The high level steel bridge on the St. Catharines and Niagara Central railway which is designed to cross the Grand Trunk at Merritton will be put in position early in February.

The Cochrane Manufacturing Co., have lately erected a new building, 40 x 54 feet, two and a half stories high, at Dundas. The brick-work was in the hands of contractors Palmer & Hickey.

The number of workmen engaged in constructing the dyke which is designed to protect Montreal from damage by floods, has been doubled, with a view to completing the work on time.

Owing to the refusal of workmen to endanger their lives, the building of the great iron tower, 1,000 feet high which was intended to be the leading feature of the next world's fair at Paris, has been abandoned.

The recent disastrous fire at the Insane Asylum at London, Ont., has led to the consideration of the necessity of laying an 8-inch pipe to connect the institution with the city water works system.

The construction of a swing bridge over the canal at Fenelon Falls, Ont., has been commenced. When it it finished and the new railway bridge built, boats will be able to pass from Sturgeon to Cameron lake.

The contract for the east end of the Cape Breton railway has been taken from contractors Sims & Slater, of Ottawa, whose securities have promised the government to get competent men to push the work on more rapidly.

By the recent completion of three new locks, navigation has been opened on the Trent Valley Canal between Lakefield and Port Perry. The locks are 134 feet in length, 56 feet in width and have six feet of water on the mitre sill.

Toronto builders and plasterers are now charged by the city authorities 2½ cents net per barrel of lime for city water. They are also required to deposit 50 per cent. of the amount usually paid for water during the season. This regulation applies to all brick and stone work.

The Dominion Bridge Co., of this city, are constructing a railway bridge over the St. John river from Fredericton to St. Mary's, a distance of 2,000 feet. The superstructure of the bridge will be put on during the winter. The cost will be about $350,000.

With a view to prevent too rapid, and consequently poor work, the *Engineering and Building Record* advocates a law prohibiting the adding of more than a specified number of feet to the walls of a building in process of construction in one day.

Mr. Y. K. Blatch, of the Department of Inland Revenue Ottawa, has been engaged three years on a large colored map showing the canals and water power of Canada, and competing canals of the United States. The map will also show canals proposed as well as defunct, profiles, lockages, and tables of comparative sizes of locks.

A very nice piece of engineering, by Chief Engineer Hobson, has lately been in progress at the crossing of the Grand Trunk over the Desjardines Canal. A new iron bridge is being put up in place of the old one, piece by piece and the work will be completed without delaying any of the trains.

The Chatham Dredging Co. are engaged in perfecting a drainage system, which, by the aid of earth embankments and pumping machinery, will reclaim some 5,500 acres of swamp land in the township of Tilbury, Ont. The cost of the work will be $45,500, and the undertaking is expected to be complete by next June.

The total number of building societies in the United Kingdom is 1,846; they have a membership of 581,681—an average of 315; they have a total annual revenue of twenty and a half millions sterling—an average of more than £10,000: their total liabilities amount to £51,193,450, and their total assets are returned at £52,931,611.

A few miles beyond St. Thomas, on the Canada Southern railroad, is a very deep ravine, across which an arched bridge about sixty feet long, composed entirely of stone, has recently been constructed. It is very nigh, and said to be the largest arch bridge of the kind in Canada, and is considered a triumph of engineering skill. The bridge is used both by the railroad company and as a wagon road.

On the 9th of Nov. the first truss of the great bridge to cross the Hudson river at Poughkeepsie, was finished and swing clear. It is 525 feet long between the centers of the towers, 82 feet deep and 32 feet wide; and is the largest and heaviest steel truss in the world. It carries a floor system on top for a double track. The piers are of steel 100 feet high standing on masonry piers 30 feet above high water mark. The foundations are sunk 125 feet below high water mark.

The Dominion Subway Company has recently been incorporated with a capital stock of $100,000. Its purpose is to construct and operate underground conduits or other apparatus and appliances for underground electric and other wires and plant and pneumatic tubes. Among its leading members are Messrs. J. E. Hudson and W. H. Forbes, of Boston; Messrs. C. F. Sise, H. McKay, A. Robertson, J. R. Thibaudeau, G. W. Moss and R. Archer, of Montreal.

The Sault Ste. Marie canal has the second largest lock in the world. It is built of solid masonry, 560 feet long, 80 feet wide, with walls 40 feet high, the lift 18 feet, and the depth of the water in the basin 16 feet. This lock belongs to the U. S. Government and cost $3,000,000, and will accommodate, four at a time, the largest vessels ever brought to these waters. A new and still larger lock to cost $5,000,000, is now being constructed. The canal now has a larger daily traffic than the great Suez canal.

The enlarged Welland Canal is regarded as one of the grandest exhibitions of engineering skill in the world. The water level of Lake Erie is over 300 feet higher than that of Lake Ontario, and this canal has been built to allow loaded ships to pass from one lake to the other. For this passage 28 miles of canal and 26 locks are required. The small village of Port Colborne stands at the entrance of the canal. The first lock is built near the entrance, to keep back the washing sea, after which comes a stretch of 14 miles through a farming country to the second lock, after which the locks are located about as thick as possible until Lake Ontario is reached. The greater part of the descent is in the upper half mile of the route, and it takes about 13 hours to get through the canal with no hindrances.

Plans have been adopted and contracts let for increasing the roadway of suspension bridge from ten to sixteen feet. Although the change will practically necessitate the re-building of the structure, it will be accomplished without interfering with railway traffic over the bridge. The present anchor plates on the New York side are 18 feet below the surface of the ground; the new plates will be 50 feet below the surface, 26 of which will be solid rock. The cables are composed of galvanized steel wires ropes 2¼ inches in diameter, seven of these ropes forming one cable, each rope having a separate fastening to the before mentioned anchor bars. There will be one pair of cables on each side of the bridge seven inches in diameter, or four in all. On the Canadian side the anchorages will be similar, except that the anchor will be set 36 feet below the surface of the earth, owing to the fact that the rock comes to the surface of the earth at that point. The present cables are amply competent to carry the additional load of the widened bridge. They are of first-class charcoal iron, but as the moduli of elasticity of steel and iron are not the same it is impossible to equitably divide the load between the two sets of cables of different materials, necessitating the abandoning of the present cables for steel ones. The present suspenders by which the bridge proper is held to the cables are ⅜ wire rope, for which ⅝ wire rope will be substituted. The present truss system of six feet in depth will be changed to iron of twelve feet in depth, and all transverse beams will be of plate and angle iron, the flooring being secured to rolled I beams. The system of overhead stays will be abandoned, owing to the change made in the depth of the truss. It is the intention to abandon the river guys, substituting therefor a lateral wind cable system that will far more effectually perform the service imposed upon the river guys, and thus do away with the damage incident to them by floating ice and falling rocks, which has been an expense of no small amount. The work of stringing the cables has already begun, and the contract calls for the completion of the whole work by 15th April next.

## PUBLICATIONS.

*Dixie*, the handsomest and brightest trade journal published in the Southern States, marked the attainment of the third year of its existence by issuing a special Christmas number, enclosed in cover of artistic design, lithographed in half a dozen colors, printed on the best of paper, and its pages sparkling with literary gems from the pens of some of the foremost writers on this continent. *Dixie's* special number deserves to be called a superb success.

The different fields for trade journals in this country are being rapidly taken up. The unoccupied area has been narrowed during the past month by the publication of the prospectus of *The Canadian Shoe and Leather Journal*, to be published in this city about the first of February by the Journal Publishing Company, under the management of Mr. James Acton. We wish the new venture success.


## BOILERS FOR STEAM HEATING.

By Geo. C. Robb.

A BOILER intended to be used for a steam heating apparatus, should be designed to hold a large proportion of water for the amount of heating surface, and the heating surface should be large in proportion to the grate surface—that is, these proportions should be larger than is usual in boilers intended to be used for steam engines.

The reason for this is, that in a heating boiler a slow fire may be used with great economy, and as the boiler will most likely be often left for a length of time without any attention being paid to the fire, there should be a sort of reservoir of heat stored up in the water.

It is also advantageous in such boilers to have a large quantity of brick-work about the furnace, which will absorb heat when the fire is strong and give it off when the fire is low, and thus tend to maintain a more uniform temperature in the boiler.

Cast iron sectional boilers are often used, but they are most frequently recommended on account of some other reasons than their real value as safe and economical boilers to use. They may be convenient to make, and easy to set up in position, and hence from a maker's point of view be good boilers; but the man who pays for the coals, and the woman who grumbles about the want of heat on a cold day, find by experience that there are other ways of determining whether or not a boiler is a good one. The use of a boiler in a steam heating apparatus is merely to absorb the heat produced in the furnace, and by so doing change water into steam, which is conveyed by pipes to the radiators, where it again gives off the heat while changing steam to water.

There are thus four elements in the complete apparatus, viz., the furnace, the boiler, the piping and the radiators. And there should be a complete cycle going on by means of these, which may be described thus: heat absorbed producing steam from water, and heat radiated producing water from steam. Defects or derangements in any one of these four, will affect the working of the whole, and sometimes it is very difficult to determine exactly where the difficulty really is. Hence frequently a boiler is blamed as being a bad heater, when the trouble really is in the furnace or chimney. In other cases, the fact that in a certain boiler steam can be very quickly got up, is held to be sure evidence that it will answer well for heating, while really the getting up steam quickly is merely evidence of the small quantity of water in the boiler.

In a certain large steam heating apparatus several upright tubular boilers were put in by the designer, who reckoned the amount of heating surface in the boilers by calculating the whole length of the tubes as available and useful for steam making. When the job was started, it was found that while the mains were hot, the radiators remained comparatively cool, and the building could not be heated. By adding more boilers the difficulty was removed, and the apparatus worked all right. The mistake of having the boiler too small is much more frequently made than that of having the boiler too large.

It is better to estimate the boiler by its capacity for evaporating water into steam, than by its heating surface; as no proper comparison can be made between a vertical tubular boiler with fire-box, and a horizontal tubular boiler with brick furnace, if the square feet of heating surface in each be the only dimension given. But if the number of pounds of water at a given temperature which each is capable of making into steam of a given pressure be stated, then a fair and useful comparison can be made, and more especially if the amount of fuel used be also known.

It is usual to state for comparison the number of pounds of water of 212° temperature evaporated into steam at the pressure of the atmosphere per pound of coal as the measure of the evaporative power of the boiler. Thirty pounds of water evaporated in an hour is called a horse power. The term applied to boilers is very confusing, as it is often supposed to have the same meaning as the "horse power" of an engine, whereas there is really no necessary connection between the two; except that it is supposed that an engine ought to do a horse power of work for each thirty pounds weight of steam which it gets from the boiler. Some engines will do a horse power of work with twenty pounds weight of steam, and others will need no less than sixty pounds