can well afford to pay say 20 per cent. more for their structures than would have sufficed for their erection in the times of depression. In many localities land values have gone up to an extent sufficient to offset the extra cost of building. So far as lumber, the staple building material, is concerned, the supply is rapidly decreasing every year, and higher prices must therefore be expected to rule for the future. No doubt when landowners shall have become thoroughly seized of the above mentioned facts, they will see the unwisdom of pursuing a policy of delay in the carrying out of their projects.

The Toronto Industrial Exhibition. Notwithstanding the counter attraction offered by the Pan-American Exhibition, the number of exhibits at the Toronto Industrial Exhibition was as numerous as in former years. In live stock the exhibits were considerably greater, and the stable accommodation proved inadequate. The conclusion seems justified that the success achieved this year under adverse circumstances, might be greatly amplified if the Main Building and several of the other important ones, were replaecd by modern structures designed to fulfil in a more perfect manner the requirements of exhibitors. That there is need for reform in the management is shown by the fact that after the opening of the Exhibition this year the root of the Main Building leaked like a sieve. In consequence many of the exhibits were seriously damaged. The management should have known that the roof was defective, and the necessary repairs should have been made before the Exhibition opened. It would be unwise, however, to spend any considerable sum for repairs as the building is no longer capable of fulfilling the requirements. The support that has been given the Exhibition in spite of its many defects, is a guarantee that if properly managed it will develop into an enterprise of vastly greater importance in the future. There were to be seen this year a number of exhibits from the United States in addition to those of Canada, a proof that the value of the Exhibition as a means of advertising is becoming more widely recognized. The presence of these foreign exhibits side by side with those of our own country, affords opportunity to make comparison between the quality of home and foreign productions. As a rule the result is a higher appreciation of the home article.

An Important Decision.

On the 22nd of July the House of Lords gave an important decision in the case of the Amalgamated Society of Railway Servants vs. The Taff Vale Railway Company, namely, that a Trade Union registered under the Trade Unions Act can be sued in its registered name, and the funds of the Union made available for payment of costs and damages where injuries have been inflicted by its authority. The action was based upon illegal acts, namely, watching and besetting, committed by authority and direction of the executive officers of the Union in connection with the strike of employees on the Taff Vale Railway. This judgment of the House of Lords is in reversal of the judgment of the Court of Appeal which held that the language of the statutes was not sufficient to warrant trade unions being sued for damages. The first decision was rendered by Mr. Justice Farwell, whose judgment has now been confirmed by the highest tribunal, and who in giving judgment said : "The contention of the defendant society implies that the Legislature has authorized the creation of numerous bodies of men capable of owning great wealth and of acting by agents with absolutely no responsibility for the wrongs they may do to other people by the use of that wealth and the employment of those agents." Lord Macnaghten in his judgment said : "I have no doubt whatever that a trade union, whether registered or unregistered, may be sued in a representative action if the persons selected as defendants be persons who from their position may be taken fairly to represent the body." It therefore appears that a registered Union may be sued in its registered name, and an unregistered Union through its proper officers. That the accumulated funds of the Unions can now be legally reached by persons and corporations who may have suffered damage by interference with their employees, will have a wholesome effect in keeping the agitators from continuing the methods of interference and persecution which have so frequently been practised in the past because they were exempt from legal process.

THE DEVELOPMENT OF MUSKOKA—AND A PRECAUTION.

The erection of the Royal Muskoka Hotel has brought luxury to Muskoka at last, and has probably broken ground for a new order of things. Hitherto Muskoka has been the poor man's paradise ; there he could live in a hotel with board partitions between the rooms ; sleep on a clanging spring bed, which substitutes sagging for softness ; and eat food in which he could feel the modified enjoyment which comes from the conviction that it will be cheap. The new hotel is of a different kind. It is a well planned structure ; spacious and, in a simple way, elegant ; and aims at that degree of comfort which is indicated by the presence of the colored waiter. It is said that other hotels of the same sort are intended to be erected. We may therefore look for a change in the character of Muskoka. As surely as bad coin drives out the good so surely does the introduction of luxury strike at the existence of simplicity. We may look for improved buildings as a first symptom ; a demand for wooden buildings with some design about them. This is an interesting class of work which returns better results for the amount expended than any other sort of building, if it is carried out with due appreciation of the merits of the material. We may however, look for the usual outbreak in the direction of imitation. Whether it takes the direction of castles and baronial halls, or a romance of humility and imitation log cabins, there are examples to start from, and even text books for the rapid worker. We can only look on helpless, and to some extent hopeless awaiting these developments in design. But there ought to be no doubt about the question of sanitation. The Muskoka Club ought to embrace, as a matter of necessity, all dwellers in the Muskoka Lakes ; and should establish a rule, based upon the best science it can command, fixing a standard method of drainage from which there may be no departure. The foundation of life in Muskoka is the purity of the water ; and this is assailed by the introduction of the sort of luxury that boasts, as this new hotel does, of its water service and drainage. It is popular to speak of Muskoka as a sort of Venice in the future ; but there is this essential difference between the islands of Venice and the islands of Muskoka that in the former case there is an eighteen inch tide which twice a day sweeps all the city refuse out to sea, and though the process is not always complete and there are complaints about the smells of Venice, makes the place on the whole clean and sanitary. With the land-locked lakes of Muskoka, though they are deep, the case would be otherwise. Nearly every island is occupied now, and many points. Hotels are on the increase, and the exactions of competition soon require all hotels to be on a "modern" basis as regards drainage. Many cottages will without doubt follow suit, and the case will then be dangerous. The new hotel claims consideration on account of its "septic tank," through which all wastes must pass before they are delivered to the water—and perhaps this is sufficient. But it is impossible to feel the same delight in the purity of water into which the wastes of a populous hotel have been poured, no matter how scientific the sound of the process to which they have been exposed. Moreover, if the process is one which requires attention—knowing the unresting energy of nature and the laziness of man, we doubt.

It is not so much a question of the present case, where we may assume good management, as of the inferior class of hotel, upon which a system of drainage will be forced by the necessity of competition. Above all, when it comes to be a question of the insufficient labour (and often the volunteer labour) of a summer cottage, there is no certainty about the operation of anything that requires care. The only safety is in a rule absolute, that no drainage of any kind shall enter the water. The land is the place for drainage. The thousands of Israel lived in safety in their encampments, under the simple rule that every man should ease himself at a place without the camp, and take a paddle with him, to dig there and cover that which had come from him. The method of subsoil irrigation, to which this may be compared, should be adopted where there is a sufficient surface of turf near by, as there is at the new hotel, and as there is likely to be near any good hotel site; but Muskoka consists for the most part of an irregular rocky surface and the only method possible in ordinary cases will be simply to deliver the drainage over the surface. This method also has been put to proof by a nation. China, densely inhabited in parts, supports a people, with the strongest constitutions in the world, under a system of disposal of wastes upon the surface of the fields that is said to make it impossible for an Englishman to take a walk across the country, because of the filth which sticks to his trousers. The Chinese method is not commendable otherwise than as evidence that the surface of the earth is a safe place for the disposal of sewage products; or rather we should call them wastes, for they are not degraded to the quality of sewerage until they have been in a sewer. It is extremely probable that under any other system the land of China would not support its population and the yellow terror would have been upon us long ago. The land of Muskoka will not support its population now; but that even these rocks are capable of improvement is evidenced by the fact that earthworms (once undiscoverable in Muskoka) are to be found, fine and large, near the privies of the old Muskoka cottages. These old receptables are not models for the future by any means and, for a hotel are certainly impossible. The stuff must be conveyed by water to a suitable place and spread over the land; just as the saw-millers, when they were forbidden to throw their saw-dust into the water, pumped it up to the conduits, which carried it inland to convenient places. There is in the interior of most islands an unvisited area. If not it would be necessary to make such an area and prepare it for use. If there is a fall from the site of the house to this spot, the problem is easy; if not there must be an arrangement for pumping at intervals. For this purpose the windmill—which, with a tank, will be an indispensable adjunct for water service—could be utilized. There is no reason to suppose difficulty about contrivances, if the system is made compulsory; and, though this may be difficult, it ought not to be impossible, because it is necessary.

These remarks are suggested as applicable to Muskoka chiefly on account of the progress in that particular region which the establishment of the hotel indicates; but the situation tends to become the same in any of our small lakes which have become devoted to the uses of the summer cottager; and in all of these places consideration for the future, in the matter of drainage, becomes necessary as the population grows thick.

Acetylene Gas. Here is a convenience which is making its way for use in both summer cottages and permanent country houses. It costs less than fifty dollars to install both piping and apparatus for an ordinary house, and the running cost is said to be about the same as that of coal oil. At this rate it has the advantage that experiment does not involve a paralyzing expense, and we may feel at liberty to suggest its application to country work, without having any knowledge from experience of the quality of the light. It seems to be a pleasant and steady light and has the advantage that, as the flame is very small, it does not easily flicker in the air. The light is therefore well adapted for out of doors use, for verandahs and to light paths and boat landings. There are many contrivances for the generation of the gas. The contact of water and calcium carbide is all that is necessary, and the aim of the best contrivances seems to be to generate gas only as it is needed. The release of pressure by turning a tap brings in some cases water to the carbide, in others carbide to the water, just in proportion as it is needed; that is to say in proportion to the release of pressure, or to the taps turned on. This facility of application in quantities as needed seems to tend not only to economy but to safety. There is a residuum of slaked lime which requires to be drawn off two or three times a week; an accumulation of a few buckets which may perhaps be made useful.

INSURANCE RATES IN RELATION TO RISK.

The Maritime Board of Trade is an organization which represents the local boards of trade in the principal towns of New Brunswick and Nova Scotia, and is an exceedingly enterprising body. The board meets once a year and discusses a variety of questions affecting the commercial interests of the maritime provinces. At the seventh annual convention held in Chatham, N. B., on August 21st and 22nd last, a number of important subjects were considered. Among these was the question of fire insurance rates. This was taken up in view of the reported intention of the insurance companies to increase the rates. The testimony of the representatives who spoke on the question went to show that the insurance rate was not governed as largely as it should be by the character of the risk. One speaker remarked that twenty years ago before the advent of electric lights and fire extinguishing appliances, when stores were lighted by oil lamps and stove-pipes were everywhere, the insurance rates were 100 per cent lower than they are to-day. It was stated that in Charlottetown the promise was made that the rates would be reduced as soon as a good water works system was installed, but that this promise had not been fulfilled, on the contrary the rate had been increased. It was said that with the exception of a few large conflagrations, the fire loss in the maritime provinces had been considerably less than in other parts of the Dominion, and the opinion was expressed that the people of these provinces were being called upon to pay for losses elsewhere. A resolution was adopted protesting against any increase in the rates, and declaring that in the event of an increase being imposed, a united effort be made to induce American and other companies to accept the business. It was also resolved that the insurance companies be requested to separate the maritime provinces in their insurance calculations from the rest of the Canadian business.

MEASURING ROUND TIMBER.

The usual practice, in measuring round tapering timber, is to take the girth of each piece at the middle of its length. A quarter of the girth is then squared in inches, and multiplied by the number of feet run in the log, the resulting figures being divided by 14, which gives the answer in cubic feet. A tape measure, known as girthing tape, is often used by timber measurers. It is 12 ft. long, marked with ordinary inches along one side, and also with feet reduced with scale—1 in. = 1 ft.—showing the cubical contents of 1 ft. on the back of the tape behind each figure.

BY THE WAY.

The firm hold that electric lighting has obtained on public favor is exemplified by the fact that in a number of the new dwellings now being built in Rosedale and other choice residential districts of Toronto, no gas piping for lighting purposes is being put in. A single gas pipe entering from the rear suffices to give the supply required for cooking purposes.

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THE main building at the Toronto Exhibition which must shortly be replaced by a more modern structure, has had quite an interesting history. It was originally built in 1852 on King Street West on a site which is now included in the asylum farm. On the occasion of the visit of the Prince of Wales in 1860, a grand ball was given in his honor in this building. In 1878 it was taken down and rebuilt on its present site, another storey being added.

× × ×

A good story is told by an English trade journal of a master builder, who, having heard that the men did not start work at the proper time, thought he would drop down about half-past six one morning and see. Going up the yard he caught sight of a joiner standing smoking, with his kit not even opened. Simply asking his name, which he found to be Malcolm Campbell, he called him into the office, and handing him four days' pay, ordered him to leave at once. After seeing the man clear of the yard, he went up to the foreman and explained that he had made an example of Malcolm Campbell by paying him off for not starting at the proper hour. "Great Scot, sir!" ejaculated the foreman, "that chap was only lookin' for a job."

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IN 72 days the elevator in the tower of the new municipal buildings in Toronto, carried 39,833 persons to the top of the tower to see the great clock and obtain a bird's eye view of the city. As the elevator will accommodate but twelve persons, more than three thousand trips were required, and at times the corridors were lined with a crowd of people waiting their turn to make the ascent. No doubt there were thousands of visitors to the building who did not visit the tower. It will thus be seen what a point of attraction the new city buildings have already become to strangers visiting the city, of whom the number steadily increases each year. It is desirable that the building on the erection of which so much money has been expended, should be made increasingly interesting as time goes on by the addition of mural decorations, paintings and sculpture.

INDUCEMENTS TO FIRE PROOF CONSTRUCTION.

A correspondent sends the following extract from the New York Insurance Exchange Schedule, relating to fire-proof buildings :—

"EXCEPTIONAL CONSTRUCTION.—For fire-proof floor surfaces of cement, concrete or asphalt, deduct 5 per cent. If floors inclined for carrying off water with scuppers, deduct 2 per cent. Fire-proof woodwork, trim, etc., deduct 5 per cent."

"If the same reduction was made in Canada as the above," says this correspondent, "it would induce people building to take advantage of the insurance reduction and use fire-proof materials."

THE PROTECTION OF BUILDINGS FROM LIGHTNING.

A paper on this subject recently read by Mr. Alfred Hands, before the London Architectural Association, concludes as follows:—

As to the methods for rendering our system of protection perfect. We must first of all decide on which are the parts of the building liable to be struck by lightning, and protect them either by separate conductors or by branch conductors carried to one or more mains to earth as may be necessary, and we must see that these conductors afford as little resistance as possible. The joints must be soldered so that they will not only be perfect at the time they are put up, but will remain perfect. The earth connections must also be made so that this path is at least as good a one as other paths about the building; and besides this we must carefully study our building, both inside and out. We must take into consideration all the metals used in its construction, both as regards their relation to the conductor system and to one another, and take such precautions that neither division of the discharge shall occur unless we intend it to occur, nor sparking in places where sparking would do harm. It is here that the skill and experience of the expert have to be displayed, and I cannot give you any rules for your guidance on this matter, for buildings differ so much in their construction and arrangement that rules appliable to one case would be absolutely useless for another. Nothing is of use but knowledge and experience, and, as I have already indicated, these cannot be imparted or acquired in a short space of time. I can only say that in some cases connections are made and in others the dangerous metals are avoided, but that great discrimination is required as to what metals are connected and what avoided. Sometimes dividing the discharge between several paths or over a wide extent is the best plan, and sometimes other plans are adopted according to the exigencies of the case or the particular combination of dangers which one may find to exist.

I may, in conclusion, discuss a matter which is of great importance to architects, and that is as to what parts of a building are liable to be struck, and which, therefore, require protection. I have devoted many years to this question, and have examined many thousands of buildings which have been struck, first, with the object of formulating a theory, and afterwards to prove that theory; and I propose putting this before you as briefly as possible. The main principles are simple, and possibly it is the very simplicity of the matter which has led to its being overlooked. The popular idea is that it is the highest point of a building which is struck, but probably some of you may have met with cases in which others very much lower down have been damaged. I have come across hundreds such. The explanation is that the nearest part of the building to what I may call the point in the cloud from which the discharge originates gets struck, and the highest is not necessarily the nearest. A discharge occurs between two planes or points, one of which is in the clouds and the other is in the ground; the building is merely an object en route, as one might say, which forms a path of less resistance than the surrounding air. Now, a lightning-conductor does not attract lightning except as, being of metal, induction and consequent difference of potential takes place more strongly in it than in the surronnding non-conducting materials, and in this respect the thin line which is intended to protect the building from lightning is insignificant compared to the other metals used in its construction.

Brickwork, although non-conducting to a certain extent, offers a lower resistance than air. Therefore it would be contrary to science for a discharge to pass over a chimney-stack or gable-end to strike a lightning conductor merely because it is metal, when probably the gable-end or chimney has a much larger extent of metal just below it. Even if the lightning-conductor affords the best path to earth, the path of least resistance would be through the gable-end or chimney and the house to the conductor, rather than through a corresponding distance of air, to get to the top of the conductor. We have to consider two kinds of discharge, one the most dangerous type, which occurs fairly straight through the air in an almost vertical line, and the less dangerous flashes which occur in a somewhat oblique line, and are generally meandering in their course. These latter flashes are often called forked lightning, though this is a misnomer, and are popularly, but mistakenly, supposed to be the most dangerous. It is the straighter flashes which do the most harm ; those which are capable of breaking almost straight through the air without having to go out of their course to take advantage of any little conducting matter, such as moisture, which will assist them on the way. The meandering flashes are not by any means to be ignored ; it is only in comparison with the straighter ones that they are mild.

In arranging what parts of a building require protection, we have to consider the various points in the sky from which the discharge may originate, and so arrange our system that the conductor, or one of its branches, will form the nearest part, no matter from what direction the discharge may come. There is, of course, a limit, to the angle of obliquity, and this limit should be about 40 degs., and my observations have led me to infer that the greater the angle of obliquity the milder the discharge. We hear reports sometimes of buildings having been struck by lightning in absolutely unaccountable places, such as lightning missing a tall spire and striking the nave close underneath it, or even striking through a window. Like all other so-called vagaries, freaks, or perversity of lightniug, such peculiarities do not exist except in the minds of people who do not understand the matter. Lightning is a force of nature, and, like all other natural forces, is governed and regulated by laws more unchangeable than those of the Medes and Persians ; therefore, if we find cases which do not quite agree with our preconceived ideas, we must admit that we either do not know the law, or that we have overlooked some important factor of the case, and not put it down to a sudden and capricious change in the laws of nature.

In arranging as to which parts to protect, we can consider this question as to which would be the nearest part, and we can take it that these are parts which might be struck ; other parts higher than these may be absolutely safe if they come well within a line drawn from one to the other, provided other circumstances are equal ; but they may not be, for metals either inside or outside the building, and other circumstances, may complicate the question so far that this rule does not entirely apply. Notwithstanding all the difficulties h at I have pointed out, absolute protection is possible if the building is thoroughly studied. We can either protect it so that we can say not a brick or stone shall be disturbed, or we may say we will protect it so that the inmates shall be safe and the building shall not be set on fire or damaged to any extent—we may say that a stone finial at this end may be knocked down, or a few bricks or tiles disturbed there, and that we will risk that, as we do not consider this damage worth providing against ; but if we do this we must realize that we are running the risk, and if the stone finial is thrown down, or the bricks or tiles displaced, we must consider that we deliberately took the risk, and that it is not a failure of our system of protection.

In conclusion, I can only advise you not to make the general error of providing your conductors of exceptionally large size under the mistaken idea that by providing your conducting path of exceptional capacity, as it is wrongly called, you can ignore the scientific aspect of the question, for no increase in size of the conductor will compensate for this.

ST. PAUL'S CATHEDRAL IN DANGER.

As the result of rumors which have lately been in circulation regarding the stability of St. Paul's Cathedral, Mr. Somers Clarke, the architect to the Dean and Chapter, has addressed a communication to the Times, giving the results of his observations and examinations of the building. He states that owing to the expense involved, the foundations of the cathedral were not carried down to the bed of hard clay, 40 feet below the ground surface, but were spread out as much as possible and made to rest on a layer of "pot earth" over a bed of sand and shingle above the clay. The numerous tunnels which have since been made for sewers and underground railways, have caused uneven settlement of the foundations, dislocation of the arches of nave, choir and transept, and subsidence of the west front with its heavy towers and bells. The outer wall of southern transept, which is between 8 and 10 feet thick, and has an outer face of Portland stone with a lining of Oxfordshire stone, is out of perpendicular, and in consequence of the strain it has opened from east to west. The north side of the cathedral is, however, perfectly solid. Upwards of one hundred years ago the building was strengthened by the insertion of iron ties and the dome encircled by great iron chains. It is now proposed to insert iron ties in the transept walls. Another method proposed by Mr. Charles Reilly, is to carry the piers down to the sub-stratum of blue clay. The cost of underpinning is estimated at £220,000. This architect recently strengthened the Stock Exchange by underpinning to a depth of 50 feet the isolated stone piers which support the building, each of which weighs 300 tons. This was accomplished without cracking the plastering in the interior of the building.

NOTE.

As a result of the recent decision of the English House of Lords, holding the funds of labor unions liable for damage caused by the official action of the unions, the Taffvale Railroad Company has begun suit against the Amalgamated Society of Railway Servants for one hundred thousand dollars damages, incurred by the unlawful action of the Society during the strike of last year. The Blackburn branch of the Weavers', Winders' and Warpers' Association has also been served with papers in connection with a strike in a factory. The Trades-Union Congress has appointed a committee to endeavor to find some legal means of protecting the funds of unions from attack.

BUILDING MATERIALS AND CLAY PRODUCTS.

The report of the Ontario Bureau of Mines for 1901, gives the aggregate value of the building materials produced during the year 1900, including under this term stone, lime, common brick, pressed brick and terra cotta, as $2,689,351, compared with $2,621,282 in 1899, an increase of $67,069. An error crept into the statistics of building stone and rubble for 1899 by which the value of the product was given as $1,041,350 instead of $667,532. The comparative table for the last two years is as follows :

	1899.	1900.
Building stone, rubble, etc.	$ 667,532	$ 650,342
Lime	535,000	544,000
Common brick	1,313,750	1,379,590
Pressed brick and terra cotta	105,000	114,419
Totals	$2,621,282	$2,688,351

Judging from these figures says the report the building trade remained in a fairly active condition. Part of the increase is due to a rise in prices, the average cost of lime per bushel in 1900 being 13.9 cents as againt 12.3 cents 1899, and common brick being valued at 5.73 per thousand as against $5.61 in 1899. The output of other clay products for the two years compares as follows : drain tile, paving brick and sewer pipe showing a falling off which is more than made up by an increase in pottery.

	1899.	1900.
Drain tile	$ 240,246	$ 209,738
Paving brick	42,550	26,950
Sewer pipe	138,356	130,635
Pottery	101,000	157,449
Total	$ 522,152	$ 524,772

The manufacture of cement continues to expand, the total production of 1900 being much larger than in any previous year. The increase is wholly in Portland cement, the natural rock variety being smaller in output and value than in 1899. The raw materials for an excellent quality of Portland cement—marl and clay—being so abundant in Ontario and the demand for pavement and constuction purposes being so great and constant, there is every likelihood that the production will continue to increase. The number of cement works reporting to the Bureau last year was nine, of which four made natural or rock cement and five Portland cement. In addition to the factories now in operation, one or two others will place their product on the market during 1901. The detailed statistics for 1900 are as follows :

Kind of Cement.	Number of works.	Number of workmen.	Wages for labor.	Product bbls.	Value of product.
			$		$
Natural rock	4	90	32,760	125,428	99,994
Portland	5	485	166,143	306,726	598,021
Totals	9	575	198,903	432,154	698,015

There was an increase in the total quantity of cement produced in 1900 as compared with 1899 of 70,117 barrels and in value of product of $136,749. The average price at which the cement was reported to the Bureau was 79 cents per barrel for natural rock and $1.95 for Portland, as against 84 cents and $2.00 per barrel respectively in 1899. That the home market is not by any means wholly supplied by the product of Ontario works is proven by the fact that during the fiscal year ending June 30, 1900, the imports of cement into Canada amounted to 1,312,170 cwt. as follows:

	Value.
From Great Britain	$ 249,280
" United States	55,569
" Belgium	156,213
" Germany	59,331
" other countries	200
Total	$ 520,593

The duty paid on the importations was $151,075.06.

It is worthy of note that a marked change took place during the year in the proportion of cement imported from the several countries of origin. In the 12 months ending 30 June, 1899, the imports were :

	Value.
From Great Britain	$ 125,778
" United States	52,878
" Belgium	232,434
" Germany	73,135
" other countries	146
Total	$ 484,371

It will be seen that the imports of Belgian and German cement which had risen from $79,370 and $15,603 respectively in 1896 received a decided check, while those from Great Britain were almost doubled, and constituted even a larger proportion than in 1896 when they were $123,436 worth out of a total importation of $252,882. The preferential tariff, whatever may be its operation with respect to other articles, certainly seems to be effective with cement.

While the above statistics show that the importations of German aad Belgian cements into Canada have largely decreased, and in like proportion those from Great Britain have increased. British statistics show that the product of continental factories, principally Belgian, is going into the British market at the rate of 270,000 tons per year, which is equal to ten per cent. of the production of the British factories. So that the gain that Great Britain is making in the Canadian market is being offset by the loss of home trade. The statement is made that the Belgian cement which is finding its way into the British market is not being sold at a loss, but owing to the excellent equipment and labor saving methods employed in factories where it is produced, it is bringing to the manufacturers a fair margin of profit. British manufacturers are in consequence being urged to modernize their works, thereby reducing the cost of production, and placing themselves in position to compete with the foreign material. Within the last five years the manufacture of Portland cement in the United States has been greatly extended and perfected, and the product of the mills across the border is this year being placed on the Canadian market in large quantities. Several new Canadian factories are ready to begin operations and others are projected, so that in the near future the capacity of the home mills will more nearly approach the requirements of this market. There is need for caution on the part of those who are thinking of engaging in the business, to see that the manufacturing capacity does not run in advance of demand. This has already happened in the United States, hence the eyes of manufacturers there are being turned to Canada and other foreign markets.

With a view of securing better sanitary regulations in municipalities where waterwork and sewerage systems exist, a resolution was passed by Dominion Trades and Labor Congress that the Executive of the Congress urge the Legislative Assemblies of the Provinces to amend the health act so as to compel such municipalities to appoint a competent plumbing inspector.

INTERCOMMUNICATION.

[Communications sent to this department must be addressed to the editor with the name and address of the sender attached not necessarily for publication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but w ll, nevertheless, endeavor to secure correct replies to queries sent in. We do not guarantee answers to all queries, neither do we undertake to answer questons in the issue following their appearance.]

From R. P. :—Wants to know of the most economical method of making a good box frame for a window that is to go into a baloon building?

Ans. :—There are so many ways of making box frames that it is difficult to tell which way is the better one. The one shown at Fig. 1 is easily made and is economical both in material and labor.

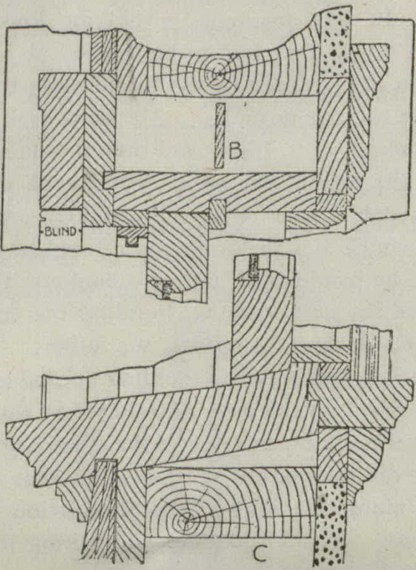


FIG. 1—BOX FRAME FOR BALLOON BUILDING.

Section B shows the box, the stud being utilized for the back. The whole can be put together quite readily. At C a section of the sill and inside stool and apron are shown. This combination is quite simple, and the diagrams can be readily understood.

From H. R. :—Do you know of any method of building cement tanks so that they will not burst with frost, even if not protected with covering from weather.

Ans. :—A cement tank, square or round, for holding water may easily be built, but the walls should be strengthened by the insertion of expanded metal bars at proper intervals. Without proper provision is made for frost expansion, the tank will surely burst if the water in it is permitted to freeze. One way to prevent fracture of tank, is to have a six or eight inch galvanized iron pipe to stand in center of tank, the pipe to be empty and dropped in the tank during frosty weather. When the water solidifies with the frost, the pipe will be crushed by the pressure of expansion, being weaker than the walls and will thus relieve the walls from the extra pressure. In a large tank, it will be better to have two or three smaller pipes, and place them around the edge of the tank; they will then take up the expansion. Tanks may also be protected by throwing in them when nearly full, a few pieces of white pine scantlings. These pieces of wood, being soft, are gripped by the ice as it makes, and are crushed in enough to take up the expansion. The walls of the tank, of course, must be strong enough to resist the pressure of the pine blocks. The insertion of pine blocks in rain-water barrels to prevent them bursting from the effects of frost, is an old trick, and has been practiced from time immemorial by thrifty housewives.

From W. T. :—The rules given for the areas of window surface differ widely, but recognized authorities give the following: Area of window surface, $= \sqrt{\text{cubic contents of rooms}}$, breadth of window $= 1/8$ (breadth + height) of room, height of window, two to two and a half times the breadth. One foot super of window space to every 100 cubic feet of room, or 125 cubic feet in dwelling houses, to 50 or 55 cubic feet in hospitals. The window sill should be 18 inches to 36 inches above the floor, but the average height should be 30 inches. The head of the window should be as high as possible to obtain the best results.

From P. P. K. :—The way to cube up a house for an approximate cost, is to multiply the length by the breadth, and by the height from the bottom of the footings to half way up the slope of the roof. Take for example a house having a frontage of 35 feet, depth 30 ft., average foundation 3'-6", from top of foundation to plates 21 feet, both ends being gabled, then we have $35 \times 30 \times 29.5 = 30,975$ = cubic contents of house. If the house is an ordinary frame one, we may place the cost at 8 cents per foot; if of brick or stone, the cost per cubic foot, may be from 14 to 25 cents, according to the finish and quantity of materials.

From J. N. :—Asks for a good cement to fill in cracks of a floor before staining or painting it.

Ans.—If the cracks are wide and gaping, the best thing to do is to fill them in with narrow strips of wood glued in, and when dry, dress off with a plane. If the cracks are small they may be filled in with a coat of Wheeler's wood filler, which will harden when it dries, and get a good surface on it. If the cracks are too wide for wood filler, and not wide enough for wood strips, then soak old newspapers, or other pulp-wood paper in a weak solution of hot glue, work this up until it is in the form of a paste, then fill the cracks with it and let set. When thoroughly dry scrape off the surplus paper, and a good job will be obtained.

From R. P. : I would very much like to know how to frame and finish a corner of a square bay window, in a balloon building, in an economical and substantial manner.

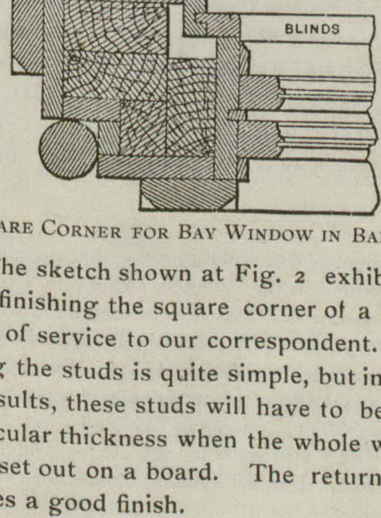


FIG. 2—SQUARE CORNER FOR BAY WINDOW IN BALLOON FRAME.

Ans. : The sketch shown at Fig. 2 exhibits a good method of finishing the square corner of a bay window and may be of service to our correspondent. The manner of adjusting the studs is quite simple, but in order to get the best results, these studs will have to be dressed to some particular thickness when the whole work may be accurately set out on a board. The return head in the angle makes a good finish.

From Young Bricklayer : How can I find out the number of bricks required to build a wall of given dimensions, the thickness of wall being 4½ x 8 x 14, or 18 inches in thickness ?

Ans. : Here is a good opportunity for some of our expert readers to answer an oft-asked question. As the rule for ascertaining the number of bricks in a wall, varies in different localities, we will take it as a favor if readers will consider this question, and send answer to this query, so that we may see what different methods there are in the country for ascertaining the number of bricks required to build a wall of given dimensions of any thickness.

From J. P. : I would like to know how to lay out a hole in a sloping roof so that a round stove-pipe or other cylindrical column would fit the opening ?

Ans. : An opening of this kind would, as a matter of course, be an ellipse, and the matter of laying out, may be performed in several ways. We give one, which will be a guide for all the others. We will suppose a 6 in. pipe is to pierce a roof having a pitch of two thirds. A line from 12 to 16 on the steel square represents the pitch. Now, with 12 as a centre, Fig. 3, and with radius equal to one-half the diameter of the

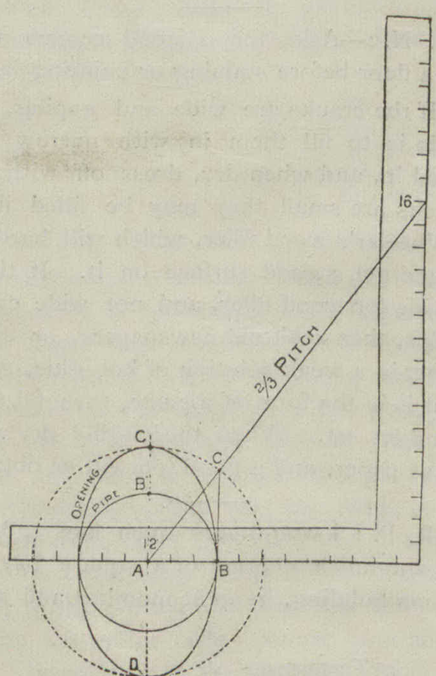


Fig 3.—Metxod of Obtaining Opening in Roof for Stove-Pipe.

pipe, draw a circle and square up from the tongue to the pitch as shown at BC. Then AB represents one half the short diameter and AC one half of the long diameter. To make the illustration more clear, transfer these lengths as shown in the diagram, and the length of the opening is shown at CD, while the width, of course remains 6 inches in the centre. This is a very simple way of determining the shape of the opening.

A correspondent of The Builder writes that building stones are not well represented in the Glasgow Exhibition, except in so far as Ireland is concerned. This is to be wondered at seeing that the stone industry is one of the principal industries in Scotland. The numerous excellent sandstones found in Dumfries, near Edinburgh, and near Glasgow, are practically unrepresented. Scotch granites are in evidence on one or two stalls, but the best exhibit of them, includes also some foreign stones, which seem to be rather out of place. English building stones are conspicuous by their absence.

THE PRACTICE OF STACK BUILDING AND BOILER SETTING.

By John G. Dunn (Instructor in Building Construction).

There are three requisites to a chimney : (1) Efficient draught ; (2) stability ; and (3) a satisfactory architectural appearance on elevation.

We shall consider chiefly the stability. It is not always easy to retain the perpendicular in these great shafts. One of the chief causes for their going off the plumb is insufficient foundation, or starting to build without ascertaining the nature of the underlying rock stratum, and so causing unequal settlement ; with having one-half of the foundation on a compressible soil and the other on an incompressible, or less compressible, soil. In one instance within my knowledge a stack about 80 ft. high had to be erected at a colliery, and, without even examining the foundation, the builder started with regular footings. All went well until the stack was about 50 ft. high, and then it was noticed to be leaving the plumb, becoming worse each day. The contractor, who was also the builder, wanted to stop and rebuild, but the company offered to pay for all damages if he would still try to complete the stack. He accepted the risk, and was building the stack hanging on one side and battering the other. The stack was completed and only the tackling needed to be taken down, but when on the next morning they went to clear everything the stack was lying in the adjoining field. On examining the foundation it was found that at a good depth and along one edge of the foundation there was a large drain. While the stack was taking its bearings this side settled more than the other.

In another instance of a stack leaving the perpendicular, the concrete foundation was put in as usual, excepting one part. This was filled in with bricks and mortar (in the absence of inspection) because the cement was finished. Owing to unequal settlement the stack left the plumb when 110 ft. high. The soil was of a very sandy nature.

Still another cause of stacks leaving the plumb is the prevalence of the wind in one direction while the stack is in course of erection, or perhaps a fierce gale which arises before the work has actually set, even though the actual building is completed. Another cause is the cutting of port holes at the bottom after the stack has taken its bearings. I have known this to be done without the consequent results being considered at all. Still another cause of stacks leaving the perpendicular is allowing courses of brick to pitch or be built off the level.

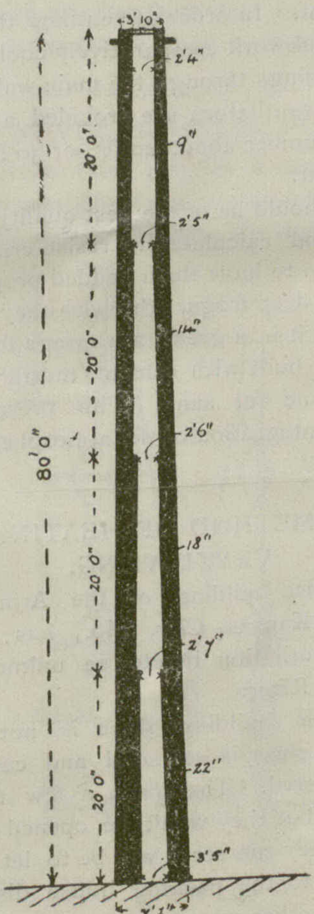
There are many ways of bringing stacks, church spires, etc., back to the plumb, the most common (and in my opinion the best) being to saw the horizontal joints on the round and bulging side, thus bringing back the weight ; or some of the bricks may be cut out and pinned up again (a very dangerous operation). Too much care cannot be given to the foundations. The same rules apply to these as to other buildings, except that the nature of the foundation should be considered for a greater depth, owing to the very great weight concentrated on a small area. A stack in a mining district should be as far as convenient from the pit shaft in order to avoid the vibrations caused by the winding engines. Even though the foundation is of the best character, I would advocate the use of an artificial conglomerate such as Portland cement-concrete to

*Abstract of a paper read before the Glasgow and West of Scotland Technical College Architectural Craftsmen's Society.

ensure against crushing at any one point, and also to give a proper level bearing to the stack (rock strata often lie at an angle to the surface level). Much has been and may be, said about the width of concrete foundations for any given stack. This should always be determined after the nature of the foundation has been ascertained, but a foundation of concrete is not too wide provided it does not exceed the body of the concrete—that is do not have concrete so wide that, considering its thickness, it will fracture round the line of crush.

A grillage of steel beams on iron tiers may be bedded in the concrete foundation to add to the tensile strength, especially in treacherous soil. The pressure on a concrete foundation should not exceed 22 cwts. per sq. ft. If the angle of 60 degs. beyond the face of the wall is exceeded the concrete must be thickened accordingly.

This crushing is greatly remedied by footings, which are of the greatest importance. They also act (especially in isolated structures standing on small bases) against the danger of the work being forced out of the



perpendicular by the wind. Footings should project at least the thickness of wall beyond the face of the work and be set off in regular offsets of $2\frac{1}{4}$ in. and not more than 3 in. to avoid fracture of the bricks. Let us take the case of a chimney stack 100 ft. high standing on a base 10 ft. square and exposed to heavy gales. The compression of the ground to leeward to the extent of 0.025 ft. would be sufficent to cause the top of the stack to overhang 6 in. If, however, we increase the base to 20 ft. square we not only double the leverage with which the foundation resists the force of the wind, but the bearing surface is quadrupled, so that the total resistance is eight times greater than in the first instance. It need scarcely be said that for footings to be efficient they must be securely bonded into the body of the work and be of sufficent strength to resist the violent cross-stress to which they are subjected. The lower the brick the greater the weight there is upon it, and the important matter to observe is that the back joints are as far from the face of the wall as possible. A good arrangement in foundations is to lace a few of the bottom courses together. Another rather special method is to introduce the inverted arch in the interior of the chimney. The plan of a circular shaft is like a kiln crown, that of a square one being ribbed. This is not a very common practice.

The thickness of the work in stacks needs also to be carefully considered. The common rule is to start from the top with 9 in. adding $4\frac{1}{2}$ in. every 20 or 25 ft. downwards, the width at the bottom being one-tenth the height for square stacks and one-twelfth for round ones. The common batter from bottom upwards is $\frac{1}{4}$ in. per ft. I have been concerned with many stacks battering 3-16 in. per ft., but prefer $\frac{1}{4}$ in. or 1 in. in a yard. I think the thickness of the work should never be less than 14 in. at the top, especially if the stack exceeds 80 ft. This gives a far stronger body of work to bond in a heavy or hanging head, and is not nearly so liable to get racked or rent up.

The amount of batter given to a stack chiefly concerns architectural taste, and although the engineer prefers a plain obelisk, he may secure this internally without affecting the draught to any perceptible extent and yet have a finely proportioned architectural column. A stack should not be ornamented at the expense of its stability, but it is preferable not to leave it entirely plain. This is one good reason for having 14 in. work at the top instead of 9 in.

Argument still persists as to whether a stack should diminish in sectional area inside, or whether it ought to be parallel (as wide at the top as at the bottom); or, again, whether a chimney should be even wider at the top than at the bottom. It does not fall under our consideration at present to determine what are the proper dimensions, especially as regards the internal area of a chimney-shaft, most suitable for a steam engine of any given horse-power or for burning a given quantity of coal per hour; bnt here is an example: The area of a chimney in inches for a low pressure steam engine when of more than 10 h.p. should be 112 times times the h.p. of the engine divided by the square root of the height of the chimney in feet.

Example: Required the area of a chimney for an engine of 50 h.p., the height of the chimney being 80ft.

$$\frac{112 \times 50}{\sqrt{80}} = \frac{5600}{9} = 622 \text{ sq. in. } (\sqrt{622} = 25\text{in.})\text{sq.}$$

$$622 \times 1{\cdot}27 = 78994 \; (\sqrt{78994}) \text{ 2ft. 8in. circular.}$$

This gives 2 ft. 1 in. for the side of a square stack and 2 ft. 4 in. for the diameter of a circular stack.

Adopting Tredgold's rule to Mr. Milne's data, it only requires the constant multiplier 112 to be substituted by 280 and the calculation in the above case will then be as follows:

$$\frac{50 \times 280}{\sqrt{80}} = \frac{14000}{9} = 1555 \text{ sq. in.} = 3\text{ft. } 3\tfrac{1}{2}\text{in.}$$

for a square stack.

This just shows how engineers differ, but it will be interesting to notice the following example taken from the common rule—that of only considering the height and having one-tenth the height for a square stack and one-twelfth for a circular one:—

An engineer requires a circular stack of 2 ft. 4 in. least diameter. We shall begin at the top with 2 ft, 4in. internal measurement and with 9 in. walls, adding 4½ in. every 20 ft. downwards.

ft.	in.	
2	4	internal diameter.
0	10	batter.
3	2	
0	9	brick additional.
2	5	diameter 20ft. down.
0	10	batter.
3	3	
0	9	brick additional.
2	6	diameter 40ft. down.
0	10	batter.
3	4	
0	9	brick additional.
2	7	diameter 60ft. down.
0	10	batter.
3	5	internal diameter at 80 ft. down.

Add thickness of walls to diameter, namely, 3 ft. 5 in. + 1 ft. 10 in. + 1 ft. 10 in. = 7 ft. 1 in.

As one engineer rightly puts it, a chimney (disregarding cost) is never too large or too powerful provided it has efficient means for checking the draught by properly fitting dampers, or otherwise, whereby the supply of steam can be readily controlled at any moment, so as to work the engine at half its full power and using considerably less than half the power of draught of the the chimney, thus having a surplus draught for emergencies. When the chimney is too small it is unable to create a sufficient draught through the furnace. A smoky flame is then produced, instead of a flame with little or no smoke. When the chimney is too small (as often happens) it becomes overworked, and undue pressure is brought to bear upon its sides, and this often leads to the chimney becoming cracked. Too much stress cannot be laid on the turning of the arches over the portholes at the bottom ; semicircular or deep segmental arches are the most satisfactory, the centres being lowered a little by means of wedges and then drawn together, so that they may take the ever-increasing weight before the actual setting of the mortar. It is best to have, say, a round chimney on a square base. This allows properly constructed arches to flues to be provided at the bottom ; otherwise you have circle on circle arches, which are not very satisfactory.

Much difference of opinion exists regarding the bond of chimneys. In the first place, I would say a round chimney is the best, as you never have so many bats or closers as in a square, octagonal or hexagonal stack. The bond varies as the sectional area of the stack decreases. This is a slight objection to octagonal and hexagonal and also square stacks (especially the first and second) especially if they are not circular inside. Although it is desirable to have as many headers as possible in the interior of a wall to resist direct crushing, yet in the case of chimneys it is possible to have too many headers. Chimney sides extend so short a distance that what is needed is a bond which will keep the sides from falling asunder. I have never yet known a case where the headers in a chimney were snapped and the work split for want of transverse bond ; whereas I have seen much cross-splitting due to very little more than want of longitudinal bond (or we may call it half bond). Circular brick should be used for the whole of a circular stack. Hoop iron (tarred) is a great help to a chimney bond. It is placed vertically either in a longitudinal joint one brick deep or between two courses deep, and at vertical intervals of 6 ft., 10 ft. and 20 ft. All stacks should be lined with firebrick from half-way or two-thirds up. Care should be taken to have an air-space between this lining and the outside brickwork. The lining, being independent, should have ties occasionally into the outer wall. Sometimes special firebrick blocks are used when the air-space exceeds 6 in., but where the space is only 2 in. or 4 in. the common headers can be used quite well at intervals of from 3 ft. to 6 ft. In small chimneys (60 ft. or 80 ft. high) the common practice is to line them with 4½ in. brickwork having a 2 in. to 4 in. cavity, but (and especially in large chimneys) I would advocate a 9 in. lining and a cavity of not less than 6 in. to 9 in. When the stack exceeds 150 ft. in. in height there should be a 14 in. firebrick lining at the bottom reducing 4½ in. every 50 ft. Of course gases enter some stacks at a higher temperature than in others. For instance, as a rule a higher temperature (10,000 to 15,000 degs. F.) is given off in a gasworks, necessitating the use of thicker lining. This lining should be bonded in with the main wall at its end so as not to affect the draught. In order to ventilate the cavity and so keep the brickwork comparatively cool, ventilators are fixed in openings through the main wall. As a rule four regulating ventilators are provided at the bottom and the same number about 20 ft. or 30 ft. up. This causes a draught.

The mortar should be of the best quality ; the bricks hard, durable and calculated to resist crushing, great care being taken to have them bedded properly, especially if they have deep frogs, otherwise they will crush at edges. I think it is a great advantage for the last 20 ft. or so to be built with cement mortar, using say, slaked shell lime for sand. This preserves the top against the disintegration of the atmosphere and stands heat well.

A NEW METHOD OF HEATING AND VENTILATING.

THE new office building of the Armour Packing Company, at Kansas City, Mo., has a system of heating and ventilation heretofore unknown west of the Mississippi River.

In the whole building there is not a movable window. The glass is set solid and can neither be raised nor lowered. There are a few transoms that can be moved, but they won't be opened often, for the only purpose they can serve will be to let in the odor which belongs to the packing house district. Fresh air comes in another way,

The temperature and atmosphere of the building are manufactured down stairs in the basement and will come to the office through open registers in each room. Two hvge chimneys, each 8 feet square, rise above the building so high that they will escape the greater part of the smoke that fills the atmosphere of the West bottoms. In the basement are fans run by electricity which draw the air down through these chimneys and long alleys at the bottom with a force that will take a man's hat off. The current is like the wind before a severe summer storm.

At the foot of the chimney the current turns and runs through a brick conduit that extends the length of the building. First it goes through a spraying room where a hundred sprays are throwing water in fine rain. The water is hot or cold according to the season.

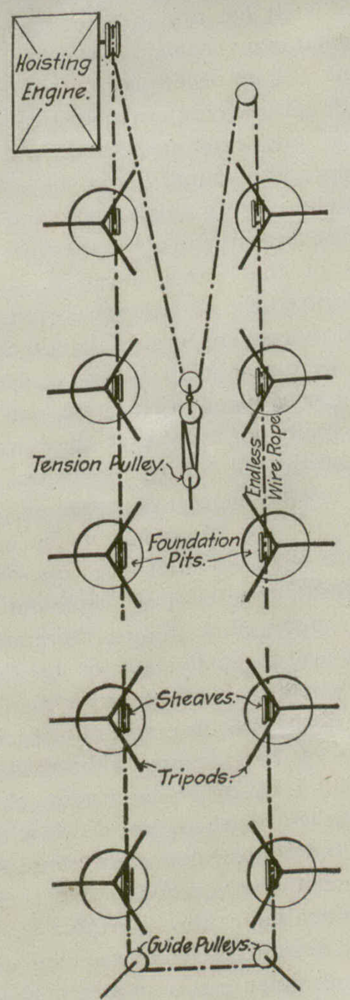
In hot weather it is cold and in cold weather it comes from the boilers. This water is expected to wash the air. It takes out of it particles of coal and dust that may be flying and precipitates these atoms. It literally washes the air and goes a long way toward purifying it besides, changing the atmosphere a few degrees, according to the season.

After passing the sprayers the air rushes through a series of spiral tubes which dry it, taking out the moisture that came from its recent washing. Then over the big electric fan it goes and past coils which heat or cool it as the conditions require. These coils are so well controlled by valves and connected with the hot air chambers and cold blast that it is possible for the air when it leaves them to have a uniform temperature the year round, no matter whether the temperature outside is 105 in the shade or 26 degrees below zero. There is an automatic thermometer connected with a device in compressed air that can hold the temperature exactly to order.

With the two machines running normally the air in the building will be changed every ten minutes. It will always be fresh air, free from dust or smoke particles and of the temperature that is most comfortable in season.

A NOVEL HOISTING PLANT.

A rope drive working a series of excavating buckets in foundation pits has been successfully used in preparing foundations for the new Marshall Field Building



in Chicago, and is thus described by the Engineering Record: The old building was torn down to the street level, the first floor being left temporarily for a working platform, below which rows of pits are being sunk through a stiff clay for the concrete piers of the new interior steel columns. There are eight pits, about 20 feet apart in rows separated by distances of 20 feet; the pits are being carried down nearly 100 feet to solid rock. The pits are lined with wooden staves 6 feet in length placed in position, after which interior steel hoops 7 feet in diameter are put in place, this being accomplished as workmen excavate the pit with picks and shovels. A hole is cut in the working platform over each pit and over the hole is a small timber tripod with a horizontal framework connecting two legs arranged to support a short horizontal shaft. On the outer end of this is a grooved wheel or sheave about 3 feet in diameter. On the inner end of the shaft, inside the legs of the tripod. is a capstan head. The sheaves in each of the tripods in each row are lined up so as to be in the same vertical plane and around each is taken one or two turns of an endless wire rope operated continuously by a hoisting engine placed upon the working platform. By means of guide pulleys beyond the tripod most distant from the hoisting engine, the rope is carried across to the adjacent row of tripods over similar pits, then towards the hoisting engine, operating all of the tripod pulleys in the second row. Pulleys fastened to small uprights on the floor serve to carry the rope. The tension pulley is operated by a horizontal hoisting tackle and serves to keep the proper tension upon the rope drive. From the top of each of the shaft tripods, a hoisting tackle is suspended, and when the bucket of spoil is ready to be hoisted it is fastened by a hook to the rope, the other end of which is carried over the pulley at the top of the tripod, and an attendant, upon the working floor level, takes two or three turns of the fall line around the capstan head and, tailing off the slack, hoists the bucket. Twelve or fourteen pits are thus served simultaneously and continuously by one hoisting engine. Messrs. D. H. Burnham & Co. are the architects, and the T. Nicholson & Sons Company, of Chicago, are the contractors for the foundations and arranged the plant described.

ANCIENT TERRA COTTA.

The use of terra cotta as a building material is of the greatest antiquity. Suberb examples have been found in the ruined Indian and Persian palaces and temples; tiles, friezes, frontons, and wall-slabs of "baked earth" dating back to the "Classic" age are found in every part of the East, and in the remains of cities which flourished during the Greek and Roman Empires there have been found examples of works in terra cotta which exhibit a very high degree of perfection both in taste and execution. The best work of that period, says the Stone Trades Journal, dates from the time of Phidias and Polycletes, in the fifth century before Christ.

In the art of making and moulding terra cotta, the Etruscans, while giving their productions an originality of their own, undoubtedly borrowed much from the Greeks; Rome employed Etruscan sculptors for the decoration of her public bnildings, and especially for the Capitol, under Tarquin the Elder, in the sixth century before Christ. Terra cotta held such an important place in Roman buildings that a school was eventually established in Rome with the object of training workmen in the manufacture of this artistic artistic building material. The invasion of the Goths and the fall of the Empire checked the progress of the arts, and the use of terra cotta, although not entirely abandoned, for several centuries suffered an eclipse.

In the eleventh century of this era, however, it once more took a prominent position in architectural decoration, and many fine specimens of the work executed during that and the subsequent centuries are to be seen in almost every city in Europe. England, Germany and Italy are at the present day the largest users of terra cotta in Europe.

Terra cotta has, undoubtedly, many objectionable features, but these, providing that the material has been made with sufficient care, are more than outweighed by its advantages. Time is the most important factor in the manufacture of terra-cotta goods, as a hurried drying process is apt to spoil the entire making.

The chief advantage of terra-cotta is its durability, atmospheric and other external influences having but little effect on its surface.

MODERN QUARRYING METHODS.

The old fashioned hard methods will no longer suffice to get out the material as cheaply and rapidly as modern conditions demand. The Quarry states that: "As many men are now engaged as there is room for, the waste is transported on rails in hutches in many quarries to brick-making plant: steam or compressed air drives rock drills; stone-breaking plant, Blondin cranes and traction engines all aid in reducing costs and increasing output; and the rapidly growing use of electric shot-firing proves that it also has been found very advantageous for general work, independent altogether of its absolute necessity when stone is wanted in large blocks. Probably there are ten electric exploders now in use in the United Kingdom for every one in operation a few years since, and to own an electric shot-firing outfit will be the rule ere long rather than the exception."

WHAT IS A "WELL-BURNT" BRICK?

THE specification runs "All bricks to be of the best quality, and well burnt", or, "if seconds be used they must be sound." There is no selection in this specification, says the British Clayworker, as to what part of the country the bricks are to come from. There is no stipulation that they shall be furnished by any particular firm. There is no definition of "best quality," and, as to the meaning of "well burnt"—we give it up. In the hands of a lenient architect or builder, both the terms quoted might be regarded in a lenient light. But, suppose some little trouble arises on the work, which is very often the case, and all parties are in a state of tension, cantankerousness comes to the front, and then all these little points are apt to be debated with considerable vigour, as we know in regard to a recent dispute. There is a sample which is to shew what was contemplated when the order was given. Well, we know something about samples; and if those who buy bricks are stupid enough to think that those who sell them are standing by when the order is sent off, and that the seller marks every brick so to speak when it leaves the yard, we can only pity the buyers' simplicity. Bricks are not like ingots of gold that every one of them shall be tested by the assayer before leaving the premises. It is inevitable that where a good sized brickyard is in full swing there must be a certain number of undesirable bricks included in a consignment, in some instances. The manufacturer may do his best to prevent this, and in yards where there is competent supervision it may be that inferior bricks do not leave the premises without being invoiced accordingly, but it is impossible to do away with this unsatisfactory feature entirely. In view of the present temper of workers, again, it is doubtful as to how far the pressure of undue supervision pays.

The fact is, that were all parties to pull together—were the builder to do his best with what few inferior bricks he received, and were the clerk of works to look at such with the eye of common sense rather than with overbearing superiority of knowledge, many of the difficulties relating to brick contracts would disappear.

Of course, the question of quality is always a matter of opinion within certain reasonable limits, and we must leave it at that. But with "well burnt" that is not much a matter of opinion. Given a sample brick, it is not very difficult to see whether the goods delivered are burnt to the same extent as the sample—we say nothing about colour. Moreover, the brickmaker has no object in trying to foist badly burnt bricks upon the builder or architect—except, of course, he be unscrupulous, when the attempt is palpable on the face of it.

THE RELATIVE MERITS OF CUT AND WIRE NAILS.

A correspondent of the Mississippi Valley Lumberman contributes the following interesting observations and experiences on this subject: While I have been in this place I have had good opportunity to note the lasting qualities of what has now become the old-fashioned cut nail. A good many roofs of the old houses are giving out and being reshingled. Standing recently near a house that was being covered, I took up some of the old shingles and examined them and found that where the shingle was sound about the nail hole the nail itself was almost as good as ever, and it struck me that the life of a cut nail and a white pine shingle was pretty nearly of the same duration. Where the shingle was decayed the nail also was rusted out, and so I concluded that where both the wood and iron were kept dry they were practically indestructible.

When the now common steel wire nail first came out it was generally conceded that they were a great improvement on the old cut nail, and there is no question that they are for general purposes in construction. Their toughness and breaking strain are so much greater than the old kind that the question of their strength and utility admits of no argument, but, as in the case with a good many things, there are some uses for which they are decidedly inferior to the cut nail, and these are where there exists a state of dampness. Common experience and observation go to show that the steel nail is susceptible of being oxidized much quicker than the cut nail. Go over one of your old sidewalks in the town where it has been put down with steel nails and you will find almost invariably that the nail has given out sooner than the wood. This is the cause of so many loose boards in the sidewalk.

It is for this reason that whenever you see a railroad company putting down a new platform at one of their stations you may notice they use the cut nail instead of the steel article. You may also notice that the spike which is used to fasten the rail down to the tie is practically the same as it always has been and of the same material. If the steel kind were more serviceable you may be sure they would be used for that purpose, as railroad men are given to determining pretty closely what is the the most durable in such matters.

Fastening shingles to the roof with wire nails has come to be pretty generally known among observant builders as defective to the making of a good serviceable roof. They have learned this through experience, although it must be said that the great majority of them still keep on using them, and will continue so to do until the public generally becomes advised against them for that purpose. The principal reason for this is, no doubt, because of their being easier to drive than the old cut nail, but everybody doesn't know how to do the same with a cut nail, because if you do not start the latter just right you will split the wood if you are driving it near the end of the piece. This will be news to some of you youngsters who have come up since the wire nail was introduced. You ask your father if you've a mind to and he will tell you the same thing.

Two years ago I reshingled my own house and profiting by what I had seen of the wire nail for that purpose, I had my carpenter use the cut nail. He "kicked" about it, but, as I was paying him by the day, it made no difference to him. He contended, like a good many others, that it was not the fault of the nail that it rusted out so quickly, but that the red cedar shingle was the cause. I am aware of the fact that from this idea has arisen a prejudice against this kind of shingles, it being claimed that there is some kind of an acid in the wood that has close affinity for metal and eats it away. Now, without being rude to anyone who holds such an opinion, I will say that I don't believe there is a grain of truth in such an assertion.

I have in my possession some wire nails that were used in putting on white pine siding. They had become so badly rusted that the heads had fallen off, compelling the owner of the building to have the siding entirely renailed. This is not the only instance of the kind I have seen where wire nails have rusted through in white pine siding. This goes to prove that it is not acid that rusts them.

Within the past year or two there has been manufactured a new kind of wire nail which I think will, before long, come into general use to nail on shingles. It is the galvanized wire nail and has the sharp point and flat head of the common nail that is now used. Their cost is about the same, and they may be had at any hardware store in the larger towns.

CONSTRUCTIONAL IRONWORK.

It has become general in recent years, says the Contract Journal, to use wrought iron in constructional work to a much greater extent, as material, machines, and conditions of labour have changed. Where cast iron was formerly employed without exception, we find it almost non-existent to-day, its weakness having been proved only too frequently. Though it may seem almost incredible, we know that it was used in bridge structures for railways with one-half the breaking weight of wrought iron, and only serious accidents convinced the authorities that beams built up of wrought iron must replace the castings formerly in vogue. There were various reasons for the practice. In former times a wood pattern was much more cheaply turned out than it is now, and the only necessity was then to obtain a good sound casting and set it in place. A lsabour conditions have altered, however, and prices augmented, beams and columns from the foundry have materially increased in cost, and except for purposes of ornamentation it does not pay to produce them. Taking a hollow column, for example, the highest skilled labour is required in its production. The mould must be perfect, and the risks of running the metal successfully very great before a good and sound casting can be turned out.

With the advent of machines, the built-up wrought-iron structure has come in, and we not only find beams made of it, but pillars also. A pattern of cast iron probably becomes obsolete after it is used, or, at least, takes up considerable room for storage, whereas by the modern plan wrought-iron plates may be cut to any size and riveted together in the structure at will. All that is necessary is a good supply of material and machines, and the finished article may be put together in probably less time than it would take to make the former pattern. Plates may be cut, if not already supplied by makers, to any dimensions, angle-irons to length, holes punched, and rivets closed together with perfect ease, and the result is a structure which with proper design does not lack in point of appearance from its predecessor the casting. At the same time, what is perhaps of more importance, it is cheaper, because even allowing for interest on plant that is wanted, the rapidity and ease of manipulation is such an important item in the question of cost.

Allowing for general differences of construction, for particular purposes, it is common for designs to have outward flanges or webs to admit of the ready introduction of angle-irons and the tools for riveting the parts together. These flanges have the effect of improving the general sightliness, covering the angle-iron, and increasing the area of the cross-section of the structure, which results in points of strength that are self-evident. The weight on beams varies in relation to the breadth and depth, and on columns as to the same two measurements, only in the first case there are two dimensions of the depth. Therefore, if these figures are increased, so is the load accordingly. The projecting webs become, therefore, an advantage in the calculations as well as being an aid to manipulation. The material punched out for the rivet holes has to be allowed for, but this is done by adding to the thickness of the plates. For columns wrought iron is of about the same strength as cast for 30 times the depth of cross-section, and therefore, the general question of the suitability of the two materials for structures of this nature has resolved itself into machine versus hand labour entirely to the advantage of the former. The cutting of plates from a better class of iron sent out by the mills, the punching the rivet holes by appliances that are of the latest type, the cranes for handling the parts between one operation and another, and the final bringing them together, are now rendered so simple that any design on paper may be much more readily put into practice than was formerly possible. There is, perhaps, not the scope for the artistic element, though many find in the present-day wrought-iron constructions beauties they would not see in castings, however handsomely finished. The increase in the number of pillars built in this way to be observed is somewhat remarkable, as it was an axiom that these should always be in cast iron; but whatever the value of this material in compression, which, of course, is well known, when hollow, if of any length, wrought iron is superior relatively to cast. Whether in beams or pillars, the common form is the rectangular section, the base being extended with webs to give a larger ground surface, as flanges were common with castings. If the box section is plain, then internal riveting has to be reckoned with, and this is more expensive than where this can be done wholly from the outside. The simple form of beam for lighter work comes under the latter head.

The outline need not be flat. With the same scantlings greater strength is given by the arch, or there may be the flat top and the curve below with lattice work between. The structure may again be a double flat girder with the same connections. This system tends to avoid excessive rigidity, and brings into play the qualities of wrought iron for withstanding tension while admitting of infinite variety of design. The manufacture is much the same throughout. The plant is the all-important question for rapidity of handling and size of work. Some designs may lend themselves more to one maker's capabilities than others, and the tendency must be to specialise and keep to standard patterns, whereby the machines are best suited to exactly what they have to accomplish. This ensures cheapness and quality.

USEFUL HINTS.

In glazing a greenhouse it is advisable that the glass should only be bedded in putty, front putty being entirely dispensed with ; this is found by practical experience to be the better plan. Well paint the rebate with lead and oil, then run a layer of putty made from whiting and boiled oil, to which a little red-lead may be added. Cut the glass in tight to size and well rub down to bed, and sprig along the edges, after which give the edges and rebate three coats of good oil colour. The reddish putty contains a portion of red-lead ; this putty, which sets very hard and is very durable, is not used for ordinary glazing owing to the extra cost, but is used chiefly by hot-water engineers and boilermakers for making joints. Fish oil putty is much approved of for green houses by some authorities.

Asbestos will stand heat as long as any known substance, (unless it be platinum, which is far too expensive for use on a large scale), and is practically indestructible by means of heat. But there is probably no better material than firebrick, specially made for the purpose, and known in the trade as "blast furnace firebrick." Bricks and tiles made of fire-clay can be rendered more lasting by giving them a coating of plumbago, charcoal and silica (pure fine quartz sand) intimately mixed together. Asbestos powder made into a thick paste with liquid silicate of soda, and spread over firebricks, prevents the bricks from cracking or being burned away. This paste hardens quickly, and can stand any amount of heat.

Green Enamel for Venetian Blinds.—The majority of green enamels and other green pigments if placed in exposed positions to catch the full rays of the sun, fade in an extraordinary short time, this being particularly noticeable on venetian blinds. The undermentioned receipe for enamelling venetian blinds has been found very durable when exposed to the sun's rays, as well as exterior work requiring a durable, glossy finish. Mix together 7 lbs. zinc white, 1 lb. zinc chrome, 1 lb. Brunswick blue, ¼ gal. church oak varnish, 1 pint japan gold size. Mix all well together to a uniform consistency and thin down with American turpentine. The above makes a sea green and dries hard with an excellent gloss in about 12 hours. It may also be used with advantage on bric-a-brac, garden seats and other work requiring a hard surface.

Concrete.—In mixing Portland cement for concrete the essential rules to remember are that (1) the broken rock, used as an aggregate, should not be stronger or weaker than the cementing material: (2) the interstices between the broken pieces of rock only occupy about thirty per cent. of the volume of the measured rock ; (3) there is no need to have more cementing material than will just fill these spaces ; (4) a mixture of one part of sharp sand and one part of Portland cement will make a mortar which when thoroughly set, is as strong and hard as granite. A mixture of six parts of broken granite, one part of sand, one part of Portland cement, all by measure, is said to give the strongest concrete.

Petrifying Liquid for Brick Walls.—This useful preparation, says the English Decorator, is used chiefly on the walls of breweries, damp cellars, and most work requiring a hard glossy surface which will withstand the hard wear as scrubbing with water, etc., and afterwards retain its brilliance and not fall from the walls. It is also used with advantage on the walls of stables, dairies, and other outhouses where the painter finds any difficulty in making ordinary paint adhere to the damp walls, and is sometimes used for to arrest the decay of brickwork in damp walls. For this class of work it is made colorless, as not to alter the appearance of the walls. This preparation is quite simple to prepare as may be seen by the following recipe, as made by an eminent firm of manufacturers. First procure 28 lbs. of zinc white ground to paste in boiled oil, 56 lbs. of pale resin, 1 gal. thick boiled oil, ½ gal. pale oak varnish, 5 gal coal tar naphtha, half gal. ordinary boiled oil, and 6oz. newly slacked lime. Melt the resin in a suitable vessel over the fire or by means of a water-bath, then take well away from the fire and allow it to cool somewhat, then add the naphtha very steadily, constantly stirring, then add the thick boiled oil and lime. In another vessel place the zinc white and break up with a small quantity of naphtha, then thoroughly mix the contents of the two vessels while still warm, it should then be allowed to cool down when the other ingredients should be added. In mixing the naphtha, care should be taken to mix well away from the fire as the naphtha gives off a heavy vapor which is highly inflammable. The above dries with a surface like enamel. It may be made white by omitting the zinc white and a gallon of naphtha. If a red brick color is required omit the zinc white and replace with venetian red and red oxide ground to a paste with boiled oil or varnish. Should the proportions be too large reduce according to quantity required. This preparation dries hard with a brilliant gloss in about 8 to 10 hours, and may be washed, scrubbed and submitted to heavy usage a few days after it has been applied. A gallon of the above may be prepared at a cost of about 3s., and will be sufficient to do 60 square yards one coat.

NOTES.

London requires 1,300,000,000 bricks a year.

Some quarrymen prefer gunpowder to dynamite, for the reason that the shock is more widely and evenly distributed when the former explosive is used than it is with the latter. Advocates of gunpowder say that dynamite exerts too strong a force in the immediate region of the explosion, and breaks the stone into useless pieces.

A Bill now before the British Parliament, and which has received its second reading, provides for the permissive registration of plumbers. In introducing the Bill Lord Glenesk expressed the belief, that, although not compulsory, it would tend to bring about greater reliability and better work on the part of plumbers.

The German Portland cement manufacturers are said to be feeling the loss of the American market, as the United States producers are able to almost cover the entire American demand. Hitherto the Baden factories have been compensated by large home inquires, but recently owing in part to the high price of money there has been a decline in building operations.

The publishers of the Dundee Courier have sent twelve delegates chosen by popular vote to the United States and Canada with the object of investigating labor conditions and methods of workmanship as applied to their particular trades. Mr. Frank Harris, of Bo'ness, will study pottery conditions and trade ; Mr. Kenneth McKensie, Inverness, upholstery, woodwork, etc. ; Mr. George Nutley, Kingston Hill, Surrey, painting and decorating ; and Mr. Thomas Fleming, Peebles, building.

At the half yearly meeting of the National Association of Builders, of Great Britain, one of the speakers quoted statistics obtained from official sources, showing that annually a limited number of trade unions connected with the trade spent something like £60,000 on strikes and disputes, and £72,018 on management expenses, the latter an average of £5,000 each. The Journal of the Association takes this as a text to do a little preaching upon the necessity of better organization by the employers, and especially the strengthening of their financial position.

LEGAL.

Building owners should be warned that if there are law-suits about their property there is great risk in making charges against the architect or builder. Although the amount claimed was only 70l. 2s. 11d., the case Cheale v. DePinto, which was tried at the Hastings County Court, is as much of a warning as if it were heard in the High Court. The plaintiff, a timber merchant, took over the contract for the completion of the building of a house at Bexhill. He executed the work, and the architect had certified it was properly carried out. Counsel for the defendant interposed at the beginning of the case by saying he was instructed that the words "to the satisfaction of the architect" were not in the original deed. That was an allegation of a most serious kind. But evidence was not brought forward to support it. Mr. Alton, the architect, said the orders for extras were often given in his presence by the defendant, and several witnesses testified that the defendant did give such orders. The defendant said that he told the original builders that he had decided to expend no more than 250l., and no extras were to be recognized unless there was his written authority. Two architects were called to prove that the work was inferior and the measurements did not correspond with the specification. An effort was also made to upset the claim on the ground that the original contractors had filed their petition March 10, and therefore the assignment of the balance of the contract a month afterwards was invalid. Judge Martineau decided in favour of the plaintiff, saying that practically the whole of the work to be done had been performed. There were a few deviations, but he thought every shilling claimed was due except two guineas in respect of these deviations.

The apparent ease with which actions for damages against architects arising from carelessness succeed is ominous. Two cases have been heard within the last fortnight. At Stafford, in the case of Boyes & Son v. Adshead, which was allowed to go by default, the damages were assessed by a jury. The plaintiffs complained that the work was not attended to, and said they must engage another architect. That course had to be followed, and the second architect received 32l. 10s. 6d. in fees. It was alleged that some part of the work was not properly executed. The Under-Sheriff said the claim was reasonable, and the jury accordingly assessed the damages at 52l. 16s. 6d. An adjourned case, Harris v. Babb, was heard at Wrexham. The plaintiff, an architect, sought to recover 30l. 16s. for fees. The defendant put forth a counterclaim of 150l. as damages on account of plaintiff's incompetence and negligence. The jury found for the plaintiff for the amount claimed, but they assessed the damages at 82l. 14s., and the judge said the defendant was not liable for a claim for bricks amounting to 47l. 5s. 9d., or in all 129l. 19s. 9d. From that sum was deducted 30l. 16s., plaintiff's fees, and judgment was accordingly entered in favour of the defendant for the net sum of 99l. 3s. 9d. In both instances the work done was not large, and the amouut of damages is therefore more remarkable. It is too generally supposed that an architect is a privileged person, in fact an independent judge, and so long as he is supposed to act with "reasonable skill," he is secure from liability for damages. It is now evident that judges have become more exacting, and unless it is manifest that other architects of experience and skill would act in the same way, a claim for damages has a chance of succeeding. The remedy, of course, lies with architects. —London Builders' Reporter.

PUBLICATIONS.

A general treatise on school architecture, by Edmund M. Wheelwright, architect, of Boston, has been published by Messrs. Rogers & Manson, of that city. Examples are presented of the most typical and practically suggestive schools of Germany, Austria, Switzerland, the Scandinavian countries. All details of school construction are considered, yet the information is studiously condensed within the limits of a convenient handbook, which is made readily accessible by an unusually full index.

A new book on mill construction prepared by Mr. H. G. Tyrell, C.E., has been issued by the Engineering News Publishing Co., of New York. It treats of the general design of this class of buildings, contains descriptions and illustrations of details of construction and gives figures and diagrams showing the loads which may safely be imposed.

TORONTO INDUSTRIAL EXHIBITION NOTES.

The Canada Foundry Company, Toronto, had a complete display of structural iron and steel work, fire escapes, iron stairs, etc.

Rice, Lewis & Son Company, Limited, Toronto, in a special building had an extensive display of brass mounted beds, mantels, tilings for floors and walls, bronze builders' hardware, etc.

The warerooms of the Gurney Foundry Company on King street west, contained as usual an interesting display of all kinds of heating appliances, and received many out of town callers.

The Pedlar Metal Roofing Company, Oshawa, had a very attractive display in their own separate building of metal ceilings, fireproof windows and wire-bound glass, spun metal, relief work in copper and zinc.

The Dominion Radiator Company, whose works are in proximity to the Exhibition grounds gave a cordial welcome to many visitors who dropped in to inspect the numerous styles of radiators in their well appointed show rooms.

The Gurney Tilden Company, Limited, Hamilton, had in their own building a large display of stoves, furnaces and builders' hardware. The building was very prettily decorated with bunting. Mr. A. J. Brenton, Toronto representative, was in charge of the exhibit.

The Imperial Varnish & Color Company, Toronto, had an original display of high grade architectural varnishes for interior and exterior finishing, also their famous "Grantitine" floor finish and "Elastilite" varnish for interior and exterior use. All varnishes are put up in cans with the company's name and address stamped on a brass seal.

In The Canada Radiator Company's advertisement in this issue appears a photo of their exhibit, which shows a few of the artistic designs of radiators manufactured by them. While they endeavor to give a radiator of handsome appearance, their chief feature is the system of circulation of water through the radiator. By causing the water to pass alternately up first and down second section of entire radiator, they secure a distinct difference in temperature of water in return and supply pipes and in consequence a positive and rapid circulation is maintained.

The Metallic Roofing Co. had one of the most attractive and original exhibits in the Main Building, the special feature which attracted crowds of people being a dome temple finished in white marble and built of sheet metal. In this temple was a twenty-five ton coining press in operation which stamped the Company's name and address, and formed a very neat twentieth century souvenir in six colors. In addition this company were showing metallic shingles, embossed plates for interior decorations, steel lathing and general architectural sheet metal work.

One of the largest exhibits at the Exhibition was that of Clare Bros. & Company, Preston. It consisted of a complete line of stoves, ranges and heating systems, including a number of new lines recently added. The most prominent feature was their "Hecla" furnace, to burn coal or wood. They have found it necessary to manufacture the "Hecla" in a series of five sizes to meet the several requirements, the largest sizes suitable for schools, churches and public buildings. The "Preston" boiler attracted considerable attention from parties interested in hot water heating. The construction of this boiler is entirely different from any other make. It provides vertical circulation, with its water-ways thoroughly surrounded by fire, and being a one-piece boiler is entirely free from joints and is practically a self-cleaner.

Mr. Baines, the eastern representative of the Preston Metal Shingle & Siding Company, was a visitor at the exhibition.

The J. F. Pease Company, Limited, Toronto, had a large and varied display of hot water boilers, wood and coal furnaces, combination heaters, etc. The company also exhibited a new apparatus for which they control the Canadian patent, the "Ideal" Heater and Ventilator for schools and churches. It is claimed by the Company that this heater will furnish a thorough system of heating and ventilation for buildings which have no basement. The new "Economy" hot water boilers have several original and effective features of construction. The company claim that this boiler has the largest area of heating surface exposed to the direct rays of the fire of any round boiler on the market. The joints are made with screwed nipples and no bolts, gaskets, or packing of any kind are required. Another feature is the ease with which the boiler can be set up; it being claimed that it can be erected in less than half the usual time.

STUDENTS' DEPARTMENT.

ANCIENT ENGLISH CATHEDRALS.

Winchester, in its earliest form, must hold the place of the most ancient. The original cathedral claims, on very apocryphal authority, to have been built in 177, by the newly-converted British King Lucius, on the site of a great Pagan temple. Another was built in 313, and another in 871. The present pile, regarded in its various parts, is of at least seven principal dates; and if viewed in its minor features, its smaller accessories, its remodellings, and its restoratians, must be pronounced to belong to ten centuries. The oldest parts of the edifice belong to a pile in the Saxony style, by the famous architects and bishops of Winchester, to Ethewold in 980. Lichfield Cathedral is said by some authors to have been erected in 300, and by others in 667, and rebuilt in 700. Canterbury is very ancient; it is said to have been founded by St. Augustine, as also is Rochester. They appear to be of about the same date. The former was founded in 598, and partially rebuilt in 1080; the latter between 600 and 1000. Exeter had a cathedral standing in 1050.

THE COLONNADE.

Colonnades are of various forms and dimensions, and assume different names according to their application and uses says the Builders' Reporter. When in front of a building or in the interior of a quadrangle they are called porticoes; when surrounding a building of any shape, peristles; when double or more, as in some of the ancient temples, and the circular peristle in front of St. Peter's at Rome, they are polystyle. No people have made more use of colonnades, or with greater effect, than the ancient Egyptians, many of their temples being literally thickset, both in the interior and exterior, with colonnades of every description. The Greeks were more simple in their arrangement, and their colonnades were mostly distributed into porticoes and peristyles, both monostyle and polystyle. Their most magnificent example is perhaps the Temple of Jupiter Olympius at Athens. Baalbec and Palmyra present also various examples of splendid colonnades. Of modern works, the magnificent colonnade of the Piazzo di San Pietro at Rome, the work of Bernini, is at once the grandest and most beautiful. It consists of 280 columns, and 48 pilasters of 40 feet high, raised on three lofty steps. It is surmounted by a balustrade, on which are 88 colossal statues 15 feet in stature. Colonnades are among the most beautiful and splendid works of architecture, and in the hands of a man of taste and science are capable of the grandest and most imposing effects.

Mr. J. Wilson Gray, architect, of Toronto, is at present on a visit to Great Britain.

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THE TORONTO ENGINEERS' CLUB.

The first meeting of the above club following the summer vacation, was held in the club rooms, King street west, on the evening of the 3rd inst. In the absence of the president, the chair was occupied by Major Gray.

Several new members were elected and other business transacted.

A letter was read from the secretary of the Canadian Society of Civil Engineers, stating that the proposed summer meeting at Buffalo had been abandoned owing to the few favorable replies received to the circular sent out to members.

Owing to the unavoidable absence of the author, the paper announced to be given by Mr. Cecil B. Smith, on "Parks, Squares, and Drives for the City of Toronto," and the anticipated discussion thereon, was not forthcoming, but will probably form the chief feature of the programme of the next meeting to be held on the 1st of October.

Part III of Engineering Studies by Charles Evan Fowler, M. Am. Soc. C. E., published by the Engineering News Publishing Co. of New York, is devoted to descriptions and illustrations of some of the most celebrated stone arched bridges of England.

The King of Siam is said to have in one of his country seats a pavilion of a very extraordinary kind. The tables, chairs, and cabinets with which it is furnished are of crystal; the walls, roof, and sides are formed of glass, 1 in. thick and a fathom in breadth, and so finely united with mastic as transparent as glass itself that not a drop of water can penetrate the building. A Chinese engineer constructed the pavilion in this manner as a certain remedy against the insupportable heat of that country. It is 28 feet in length by 16 feet in breadth, and is placed in the midst of a large basin, paved and covered with marble of different colors. The basin can be filled with water in a quarter of an hour and emptied as rapidly. When those who are to occupy the pavilion have entered the gate is shut, the seams stopped with mastic to prevent the entry of water, and, the sluices being opened, the large surrounding basin is filled to the top, so that the whole pavilion is placed under water, with the exception of the top of the dome, which allows for the passage of air for the respiration of those within. Nothing can be more delightful than the agreeable coolness enjoyed in this delicious pavilion, while all around is scorched and burnt up by the intolerable heat of the sun.

Imitation marbles have been made from the fine dust of certain woods and the dust of ivory and similar waste. A mixture of sawdust and phosphate of lime with a binder has been used as a material for taking casts of sculptures, and has been called "Similibois." Slabs for parquet floors have also been made from sawdust, as well as plates for bas-reliefs, art castings, panels and decorations. Terra-cotta lumber and artificial lumber are both instances of the utilization of sawdust. Sawdust compositions have also been used for sidewalks and dinner plates."

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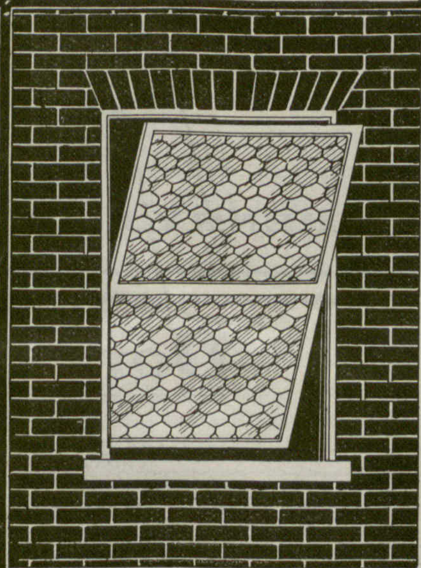

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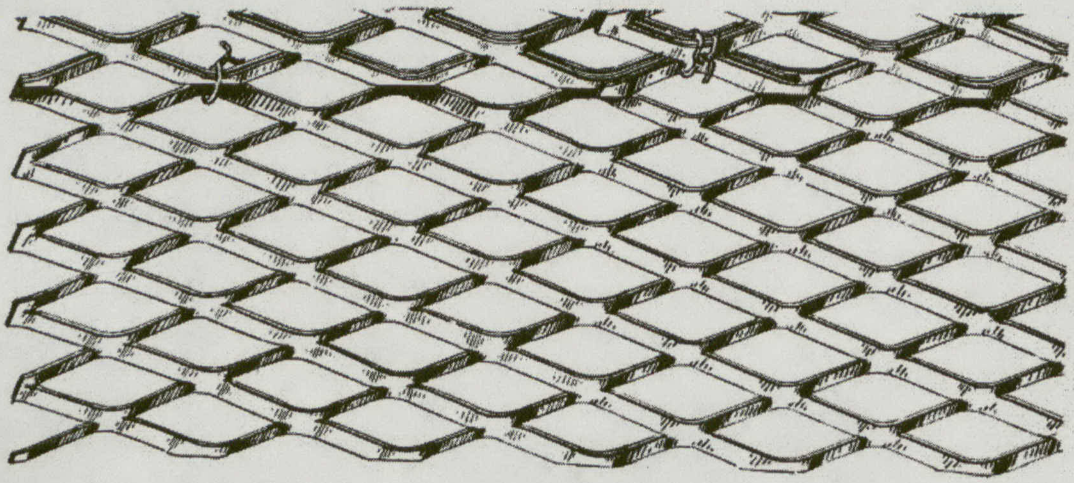

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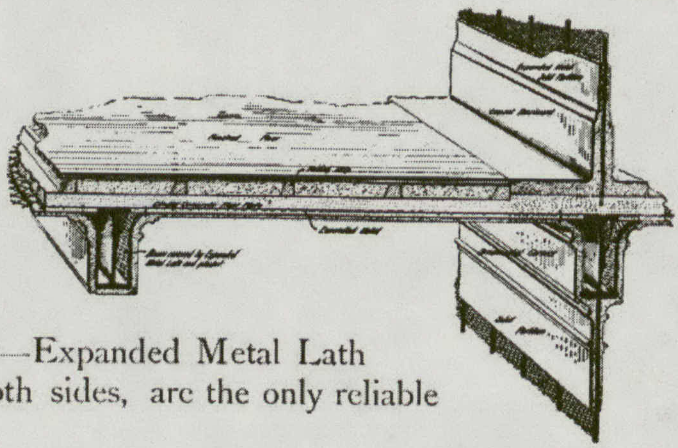

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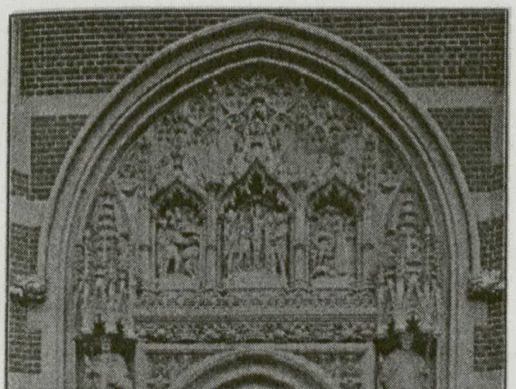
TOSNE WINDOWS.

A Consular Report to hand from Germany mentions that in a new building attached to some boiler works in Upper Silesia a novelty in windows has been tried. Light is introduced through stone windows. The ordinary panes of glass were impracticable on account of the nearness of the works to the railway lines, so pneumatic glass stones have been used instead. From the outside the appearance is the same as the so-called "Butzen" panes. They are translucent, and at the same time as strong as the stone wall in which they are set; they will withstand any pressure or blow that the walls will withstand.

SUN ROOMS ON ROOFS.

A London medical journal advocates the placing of a glass roofed room or conservatory on flat roofed dwellings. It says: A glass ridge and furrow roof can be made practically water-tight; it need not be heavy; and if the walls of a roof conservatory are carried to the full height it may be well protected from the ravages of the wind. With such a roof it would be perfectly possible by a simple mechanical contrivance such as is constantly used in greenhouses to throw the whole structure open to the air, and thus while obtaining protection from the weather when this is needed, to secure all the advantages of open air when the weather is propitious. We notice that at a recent meeting of the American Pediatric Society Dr. Northrup reported that by his advice a sun-room had been built on the roof of a private house in New York, a playroom in which fresh air and sunlight can be enjoyed without dust and free from the dangers of the streets. But our suggestion is not merely to build a playroom on the roof, but to make this glass-covered room itself form the roof of the building, much as a weaving shed is made to form the roof of a mill in the textile factories in the North of England.

The Robb Engineering Company have issued a new catalogue devoted to illustrations and descriptions of the Robb hot water heater. A number of excellent testimonials are published as to its efficiency and economy.



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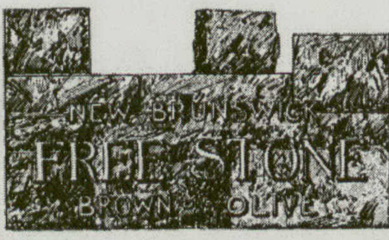

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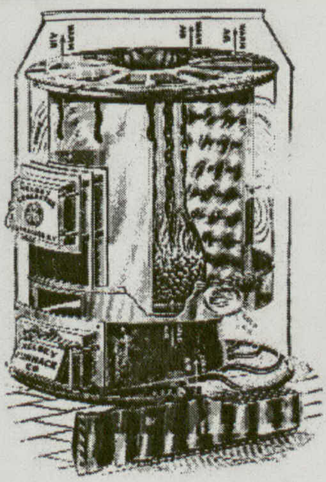

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