CANADIAN CONTRACT RECORD

A Weekly Journal of Engineering, Public Works, Tenders, Advance Information and Municipal Progress

This Paper Reaches Every Week the Town and City Clerks, Town and City Engineers, County Clerks and County Engineers, Leading Civil Engineers and Contractors throughout Canada, and Purchasers of Municipal Debentures.

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Classified Index of Advertisers, Page 15.

City of Port Arthur

Sealed tenders addressed to the undersigned will be received up to 5.30 p.m. of FRIDAY, NOVEMBER 1, 1907, for the construction of a bridge across McVicar's Creek on Algoma street.

Further instructions as to specifications and tenders must be received from the Corporation Engineer.

The lowest or any tender not necessarily accepted.

J. McTEIGUE,
City Clerk.

FOR SALE

2 Cableways, 750 feet span, and 20 three-yard Steel Skips, all practically as good as new. Apply

M. L. QUILLINAN,
Imperial Bank Chambers,
Niagara Falls, Ont.

FOR SALE

1 Merriman Screw Gang Stone Saw 5 ft. x 5½ ft. x 10 ft., nearly new.
1 "MYLES" Concrete Block Machine nearly new with 250 Wooden Pallettes.

M. BEATTY & SONS, Limited,
Welland, Ontario.

For Sale

One No.0 Rear Dump Smith Mixer, Steam Power.
One No.1 Ideal Brantford Mixer.
Both in first class condition, suitable for sidewalks or any concrete work. Apply to BOX 117, CONTRACT RECORD Office, Toronto.

Debentures for Sale

Village of Elmira

Sealed tenders will be received by the undersigned up to 8 o'clock P.M. on FRIDAY, THE 8TH DAY OF NOVEMBER, 1907, for the purchase of $7,500.00 4½ per cent Debentures, payable in twelve years, re loan to the "Elmira Interior Woodwork Company, Limited."

Particulars from undersigned.

No tender necessarily accepted.

J. H. RUPPEL, Clerk.

The London Water Works

TENDERS FOR

CONDUIT

Sealed tenders will be received by the undersigned up to 5 p. m. MONDAY, NOVEMBER 4TH, for the completion of a conduit six hundred feet in length.

Plans and specifications may be seen at Moore & Henry's office, Albion Building, London, Ont.

Lowest or any tender not necessarily accepted.

F. J. DARCH, Chairman. JOHN M. MOORE, Engr. & Supt.

CONTRACTS OPEN.

GUELPH, ONT.—Early next season an additional storey will likely be added to the Guelph armoury.

LONDON, ONT.—Plans are being prepared for a big addition to the works of the Lamb Fence Company.

HAMILTON, ONT.—City Engineer Barrow has been instructed to prepare specifications for new water works pumps.

CALGARY, ALTA.—S. E. Landry has asked the council for inducements to start a wire nail and tack factory in this city.

FOREST, ONT.—At the next municipal election a vote will be taken upon the establishment of a water works system.

STRATHCONA, ALTA. — Edward Gee is taking tenders this week for $600 ten year East Edmonton school district debentures.

CAMPBELLFORD, ONT.—The ratepayers' sanction has been given to a by-law for building a $60,000 power plant at Middle Falls.

BRANTFORD, ONT.—Negotiations are in progress for the conversion of the Cockshutt store into new premises for the Bank of Nova Scotia.

ORILLIA, ONT.—A report has been submitted to the town council by Engineer Chipman in favor of a sewerage system that will cost $125,000.

WELLAND, ONT.—The committee have adopted plans for the new County Hospital upon which it is hoped to start work early next spring.

CHATHAM, ONT.—A by-law will be submitted to the ratepayers next January for loaning $20,000 to the Canadian Pin Company who propose to locate here.

ST. JOHN, N.B.—The N.B. Southern Railway are endeavoring to get parliamentary sanction for the construction of a bridge across the St. Croix river.

ROCKWOOD, MAN.—Votes of the ratepayers will be taken on November 6th upon a by-law to issue $3,500 six per cent 20 year school district debentures.

WARWICK, ONT.—Robert Auld wants tenders up to November 2nd for the Higgins drain in this township. Specifications at Guide-Advocate office.

BRANDON, MAN.—It is reported that the government are negotiating for the purchase of a site at Princess avenue and Tenth street for the new court house.

LETHBRIDGE, ALTA.—Attention is focussed on the city's need for a new civic building and various propositions for the attainment of this end are under discussion.

THAMESVILLE ONT.—Votes of the ratepayers will be taken on November 18th upon a by-law for a $7,500 bonus to the Thamesville Box and Handle Company.

KINCARDINE, ONT. — Votes of the ratepayers will be taken on November 18th upon a by-law to guarantee $50,000 bonds of the Ontario West Shore Electric Railway.

MONTREAL, QUE.—A permit has been taken out by the George Hall Coal Company, of Ogdensburg, N. Y., for the erection of coal chutes at Point St. Charles to cost $56,000.

MITCHELL, ONT.—James Barnett, town clerk, wants tenders up to November 30th for the purchase of $10,000 five per cent 10 year debentures, re loan to Mitchell Woollen Company.

WATERLOO, ONT.—The erection of a large addition to their factory and the installation of a gas producer plant with a capacity of 100 H.P. are contemplated by the Waterloo Mf'g Company.

NELSON, B. C.—Competitive plans are being taken up to the end of the month for a new Methodist church and after a selection has been made tenders will be taken. Nearly $20,000 has been raised for this purpose.

MARKHAM, ONT.—The ratepayers have approved of by-laws providing $3,000 for new granolithic sidewalks, $3,000 for extensions to electric light system and $3,000 for bridge construction over the Rouge river.

NEW WESTMINSTER, B.C.—The North Pacific Lumber Company are making preparations for the erection next spring of a large saw mill, which, according to all accounts, will be the best equipped in British Columbia.

OTTAWA, ONT.—In connection with the proposed home for consumptives, the local society are negotiating for a site at Elmbank.—A permit has been taken out by the Free Press Company for a new $20,000 reinforced concrete office building on Sparks street.

OWEN SOUND, ONT.—Debentures of $1,000 each, to the amount of $90,000, payable in 1926 and with interest at 4½ per cent, are offered for sale by the corporation. Further particulars of A. J. Spencer, town treasurer.—William Meade, a furniture manufacturer of Waterloo, was in town a short time ago with the object of securing a factory site.

BATTLEFORD, SASK.—E. F. T. Brokovski, Secretary Treasurer, invites tenders for $5,000, 6 per cent ten year school district debentures.—Tenders are invited up to November 9th by F. J. Robinson, Deputy Commissioner of Public Works, Regina, for the erection of a court house in this town. Specifications on application to Storey & VanEgmond, architects, Regina.

EDMONTON, ALTA.—Recent building permits include:—E. W. Organ, dwelling, Morris street, $2,500; J. Hall, stable, Thirteenth street, $200; A. Taylor, dwelling, Griesbach street, $3,000; H.D. Humel, livery stable, Second street $1,000; I. A. Powell, livery stable, Secord street, $1,000; J. A. Powell, livery stable, Queens avenue, $1.000; Mary Carl, dwelling, Syndicate street, $1,500.

VICTORIA, B.C.—A new railway from this city to Edmonton, by way of Seymour Narrows, is projected, and the promoters of the enterprise will seek incorporation at parliament's next session. It is thought that the line will be a good commercial undertaking owing to the valuable timber tracts that it will open up.—A company will probably be formed at an early date for the exploitation of a new explosive called "Mitchellite" and a factory building will probably be built in this vicinity.

PETERBORO, ONT.—With the object of shortening the distance between Fenelon Falls and Lindsay, a new bridge is to be built at McLarens Creek and the preliminary dredging will shortly be put in hand.—The German Card Company will likely build more commodious premises in the near future, the business having outgrown the accommodation of their present factory, corner of Dublin and Bethune streets.—It is reported that T. W. Oke has disposed of his factory to the Dominion Tool Company and that he will rebuild on a larger scale.

WINNIPEG, MAN.—The Winnipeg Paint and Glass Company, whose premises were recently destroyed by fire, will rebuild on a large scale at Fort Rouge.—D. R. Dingwall is contemplating the erection next spring of a three storey brick block on his property, corner of Portage avenue and Carleton street.—Tenders will be received up to November 1st by M Peterson, Secretary, Board of Control, for a second hand, single track, through truss, steel railway bridge, 155 ft. to 165 ft., single span, for Point du Bois power development.—A by-law has been submitted to the council to raise $100,000 for public baths.—The Ideal Fence Company have taken out a permit for $2,000 building on Catherine street, while E McKenty has obtained a permit for additions to the Manor Hotel that will cost $4,000. Following are other recent permits:—E. L. Drewry, Main and Redwood, bottling house, $30,000; D. C. Cameron, Roslyn road stable, $2,500; W. R. Ferguson, Lipton street frame dwelling, $2,000; G. Boulton, Main and Lansdowne, addition to frame store, $1,200; Ruthenian church, McGregor and Stella, addition to frame church, $1,000.—J. A. Banfield addition to hotel, Notre Dame & Main $2,500; E. L. Drewry, frame stable and carriage shed, 2,500; Winnipeg Electric Railway Company, brick dwelling, Clare and Pembina, $4,000.

VANCOUVER, B.C.—It is understood that the Scott-Thompson syndicate, of London, England, will be floated about the end of the year and that the erection of a steel plant, dry dock and shipbuilding works will follow.—The authorities of the General hospital have made a decided movement towards the erection of a new wing and it is probable that a by-law will be submitted to the ratepayers next January.—Recent building permits include; H. W. Miller, frame dwelling, Seventh avenue, $1,200; D. Strathie, frame tenement, Barnard street $1,500; Allan Bros., frame cottage, Fifth avenue, $2,400; W. H. Rogers, frame dwelling, Beach avenue, $2,100; Alex Munro, frame dwelling, Parker street, $1,500; John Bird, frame dwelling, Manitoba street, $1,250; H. Campbell, frame building, Second street, $1,900; G. J. Shannon, frame dwelling, Seventh street, $1,800; R. F. Perry, frame dwelling, Eighth street, $2,350; Lee Yuen, brick store, Dupont street, $1,800; Miss Livingston, Ninth street, $2,500; J. R. Sharpe, frame dwelling, Burrard street, $2,000; C. Elliott, residence, Eighth avenue, $5,000; D. G. Campbell, frame dwelling, Park drive, $1,500; G. Hartman, frame dwelling, Twelfth street, $1,300; Albert Pansche, frame dwelling, Keefer street, $1,600; B. C. Printing & Engraving Co., brick printing house, corner Homer and Smythe streets, $15,000; J. J. Dissette, apartment house, Nelson street, $8,500; Ookichi Shiomi, frame rooming house, Alexander street, $1,000; T. K. Sakai, frame rooming house, Alexander street, $1,500; Davidson & Brown, cement block stable, Cordova street, $5,000; Arnott S. Hinton, frame dwelling, Charles street, $2000; William McPherson, frame dwelling, Burrard street, $2400.

TORONTO, ONT.—Simpson and Young, architects, 17 Toronto street, are taking tenders for an addition to the factory of the Toronto Hat works, Adelaide street west. The same firm are about to take tenders for the erection of a public school at Paris, Ont., estimated to cost $30,000.—Plans are to be prepared for a new building for the Sovereign Bank on King and Bay streets, which will be erected on the expiration of the leases of the present tenants. For the meantime they will occupy the old premises of the Molsons Bank on the opposite corner and will re-model and enlarge same.—The total cost of the sewage disposal and water filtration, which the City Engineer and the health officer have proposed in their latest report to the Board of Control, amounts to more than five million dollars.—Extensive plans were formulated by the exhibition directors on their recent visit to the grounds. It was proposed to erect the Transportation Building on Dufferin street directly opposite the Manufacturers Building and to build a a wharf for the acommodation of the Niagara and Hamilton steamers.—Recent building permits include:—T. Lewis, 1 pair semi-detached 2½-storey brick dwellings, Davenport road, $6,000; D Wagstaff, 1 pair semi detached 2-storey brick dwellings, Winnifred avenue, $4,000; R. Smith, 2-storey brick dwelling, Dovercourt road, $5,000; E. H. Sabine, 2-storey brick dwelling, Leslie avenue, $2,300; C. A. Grant, brick dwelling, Pape avenue, $2,300; Traders Bank, alterations to bank, corner Adelaide & Bay streets, $5,000; Wm. Stollery, 2 detached 2½-storey brick dwellings, Cottingham street, $7,400; Aluminum Crown Stopper Co., 5 storey brick factory, Parliament street, $50,000; S.S. Booth and H.M. Bell, 1 pair semi-detached 1½-storey frame dwellings, Woodward avenue, $2,000; O. Hoover, 2½-storey brick dwelling, College street, $3,000; Mrs. E. Todd, 2-storey brick dwelling, Emerson avenue., $2,500; F. S. Duff, pair semi-detached 2½ storey brick dwellings, Beatrice street, $6,000; W. Wood, pair semi-detached 2-storey brick dwellings, College street, $6,000; Mrs. S. L. Gain, 2½-storey brick dwelling, Lynwood avenue, $4,500; H. S. Mara, 1 pair semi-detached 2½ storey brick dwellings, Dovercourt road, $4.500; Bank of Hamilton, 3-storey brick bank, corner College streets and Ossington avenue, $25,000; Wm. R. Kay, pair semi-detached 2½-storey brick dwellings, Deleware avenue, $6,000; W F. Cousins, 2½-storey roughcast dwelling, Eastern avenue, $2,800; G. McLaughlin, 2-storey frame dwelling, Hambley avenue, $2,500; Alfred Snuggs, 3 attached brick stores, corner Gerrard & Mutual streets, $2,400; Robert Beatty, 2-storey & attic brick dwelling, Parkway avenue, $3,500; H. A. Gunn, 2½storey brick dwelling, Humbolt avenue, $5,000; Frank Unser, 3-storey brick store & dwelling, College street, $3,900; Helpert Bros., alterations to warehouse, York street, $2,000; H. Galbraith, 2-storey brick dwelling, Major street, $2,000; M. Courtmanche, pair semi-detached 2-storey brick dwellings, College street, $4,500; John O'Neil, addition to billiard room, Queen street, east, $3,000; J. B. O'Brien, 2-storey & attic brick dwelling, Scarth road, $30,000; Canada Chemical Mfg. Co., Ltd., galvanized iron storage shed, Mill street, $2,000; S. Prest, brick store and dwelling, Dundas street, $3,000; John Inglis Co., 2-storey brick pattern shop, Strachan avenue, $3,000; J. Whealey, pair 2½-storey semi-detached brick dwellings, Victor avenue, $5,000; E. B. Shuttleworth Chemical Co., Ltd., 3-storey brick factory, Wilton avenue and Victoria street, $25,000; S. W. Johnston, pair semi-detached 2-storey brick stores and dwellings, Manning avenue, $8,000; J. Hulmer, 2½-storey brick dwelling, Wallace avenue, $1,800; Cameron Stewart & Co., 2 detached 2½-storey brick dwellings, Alhambra avenue, $7,000; Henry Davis, 2-storey brick dwelling, Perth avenue, $2.000; W. Pinkerton, pair 2-storey semi-detached brick dwellings, Concord avenue, $4,500; estate Walter Lee, 2-storey brick store and dwelling, Queen street, $3,300; J. W. Walker, 3 attached 2-storey brick stores and dwellings, Bloor street and Albany avenue, $10,000.

CONTRACTS AWARDED.

COLBORNE, ONT.—Kastrer & Porter of Wiarton, Ont., have secured the contract for the new dock.

STONEY RIVER, MAN.—The contract for the new school building has been let to Conrad Glaum at $3,000.

CALGARY, ALTA.—The contract for the new 3-storey building for the Golden West Brewery has been let to Woodward & Co. of this city.

(Continued on page 6)

IMPERMEABLE CONCRETE.

One of the most desired characteristics of concrete at the present time in connection with its physical resistance to the results of loading is impermeability to water. Although the ultimate compressive resistance of the strongest concrete is far below that of the best natural building stones, it is high enough to meet the exacting requirements of masonry in most engineering structures, and its lack of tensile resistance is effectively cured by steel reinforcement. In spite of the fact that its real merits, intrinsically of a high order, have at times been greatly exaggerated and grossly overworked by ignorant and ill-judged advocates, concrete is rapidly becoming one of the most valuable of all our structural materials for engineering purposes, if, indeed, it has not already reached that position. It is employed in many cases where its main function is that of carrying loads, but at the same time where the quality of real impermeability would add greatly to its value. This is not only true in an extended range of engineering structures, such as dams and aqueducts, but also in its application to buildings both en masse and in blocks. If concrete could be given a truly impermeable character its value would be greatly enhanced and its field of usefulness would be even more rapidly extended than at present.

The great obstacle heretofore experienced in making concrete waterproof has been its highly porous character. With the dry mixtures used in times past, the porosity of concrete was excessive and not the least of the many advantages accruing to the use of wet mixtures is the greater solidity or density conferred upon the mass. A wet mixture not only causes all portions of the mass to run together in greater solidity but it enables the finer materials of the aggregate to flow freely and thoroughly into the spaces between the coarser particles, thus producing a much more nearly continuous and dense interior mass. This means obviously a greatly reduced permeability to water or a much enhanced capacity to resist seepage through it. In fact, if the cement were ground sufficiently fine to enable it and the finest parts of the sand to enter freely into all the interior spaces of the aggregate, a waterproof material under high intensities of pressure would result; but the wettest mixtures which it is possible to use neither eliminate all the air bubbles nor fill all the interior spaces. However, much care may be taken in securing a thorough and intimate admixture of the component parts, all porosity is not eliminated and some seepage results under pressures of forty to sixty pounds per square inch or even less.

If suitably mixed concrete could be put under a high pressure before the initial set takes place, so as to squeeze out all air and surplus water, should there be any, in much the same way as molten steel is compressed, in order to produce grades of that metal of special value, it is altogether probable that the resulting density would be sufficient to secure essential impermeability under very high heads. This obviously is impossible, but some recent investigations appear to indicate that there may be other simple means of attaining the much-desired quality of impermeability. In a discussion by Mr. Richard H. Gaines of the paper presented to the American Society of Civil Engineers in April of the current year by Messrs. W. B. Fuller and S. E. Thompson, there are set forth some results of tests made to determine the effect of the addition of certain substances on ordinary concrete mixtures. In the search for materials which may enhance the waterproof character of concrete it is clear that none must be used which will prejudice the resistance or durability of the mixture. Mr. Gaines, who is the chemist of the New York Board of Water Supply, shows that the addition of small percentages of alum solution and fine clay to Portland cement mortar and concrete enhances greatly the impermeability of the mixture and that both compressive and tensile resistances were increased. Although the number of the tests was relatively small and the life of the test specimens was not long enough to settle conclusively such a question as that under consideration, the results obtained show that the line of investigation followed is worthy of being carried further in order to determine just what value may be attached to the mixtures of such materials as were employed with the usual proportions of cement, sand and gravel or broken stone in the manufacture of mortar and concrete.

It has been indicated by tests that, contrary to the former opinions of engineers, the presence of small percentages of fine clay of a suitable character and properly mixed does not necessarily injure the strength of concrete, and it has also been shown that the same mixture may aid in attaining more nearly waterproof qualities. Up to the present time, however, investigations of this kind have not been carried far enough to give quantitative results of sufficient range for practical purposes. It has generally been considered that the effect of fine clay in reducing the porosity of concrete was wholly mechanical, but the modern view of physical chemistry, so to speak, may disclose a different significance to the results of use of fine clay for such a purpose. With the modern wet concrete mixtures, the presence of the clay is asserted by Mr. Gaines to induce a colloidal action which is apparently aided by such a solution as that of alum, so that the result is a modification of the interior mass, tending to eliminate ordinary porosity.

There is nothing new in the employment of an alum solution as well as various soap solutions to afford concrete a certain degree of impermeability to water, but the purpose hitherto has been to produce an impermeable surface rather than an impermeable mass, which the results of Mr. Gaines' experimental work appear to indicate as attainable. The great advantage of securing an impermeable or waterproof mass of concrete over surperficial effects is so clear as to need no comment. This observation is especially pertinent to all reinforced concrete work, in which it is of the first importance to protect the steel reinforcement from corrosion. At the present time it is difficult to imagine any greater benefit to be conferred upon all classes of concrete work than to find some simple and effective method of making it waterproof under reasonably high pressures. An investigation should include tests with hydrated lime and the various proprietary waterproofing compounds now extensively used, some of which seem to be giving good results when added to the usual concrete mixtures.—Engineering Record.

LARGEST CONCRETE ARCH BRIDGE IN THE WORLD.

The highway bridge carrying Walnut Lane over Wissahickon Creek in Fairmont Park, Philadelphia, is a concrete structure 585 feet long, 60 feet wide and about 150 feet in height above the surface of the water. The main span, 233 feet long in the clear, has a rise of 70 feet 3 inches, and is flanked by five full-centered approach spans of 53 feet. The main span is the longest concrete arch in the world, and the third longest masonry arch of any description.

The footings of all piers and abutments were carried down in open excavation to solid rock, which in all cases was dry and developed ideally rugged surfaces in sound, hard material from about 5 to 20 feet below the original surface of the ground. The foundation pits were excavated by hand and only in a few cases required any sheeting. The footings were built with 1:3:6 concrete and were made solid to a level above the surface of the ground, where for each pier they receive two shafts carrying the separate arch ribs.

A NEW METHOD OF SOLDERING.

A new method of soldering has been brought out by a German company at Bonn and is claimed to be much superior to the present way of soldering with tin. The new solder, which is called "tinol," is in the form of a paste which is more or less consistent, according to the needs. It contains the cleaning substance in itself and the soldering can be done without any previous cleaning. The paste is spread upon the metal surfaces and these are heated with the iron or by a lamp or furnace. For small pieces a candle flame is even enough. The substance is composed of lead and tin in fine powder, which is obtained by a patented process. A stream of metal coming from a nozzle is pulverized by compressed air or steam. The powder is then mixed with chloride of zinc or other similar reducing substances which are made fluid by adding glycerine, vaseline, etc. Consistence is given the paste by using cellulose, which burns without residue.

The Montreal Builders' Exchange have succeeded in having a representative appointed to the corporation of the Montreal Technical Schools to be established shortly in that city. Mr. Eugene McGrath Quirk, of Rogers & Quirk, is the appointee.

Members of the Ottawa Trades and Labor Council are authority for the statement that they will put in the field members for both the Dominion and Provincial Houses at the next election, whether there is a bye-election or a general one. It is also said a labor candidate will run in Labelle against Bourassa.

Mr. John M. Lyle has been appointed by the Architectural Eighteen Club of Toronto as correspondent of that organization to communicate with the American Institute of Architects, who are endeavoring to bring into closer relations the many architectural associations scattered over the American continent.

It is expected that a greater number than the 216 who forwarded plans for The Hague Palace of Peace will have competed. London has supplied at least fifty competitors.

A prize of 200 guineas goes to the winner, who will, of course, be entrusted with the task of carrying out his design. The remuneration of the architect responsible for the construction of the hall will be 4 1-2 per cent. on the total cost, or very nearly £40,000.

QUEBEC, QUE.—Madden & Son have obtained the contrac to install the water works system for the parish of Notre Dame de Quebec. at $94,000.

ST. JOHN, N.B.—D. C. Clarke has secured the contract for building a platform for the new warehouse at $1,179. Clarke and Adams also tendered at $1,600.

TORONTO, ONT.—Simpson & Young, architects, 17 Toronto street, have awarded the following contracts: Berck's Hotel, Parliament and King streets—masonry, Wickett Bros., capentry, J. McKenzie; Strand Hotel, Victoria street—masonry, Claxton & Son, carpentry, J. McKenzie.

MONTREAL, QUE.—P. McGovern, the Boston contractor whohas the conduit contract, has awarded a sub-contract for excavation and rock work to the J. W. Harris Company, of Quebec.—When the tenders for repairing fire station No. 20 were opened recently the lowest was that of Labelle & Lussard, $26,900.

FIRES.

Buildings of Alderman Smith, P. Burns & Company, and others at Edmonton, Alta, loss $5,000—Warehouse of Matchett & Hampton Sedgewick, Alta., loss $4,000.—C N.R. storehouse at Winnipeg, Man., loss $20,000.—West End Baptist Church, Halifax, N.S, loss $8,000.—Buildings of J. Murchie & Sons and J. P. Michaud, Edmunston, N. B., loss $7,000.—Frame warehouse of Singer Sewing Machine Company, Brandon, Man., loss, including stock, $7,000.—Methodist church, and buildings of W. H. Bartholomew, Vanessa, Ont., total loss $10,000.—Buildings of Canadian Co-operative Company, Hamilton, Ont., loss, including stock, $15,000.—Sash and door factory of R. Leeder & Son, and dwellings, Toronto, Ont., loss $60,000.

BY-PRODUCTS FROM FIR WOOD.

According to the Pacific Lumber Trade Journal, the problem of successfully extracting valuable by-products from Douglas fir has apparently been solved by a Puget Sound company. From a cord of stumps or of wind-shake wood the company have obtained turpentine, wood spirits, tar, pyroligneous acid and chemically pure charcoal, having an aggregate commercial value of $28.60, which the outside cost of production is but $12.00 per cord. The test was made with a cord of ordinary fir wood. The first treatment consisted of passing superheated steam through the chipped wood to obtain the basis for the turpentine. The chips, after this process, were placed in a fire retort and reduced to charcoal, the other products passing off in the form of gas, which, being condensed, furnished the basis for the tar and creosoting materials. The two liquids thus obtained were distilled, and the following final products obtained as a result of the test with one cord of wood; 7.85 gallons of pure turpentine; 17.14 gallons of second grade turpentine, or wood spirits; 88 gallons of high-grade tar; 138 86 gallons of pyroligneous acid; 880 pounds (55 bushels) of chemically pure charcoal.

The lumber firm of Girard & Leclerc, of St. Lucinen, Quebec, are reported to have dissolved.

CONCRETE FOR MINING PURPOSES.

The following extract from an article on Reinforced Concrete in Mining Operations, by Mr. J. H. Hart, a physicist of eminence, goes to show the permanency of concrete for mining purposes where mining operations are conducted for many years in long lines of passageways which are a constant source of expense in repair and renovation. The article says there is no reason why many of the mines in existence to-day should not be finished through a large portion of their interior as completely and permanently as many of the tunnels of railroad companies or of those existing in the large cities. Both have become practically permanent institutions and as such should receive proper treatment. The great diminution in the cost of cement renders this not only possible, but an extremely desirable feature at the present time, with not only a saving in the cost of installation, but also an improvement in the means of communication and a preventative of many serious accidents. Thus much of the danger due to fire in mines would be removed. The mines could be kept cleaner, ventilation could be accomplished more easily, and the possibility of firedamp, common in many coal mines, would be almost completely removed if the face of the coal or other material was entirely cut off by a layer of concrete, except at the working front.

A MAMMOTH TILE PAINTING.

The Royal Porcelain Manufactory at Meissen, Saxony, has just executed one of the largest tile paintings in the world. The painting measures 300 ft. long and is 30 ft. high. It is now being set up on the outside walls of the Castle at Dresden. The subject of the painting is the princely procession of the House of Wettin. There are 25,000 tiles in this painting. They were burned in fifty porcelain kilns. The size of the tile is 210 millimetres square (about 8¼ in. by 8¼ in.). The tiles were made by the dry press process, first biscuited, then painted, and burned the second time at the regular porcelain heat. It took two years to manufacture the work, and the same was executed under the personal supervision of Prof. Sturm for the first year, and later under supervision of the artist Grust.

At a recent meeting of the International Waterways Commission the question of damming the Rainy River for the purpose of generating power at a point somewhere below Fort Frances was favorably discussed. The project would cost half a million dollars.

THE COST OF INDUSTRIAL SERVICE.

A peculiar feature of many industrial organizations, says the Engineering Record, is the difficulty with which actual operating costs are determined for separate departments or classes of service. Questions of engineering are so often involved in these problems that it is worth while to consider some of the weak spots in the study of costs, especially in technical plants. It is very important for some of these organizations, particularly public service corporations under the fire of popular criticism, to be able to determine with a fair degree of accuracy what it costs to serve different classes of customers. Such information may be withheld from publication advisedly, but if a company does not know what its service costs in detail, it is certain to be misunderstood by outsiders. The idea is widely held that failure to figure detail costs of service covers abnormal profits. The central station ought to know fairly closely what it costs to serve a suburban customer in comparison with a heavy consumer in the business district, and the telephone company ought to have some reasonably good method of finding out what party line service costs it as compared with private line service. The manufacturing plant ought to know pretty closely the total operating expenses and fixed charges, either in its different departments or for a given class of products.

It must be admitted that the determination of such costs is a complex problem in many instances. The mere fact that two kinds of coal are burned in different furnaces in a plant, for example, means that every pound burned must first be weighed and charged against the proper process or furnace, if the fuel cost in each furnace or process is to be known. This simple case is often overlooked, and the total amount of each kind of coal burned recorded without reference to the use which was made of it. Perhaps it is guessed what each process took in fuel, but the total figures are generally given alone in such cases, or lumped in the total of the entire operating expenses of the plant. The fact is that the combined experience and judgment of the accountant and the engineer are needed in all but the simpler problems. The classification of accounts needs the scrutiny of the technical staff before it is established as a standard method of analysis.

The engineer can help in securing these segregated costs more than is often realized by the commercial man. Financial problems are closely associated with the planning of all important tasks in engineering, and the money side must be recognized in operation, no less. Just as in buying materials and equipment the engineer can save the non-technical purchasing agent endless trouble if he is consulted at difficult junctures, so can he help the auditor and the bookkeeper in unravelling the intricacies of new technical combinations and relations in a growing industry. In the routine determination of costs the engineer can make certain that proper methods of measuring power, of counting and weighing materials, and of figuring labor costs are practiced. As a general rule, a physical separation of materials, supplies or products at the right time in the manufacturing process is the fundamental requisite for the securing of an accurate basis of cost calculation. This is the task of the betterment engineer and the production expert in a great many cases, but it is within the province of the regular engineering staff of a company to provide the necessary facilities for keeping an accurate count or measurement of the substances and agents pressed into its service and to be included in the separated operating expenses of the organization.

General expenses and fixed charges deserve the examination of the engineer in many of these companies, no less than pure operating expenses. The actual amounts of money diverted to this or that use is not the point at issue so much as the principle by which the charges are made. Knowledge of construction and replacement expenses can often be supplied by the engineering staff with far greater accuracy than is obtained from non-technical clerical figures. Arbitrary assumptions are no doubt often necessary in estimating general and fixed costs, and here technical knowledge of the conditions of a given industry is a valuable check upon the errors in judgment natural to the clerical department obliged to deal on its own initiative with involved relations between processes and employes.

RECORD IN BRICKLAYING

In the erection of the office building for the House of Representatives adjacent to the United States Capitol at Washington an interesting fact has developed in connection with the brick masonry work.

The first brick was laid at the site on the afternoon of July 5, 1905, and on July 3, 1906, there had been laid in the wall 11,000,000 bricks. This is believed to be the greatest number of bricks laid on any building in one year in the United States and probably in the world.—Building Magazine.

According to Thomas A. Edison it will soon be possible to have your house constructed "while you wait." The idea of a three storey concrete dwelling erected within twelve hours at a cost of one thousand dollars might not seem very feasible to many practical builders, but the great inventor himself has every faith in his proposition and is going to push it to the utmost. He says that it will mean "a revival in architecture"; it would certainly revolutionize the building trade.

NEW COMPANIES.

Charles T. White & Son, Limited, East Apple River, N.S., incorporated as lumbermen, capital $100,000. Incorporators, Charles T. White, S. N. White and M. A. Leonard, all of Sussex, N.S.; M. G. White, of East Apple River, N.S., and others.

Detonite Explosives Limited, Montreal, Que., incorporated, capital $150,000. Incorporators, J. H. Redpath, H. E. Borradaile, J. C. McKay, W. Bovey, all of Montreal, and W. F. Kay, of Phillipsburg, Que.

North Star Lumber Company, Limited, Brandon Man., incorporated, capital $500,000. Incorporators, John Hanbury, of Brandon, Man., W. J. Bettingen, Andrew Kelly, R. T. Riley and J. A. Manning Aikens, of Winnipeg.

Blue Pills Company, Limited, Montreal, Que., incorporated, capital $20,000. Incorporators, L. Jette, J. A. Bohemier, J. Lussier and J. A. Lapointe, all of Montreal.

Nepisiguit Lumber Company, Limited, Bathurst, N.B., incorporated, capital $100,000. Incorporators, F. S. Morse, of Springfield, Mass.; H. B. Curran, of Bathurst, N.B.; A. W. MacRae, F. E. Sayre and A. I. Trueman, of St. John, N.B.

Yukon District Gold Mining Company, Limited, Toronto, Ont., incorporated, capital $5,000,000. Incorporators, J. S. Lovell, W. Bain, R. Gowans, E. W. McNeill and J. S. Bisgrove, all of Toronto.

George Hall Coal Company of Canada, Limited, Montreal, Que., incorporated, capital $200,000. Incorporators, George Hall and J. C. Howard, of Ogdensburg, N. Y.; Arthur G. Yates, of Rochester, N.Y., and C. G. MacKinnon, of Montreal, Que.

The Lord Bishop of Montreal is carrying on a building campaign there, endeavoring to raise funds for the building of six new Anglican churches in the suburbs.

PREVENTION OF FAILURES IN CONCRETE CONSTRUCTION

In the following I wish to present my views on the merits and limitations of cement and concrete and on the causes of failure in concrete construction, and I will suggest means for the prevention of such failures. In doing so I will take my stand between the manufacturer and the user of cement, that is to say, I will discuss this subject as consulting engineer who is familiar with both the details of the manufacture of cement and its chemical and physical properties and with the use of cement as building material. I will not side with either the manufacturer or the consumer, but will endeavor to point out what can be expected of cement and what not. The manufacturer frequently greatly exaggerates the advantages of cement. According to him there is hardly anything in the building line that cannot be made of concrete. On the other hand, the engineer and architect, who are frequently not acquainted with the intrinsic value of cement, with its physical and chemical properties, frequently make unreasonable demands and misinterpret the failures in concrete construction that unfortunately so often occur. To my mind, the best and surest way to advertise cement, to recommend concrete construction, and to give the engineer and architect confidence in this modern building material, would be to minimize the danger of failure as far as possible by proper building ordinances, which would compel the contractor to handle the material in a prescribed way and to make proper tests.

I shall dwell only in a general way on the wide possibilities of concrete construction and point out a few cases where concrete cannot be used:

Concrete offers great resistance to compression, but only comparatively slight resistance to tension. Therefore we can make use of plain concrete in cases in which it is subjected chiefly to compressive stresses, for instance, in foundation work, walls, piers, and columns. In all other cases, where it has to resist tensile stresses, as in girders, beams and floors, we have to reinforce it with steel of high tensile strength. The union of concrete and steel thus obtained can be made to fulfil any requirements as to compressive and tensile strength, according to the greater or lesser amount of concrete or steel used in each special case. In some cases the compressive strength of the steel is made use of at the same time as its tensile strength, namely, when the dimensions of the concrete work have to be reduced to a minimum, as often in columns and piers.

Piers and columns are often reinforced by plain round rods, placed near the circumference and connected by wire or ties. This kind of reinforcement is liable to be the cause of disaster, if an insufficient percentage of reinforcement is used, either in the designing or by negligence of the contractor, who may omit some of the bars. Columns insufficiently reinforced by bars, fail suddenly by pushing the steel rods apart. A safer way of reinforcing columns is to make use of spiral reinforcement. Such columns fail by bending and give ample warning before failure. There is a creaking noise of the compressed concrete and scaling off of the concrete on the surface of the columns; then the column is slowly bent out of shape before it collapses. This kind of reinforcement, therefore, should be used exclusively for columns which have to sustain heavy loads.

Girders and beams are reinforced by tension rods which are imbedded in those parts of the concrete which are subjected to tensile stresses. The reinforcement consists either of several single bars, horizontal and partly turned up, which are held in place by stirrups or U-shaped iron, or by bars which present a rigid combination of bar and stirrups. This latter method is much safer, because it makes it impossible for the contractor to omit some of the stirrups; moreover, all parts must necessarily maintain their relative positions with respect to one another and chances of defective work from faulty place of steel are largely avoided.

Floors and ceilings are likewise reinforced by steel rods imbedded in the lower part of the layer of concrete to take up the tensile stresses.

In all cases the mechanical laws that govern this type of construction are the same as in steel construction; therefore, the methods of calculation are the same. The only difference is that in steel construction we have to deal with but one kind of material, while in reinforced concrete construction we have to figure with two kinds of materials of entirely different physical properties. Of these we let the concrete as a rule take care of itself, whenever compressive strength is required, and call upon the steel reinforcement only where tensile stresses occur.

Modern methods of reinforced concrete construction frequently make building possible on grounds on which other materials can not be used. For instance, in places where wooden piles would rot, reinforced concrete piles are driven, and on sites where the soil cannot be depended upon, as on river banks and sea shores, a solid foundation is obtained by a reinforced concrete raft, which transmits the load over the whole available area and which, owing to its rigidity, does not give way, even if there should be a settlement of the ground at any particular point.

The monolithic connection of foundations, columns, girders, beams and floors, on account of its unequalled rigidity, is a decided advantage over the freely supported girders and beams of wood and steel construction. This is particularly true in places where earthquakes have to be considered.

However, concrete cannot be used everywhere, as there are some limitations to its use. In some parts of the country cement is too expensive, or good sand or crushed stone cannot be obtained. In others the high cost of lumber for forms excludes concrete construction. This latter point becomes more and more serious from year to year with the growing advance in the price of lumber. The cost of the wooden falsework and the labor cost of installing and removing it amounts sometimes to 50 per cent. of the cost of the structure. In such cases another method has been adopted, which does away with a large part of the

lumber, namely, the casting on the ground of columns, beams, girders and floor slabs, which are afterwards hoisted and erected as with structural steel work. This saves the centres and supports and reduces the cost of erection but at the same time it sacrifices the main advantage of concrete structures, namely, the monolithic character.

The erection of a concrete building, as a rule, takes considerably more time than that of a steel structure, at least if it is done with care and if all parts are given plenty of time to set before removing the forms. This is a serious item in the cost of the building, in case of a large office building or hotel, because every month which it takes longer to erect the structure means a considerable loss in rental from the building. Some cases, however, have been pointed out where the erection of a concrete office building has not required more time than that of a steel skeleton building. But such practice is extremely dangerous and should not be approved unless the contractor can demonstrate by continuous tests that the concrete work is strong enough to sustain the super-imposed load and that he is justified in removing the forms.

The principles governing modern reinforced concrete construction are thoroughly understood by comparatively few. This explains the divergence of opinion on many points pertaining to this branch of the building industry.

While some engineers are careful to specify concrete of ample strength, others blame such "overcautious" builders for making use of an excessive factor of safety. The aim is, of course, to reduce the cost of concrete as far as possible in order to give it the widest application possible. But if engineers fail in their efforts to prove that for a given case concrete work would be less expensive than steel construction, they frequently blame the cement for it, and we can hear all kinds of theories advanced. They will say, for instance, that cement is not sufficiently uniform at present, and they claim that if cement could be so manufactured as to give as uniform tests as does steel, it would be possible for the engineer to reduce the larger factor of safety now demanded for concrete over that required for steel. Such a statement is entirely without foundation. Cement is manufactured of sufficient uniformity now-a-days, at least by plants which can depend upon uniform raw materials. Cement can be manufactured as uniform in quality as steel. But in comparing the cost of steel and concrete construction and their respective safety factors, we are not allowed to compare steel with cement, but steel with concrete. Steel is a well-defined chemical compound rolled into the desired shape. Concrete, on the other hand, is the sum of a number of factors, namely, of cement (a chemical compound equally well-defined as steel and ground to the desired fineness), of crushed stone, of sand, of water, of workmanship and of a great deal of care, a combination of which cement is a comparatively small part. The calculation of a steel girder and that of reinforced concrete girder or beam can never be based on equal safety factors, no matter how much the properties of cement may be improved in the future.

Moreover, cement will not be improved in the fu-

ture; we have arrived at the limit of its good qualities. In making this statement, I refer to Portland cement, of which every builder in this country thinks, whenever the general term "cement" is used. Why can Portland cement not be improved? In order to be able to answer this question, I must remind you that Portland cement is a product obtained by calcination of an intimate mixture of finely pulverized limestone and clay or shale, and that it consists of calcium silicates and calcium aluminates. Clay and limestone may be mixed in all possible proportions, but the result from a chemical standpoint will never be anything better than our present commercial Portland cement.

Those of you who know how little attention is frequently paid to thorough mixing of concrete and with what haste the work is done, will understand that poor concrete is a very common cause of failure. The work is often done automatically; crushed stone, gravel, sand and cement are fed into the mixer in the desired proportions from individual hoppers. Unless the supervision is very severe in such a case, it may happen that one of the hoppers chokes and the material flows less freely, thus entirely changing the proportions of the concrete. Such unintentional mistakes amply suffice to bring about disaster; but if to these intentional carelessness is added and the concrete is weakened wilfully, hardly anything but failure can be the result.

One or the other of the above mentioned weaknesses in the design or in the concrete work may be present in any concrete construction, and the contractor can never be absolutely sure that his building will not collapse on removing the woodwork from under the floors and girders, as long as he proceeds in the way he has so far. The time of removal of the centering is the critical one and the time when accidents are most likely to happen. In many cases the forms are removed when the concrete is still quite soft; it may not have had time enough to harden or the concrete may have been spoiled while being mixed, or concrete partly hardened may have been stirred up again and mixed with additional concrete. The reasoning of the contractor will generally be, that it has had time enough to harden and that the forms and supports must come down, because they are needed at some other part of the building. Moreover, a floor that may have set for a sufficiently long time to carry its own dead load, has frequently to carry the supports and floors of one, two or even three storeys above it, which are in the course of construction. The floor may not have been designed for such a load at all or at least it cannot be expected to carry several times its own dead load after so short a time, but nevertheless the contractor will strike the centering, when he should know that the collapse of the floor panel is almost inevitable.

What can be done to prevent such reckless building? Shall the careful contractor suffer for the negligence of the incompetent builder, as is now the case? Every additional report of the failure of a concrete structure tends to decrease the confidence of the public in this construction. Can something be done to make it impossible for the contractor to erect buildings of improper design or to remove the wooden supports before he has convinced himself and the building inspectors or the agents of the owner of the structure, that every part of the building is amply strong to carry the load for which it has been designed?

In my opinion failures can be materially lessened, if not entirely be prevented, by proper building ordinances which make it compulsory to use concrete of specified proportions of crushed stone, sand and cement, to use the proper kind of reinforcement in each case and the necessary amount of it. Certain standard rules should be laid down by a board of building examiners and certain types of reinforcing material should be excluded where they are not in their proper place. In addition to these points, which refer to the designing of the structure, the erection of the building should be accompanied by continuous tests of the concrete that goes into the construction and the builder should be compelled to inform himself of the strength of each column, girder, beam and floor slab before striking the forms and placing the load upon them.

In the construction of floors it should not be allowed to erect the woodwork for the next floor above it on the green floor. This method of building floors imposes too much of a load on the fresh concrete. The forms for the floors should be supported independently of the floor underneath by inclined posts, so that the weight of the forms and floor shall rest upon the columns and girders and not upon the floor below. Or in case the former method of construction is adopted, the centering should be removed only when the top floor or roof has set hard, and then the removal of the planks and supports should begin at the top and not at the bottom, so that a comparatively fresh third floor has not to sustain the load of three or four floors above it with all the woodwork between them.

The requirements of which I have spoken so far dealt with the design of the structure or the method of erecting it. We now have to discuss such methods for testing concrete as might reasonably be forced upon the contractor in order to assure success.

From my previous description of negligent concrete work you will have seen that it is not at all sufficient to test the cement, crushed stone and sand. The contractor may have the best materials on the ground that can be imagined for the purpose, and he may make them into a weak concrete and his work may result in failure notwithstanding skilful design and proper and sufficient reinforcement. Therefore I regard it as the most important point in concrete construction, that every contractor who undertakes to erect buildings more than one storey high should have a small shed on the grounds which is more or less equipped as a testing station according to the amount of work he undertakes.

The main equipment of such an experimental station should be a powerful hydraulic press which enables him to crush 6-inch concrete cubes. During the course of construction he should take a sample of the well-mixed concrete that goes into the construction work and should fill a mould with it at the time the concrete is being tamped into the forms. This should be done for every cubic yard of concrete that goes into the columns, girders, beams and floor slabs; it might be done less frequently with foundation work,

where larger amounts of concrete are involved. The moulds should be set aside and should be numbered, so that for each test piece it is known with which part of a column or with which girder or beam it corresponds. Then before striking the forms the contractor should crush his test cubes and determine their resistance to compressive stress. This alone will tell him whether or not he can safely remove the woodwork. There should be several test cubes for every 5 or 10 feet of a column or girder, so that an everage from 2 or 3 tests is obtained and that still some test pieces remain for future dates, if the strength is not found to be satisfactory, when being tested the first time, and if consequently the concrete work has to be allowed to harden for an additional week or two. Such tests would show the contractor at which part of his construction weak concrete has been used. He should have to give that special part of the building more time to harden or can remove it in time and replace it by better concrete, if he notices that the set cubes which he keeps do not increase in strength from week to week.

The figures which the contractor obtains from his test cubes submitted to compressive strength will enable him to calculate the load that a column is able to sustain. He knows by experience or from observations of competent experimenters how much he is allowed to add to the strength obtained by his test for every per cent. of reinforcement of a certain type which he has imbedded in the concrete.

In order to attain the desired results the co-operation of everyone interested in concrete construction is necessary. All experimental stations equipped with the proper testing apparatus should offer their services for the sake of public welfare, and every builder and contractor should in his own interest see to it that such laws and ordinances are drawn up and enforced. Only this will make concrete construction a safe enterprise and prevent it from falling into discredit. The commissioners of buildings of our large cities would have to take the lead in this movement and to consult competent men on the subject, so that everything might be done to prevent failure in concrete construction by enforcing upon the designer and contractor certain standard rules and methods of testing. If all this has been attained, reinforced concrete construction will become the most widely used method of building. But, so far, concrete is the building material of the widest possibilities and yet the most unsafe to use.—Abstracted by Canadian Cement and Concrete Review.*

Masons or anyone who intends laying blocks, says a writer in the Journal of Modern Construction, should carefully dampen the edges or parts that are to receive the mortar or that bind with the mortar. By doing this, you may eliminate the possibility of future trouble. Mortar should not set too fast, and if the blocks are dry, they may to some extent suck the moisture from the mortar, and this would leave mortar joint porous and spongy, and in that case a heavy rain might soak through the joint, and the dampness would be blamed on the blocks. You probably have noticed that, before laying bricks, they are thoroughly wet by the use of the hose.

* From a paper by Dr. W. Michaelis, M.W.S.E.

ENGLISH CRITICISM UPON THE QUEBEC BRIDGE.

The following is an extract from an interesting article entitled "Lessons from the Quebec Disaster," recently published in the London Builders' Journal: "The evidence of those who were on the scene at the time of the disaster is rather contradictory, and the wreckage is of such a nature that the portion the weakness of which was the primary cause of the collapse can scarcely be determined by a casual inspection. It would, however, appear fairly certain that the portion projecting over the river did not fall first, otherwise the shore end would have stood up, or, at any rate, taken some time to collapse, and such a fact would have been noted by onlookers. The failure, then, must have occurred in the shore arm of the cantilever. It would seem that one of three parts of the structure must have been the primary cause—(1) the top tension members, (2) the main tension members, (3) the bottom compression chord. If the failure had first occurred in the top tension members a loud report, or a series of reports, would have been heard, as a first sign, but this does not seem to have occurred; furthermore, from the examination of the wreckage, these tension members seem to have remained intact. If only the main truss members above deck level had failed first, it would have been noticed by those working on the bridge, while a lateral swinging would have been caused, whereas the wreckage shows that the trusses fell in the plane of their original position. We are left with the third alternative. Not only does the first sign of the collapse seem to have been a sinking of the floor, but a few days previous to the disaster one portion of the compression chord was noticed to have bent laterally, so much so as to cause the superintending engineers to telegraph the consulting engineer, and for the latter to telegraph back that further erection was to be discontinued until a thorough examination had been made. Further, this particular portion has been found among the wreckage, buckled into an S shape, whereas other parts of the compression chord are not so affected. This portion was also slightly defective in manufacture, had suffered accident, and had had to be repaired upon the site. The general conclusion points, then, to this portion of the compression chord as the primary cause of failure. American engineers are naturally on the defensive, and they suggest that as the compression members in this bridge were larger than had been used in any structure before it might be that the data derived from smaller compression members were not applicable to members so much magnified. It is stated that these compression members were designed for a unit stress under full dead, live and wind loads of 24,000 pounds per square inch, which is stated to be about two-thirds of the elastic limit of the metal. Two qualities of steel were used in the structure, one having an ultimate strength of 28 tons per square inch, and the other an ultimate strength of 26 tons per square inch. Judging from ordinary American practice, it is probable that the latter softer quality was used for the compression members. At the time of the disaster the compression members were probably sustaining about 16,000 pounds per square inch. There were several

CLASSIFIED INDEX OF ADVERTISERS

well-known and experienced engineers engaged upon the design and erection of the structure. One of those chiefly responsible has in the past sneered at English engineers in regard to their wastefulness of material in bridge design. The disaster should read a lesson to American engineers. They have reduced their factors of safety very considerably, a procedure which, if justified in some branches of design where they have had more experience than ourselves, is undoubtedly too daring in large structures. In structural members which exceed in size anything that had been built before, such as the compression chords at Quebec, an English engineer would, if possible, have conducted experiments on full sized members before employing them in practice, and if their size prevented this the margin of safety on such members would have been sufficient to remove any doubt. In the case of the Quebec bridge, however, no such experiments were attempted, and, apparently, from the published data, the unit stress in these gigantic compression members was much higher than would have been allowed in English practice for important small members. It is customary to adopt a factor of safety of four upon the ultimate strength of steel, for members in buildings where the estimated load is probably never sustained in the whole life of structure. The elastic limit of the material is, however, the real point upon which our factor of safety must be based. The factor of safety was estimated to be only 1.5 upon the elastic limit of the material at Quebec. In a case such as this, where the actual working load that the structure is called upon to sustain bears a much greater proportion to the estimated maximum load than ordinarily, a much larger factor of safety should have been adopted. An English engineer would have adopted a factor of safety of four upon the elastic limit, and perhaps in consideration of inexperience with compression members of such large size the factor adopted might have been six. This disaster should act as a warning to us to be very careful in this respect. In buildings we consider steelwork is often too heavy, but in important members it would be unwise to reduce the factors of safety customary in England, and architects and engineers should refuse to follow American practice without careful thought."

TORONTO ENGINEERS AND THE QUEBEC DISASTER.

The members of the Engineers' Club of Toronto met together on October 24th for the purpose of discussing the Quebec bridge disaster. The discussion was conducted upon a theoretical basis—there being no details to hand of the construction of the bridge—and the main point of consideration developed into a comparison between the Quebec and Forth structures. Mr. J. S. Fielding, C.E., thought that there was a tendency amongst American engineers to take too great chances, and remarked that the catastrophe would doubtless be a serious lesson. The speaker laid particular stress upon the fact that the Quebec engineers had sought a foundation in 110 feet of water, while the engineer of the Forth structure had a foundation of rock for the principal pier. Then there was the risk of placing too much reliance in Cooper's formula regarding the compression member of a birdge, wherein lay its weakest point; and it was noteworthy that while this standard was employed at Quebec, the British engineers practically ignored it and conducted exhaustive preliminary experiments. After commenting upon the size of the tower of the Quebec bridge, Mr. Fielding concluded by saying that engineers should aim at infallibility in their calculations before bidding for glory in giant works.

The chairman, Mr. J. G. Sing, considered that, owing to the fact that the structure was in the hands of a bridge company, the engineering profession was absolved from all responsibility.

CAUSE OF CONCRETE COLLAPSE

The collapse of a portion of the Bridgman Brothers Company's concrete factory building in Philadelphia on July 10 last is thus described by Mr. Emile G. Perrot, C.E., in "Insurance Engineering."

The building was of concrete cage type, veneered with brick walls. It was three storeys and basement in height; the roof of the north half had been concreted and the south half was being concreted at the time of the collapse. The primary cause of the failure, as witnesses testified before the coroner, was that the props were removed from under the beams and girders of the north section of the roof while the concrete was only about a week old. The fall of the roof caused portions of the third, second and first floors to collapse.

The concrete in the upper storeys was gravel concrete and that in the lower storeys was stone concrete. The test by the city engineer on the concrete after the collapse showed that the concrete in the third storey, which was about three weeks old, stood about 2,000 pounds per square inch, while that in the roof, which was not much more than a week old, stood almost a thousand pounds per square inch in compression.

The real trouble in the building seemed to be the lack of thoroughness with which the work was performed, as well as the omission of vertical reinforcement in the beams and girders. While these were not necessary, from a theoretical standpoint, to resist the horizontal shear, from a practical standpoint the writer considers that they were necessary, especially in the beams and girders where the day's work was stopped, so as to make a metallic bond between the old concrete and the new concrete.

Further, there is evidence that the slab was placed on top of the beam after the concrete in the beams and girders had partly set, thereby making planes of weakness, which are decidedly noticeable in the beams and girders of the first storey, which were cracked by reason of the impact due to the falling mass of concrete. These beams and girders failed through horizontal shear between the slab and the beam, and diagonal tension.

Further, there seems to be a lack of alignment of columns throughout the building, some of the superimposed columns being as much as seven inches off centre with the columns below. In fact one of the wall columns is so far off centre with the one below that another column was cast alongside of it.

The floor system consisted of 4 to 4 1-2 inch slab,

supported upon concrete beams spaced about 5 feet 8 inches on centres, supported upon concrete girders, the bays averaging 17 feet by 20 feet, beams running the 20 foot direction. Calculation showed that there was ample steel in tension to do the work required, but that the 3 inch No. 10 expanded metal in the floor slab was not placed properly in the concrete, the long diameter of the mesh being placed parallel with the beam instead of at right angles to the beam, thereby weakening the slab considerably. However, this does not seem to be the cause of the failure.

There is a lack of tying of one beam or girder into another; also, the roof was very unfortunately constructed, the ridge simply consisting of the slag coming together and no precaution being taken to tie one slope of the roof to the abutting slope; that is, the expanded metal stopped along the ridge without any metallic bond across the ridge.

Numerous other details, which the writer considers important to the successful carrying out of reinforced concrete construction, were slighted, and there is no doubt that the whole building suffered by reason of the "skimping" process that went ont. Whether this was intentional or due to ignorance the writer is not in a position to say. It looks, however, as if it was more ignorance than intention.

This failure is another lesson that goes to show that the work of building reinforced concrete buildings should be entrusted to those experienced in this line of construction and whose reputation for thoroughness is unquestioned.

Mr. G. L. Griffith has succeeded to the position of City Engineer of Stratford, Ont., made vacant by the resignation of Engineer Malcolm who has been appointed lecturer to Queen's University.

NOTES.

The death is reported of Robert Ironsides, formerly assistant city engineer of London, Ont.

The new chapel of Assumption College, Sandwich, Ont., has just been completed by the Blonde Lumber and Manufacturing Co., of Chatham. The architectural sheet metal work on the exterior and interior of the building was done by the Metal Shingle & Siding Co., of Preston, Montreal and Toronto.

The Metal Shingle and Siding Company, Preston, Montreal and Toronto, are now engaged in placing 6,000 square feet of skylights on the new Intercolonial R. R. Shops at Moncton, N.B. They have also just completed installing 6,000 square feet of copper skylight on the extension to the C.P.R. Angus Shops at Montreal.

Mayor Ashdown, of Winnipeg, has returned from England without placing the bonds. He states that his object in going to London was to study the condition of the money market and he has arrived at the conclusion that the present time is unfavorable for the sale of the debentures.

A young architect was puzzling over plans of a building which he wished to make of distinctive appearance. "Just do something to the windows, and you'll be all right." advised an older architect. "It is the windows more than anything else that give a house a char- of its own. Take a trip around any big city and make a study of the houses that hit you square in the eye the minute you look at them, and you'll find in nine cases out of ten that it is some original feature about the windows that gives the place its note of distinction."

Prices of Building Material

PRESSED BRICK, Per M.

TORONTO PRESSED BRICK AND TERRA COTTA WORK

	F.O.B. Milton, Ont.
Red No. 1	$13 00
" 2	11 50
" 3	10 00
Buff No. 1	17 00
" 2	13 00
Brown	25 00
Roman Red	30 00
" Buff	35 00
" Brown	40 00
Hard Building	8 00
" Sewer	8 00
" Backing	7 00

Moulded and Ornamental from $2.00 to $5.00 per 100. Terra Cotta String Courses and Friese, from 50c. to $2.00 per ft. run.
Roofing Tiles, $20.00 per 1,000.

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Please write to head office, 34 Toronto St. Toronto, for catalogue and prices.

BEAMSVILLE BRICK AND TERRA COTTA CO.

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Red Peerless Facing	$16 00
" No. 1	14 00
" No. 2	12 00
" No. 3	10 00
Brown Peerless Facing	20 00
" No. 1	18 00
Buff Peerless	20 00
" No. 1	18 00
" No. 2	15 00

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Roman Red (Size 12 x 4 x 1½ in.)	30 00
" Buff " " "	30 00
" Brown " " "	35 00
Vitrified Paving Brick No. 1	18 00
" " " No. 2	15 00
Sewer	8 00
Roofing Tile	22 00

Sackett Plaster Board, 32" x 36" in size, sold at about 2c. per square foot.

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	Per M. Ft.	
1 inch No. 1 Pine cuts and better	$49.00 to	$51.00
1½ to 2 inch No. 1 cuts and better	54.00	58.00
2 inch No. 2, Pine cuts and better	48.00	50.00
1½ to 2 inch No. 3 cuts and better	42.00	46.00
1 inch Pine Dressing and better shorts	28.00	30.00
1 x 4, 6 and 8 Common	27.00	28.00
1 x 10 and 12 Common	30.00	36.00
1 inch mill run sidings	28.00	29.00
1 x 10 and 12 mill culls	22.00	23.00
1 inch dead cull sidings	15.00	16.00
1½ inch Flooring	32.00	34.00
Hemlock, 1 x 4 to 8 inch	19.00	20.00
2 x 4 to 8 inch, 12 to 16 feet	22.00	23.00
2 x 4 to 10 inch, 18 feet	23.00	25.00
1½ inch No. 1 4 ft. Pine Lath	4.75	5.00
1½ inch No. 2 4 ft. Lath	4.25	4.50
1½ inch No. 1 4 ft. Hemlock Lath		4.00
XXXX Pine Shingles	3.50	3.75
XX Cedar Shingles	2.50	2.75
B.C. Shingles:		
XXX 6 butts to 2 inch		3.85
XXXX 6 to 25-16 inch		4.07
XXXXX 5 to 2 inch		4.50

HARDWOODS—PER M. FEET CAR LOTS.

Ash, white, 1sts and 2nds, 1 to 2 inch	$36.00 to	$38.00
Ash, black, 1sts and 2nds, 1 to 1½ inch	33.00	35.00
Birch, M. R. 1 inch	21.00	22.00
" 1½ inch to 2	23.00	24.00
Basswood, Common and better, 1 to 1½ inch	25.00	26.00
Basswood, 1½ to 2 inch	26.00	28.00
Elm, soft, mill run, 1 to 1½ in.	23.00	24.00
Elm, rock, mill run, 1 to 1½ in.	26.00	28.00
Maple, common and better, 1 to 1½ inch	22.00	23.00
Oak red plain, 1sts and 2nds, 2 to 4 inch	46.00	50.00
Oak, white, 1sts and 2nds, 1 to 1½ inch	44.00	46.00
Oak, quartered, 1sts and 2nds	70.00	80.00

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NOTES.

Brandon building permits to date for the present year total $430,000.

Building permits issued during the current year at Calgary total $1,607,000.

The death is reported of Augustine MacDonnell, a well known engineer and surveyor of Chatham, Ont.

The assets of the General Metal Foundry and Machine Company, Limited, of Montreal, are advertised for sale on November 4th.

The City Council of Ottawa have finally endorsed the proposition for the new $2,000,000 G.T.R. hotel in Major's Hill Park and construction work has commenced.

A new Brunswick exchange reports that owing to the wet summer and other financial drawbacks, McManus & Company, who have the contract for double tracking the I.C.R. between Moncton and Painsec, will probably abandon their contract.

Prof. C. H. Benjamin states in the "American Machinist" that he has found the effect of adding defloculated graphite to oil to be very noticeable. He has made many tests with such a mixture and with the same oil used alone. With one or two exceptions, the addition of the graphite has at once reduced the friction and increased the life of the lubricant. The graphite improved all the varieties of mineral oils which were tried. One-third of 1 per cent. of graphite was tried with two grades of oil under different loads and reduced the coefficient of friction with the better oil about 20 per cent. and with the poorer oil about 23 per cent. One-sixth of 1 per cent. of graphite had a slight effect in reducing the friction of a standard engine oil, and this is apparently about the minimum quantity that can be used with any advantage. It also seems from his tests that the use of this grade of graphite with water has a tendency to prevent rust.

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