In railroad construction numerous instances occur where it is necessary to provide a wide and low opening and this condition is admirably met by the flat slab type of bridge. Before the introduction of this type of construction it would be necessary to provide an arch that would entail very much more expense than the flat slab bridge. Of recent years the flat slab bridge has been used to good advantage in cities where railroads were eliminating grade crossings by the elevation of their tracks. In the ordinary 66 ft. street where the city permits supports in the centre of the street and on the curb lines it is possible to use the flat slab type of bridge for spanning these openings. This results in a very economical form of construction as well as one that can be made aesthetically pleasing in general appearance. It also reduces to a minimum any maintenance expense. A steel structure for a similar opening requires painting every four or five years and if this work is not attended to the structure soon presents an unsightly appearance. This condition is very prominent in our elevated railroads in cities where the maintenance is not kept up.

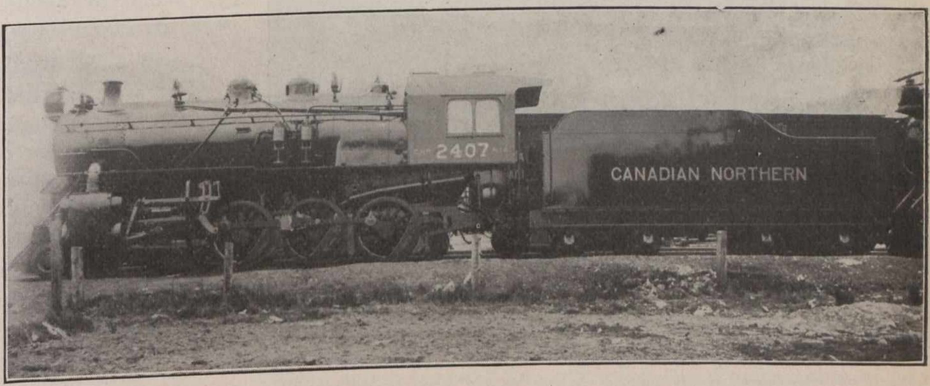
Twenty years ago, in railroad construction, it was the universal practice to use, in openings from six to thirty feet, open deck I Beams. These were usually placed upon concrete or stone masonry abutments and presented as much difficulty in maintaining good track as much larger spans for the reason that the dump ties were just as troublesome to keep up as the same ties on a 150-ft. span. I know of no greater use for flat slab bridges than in the replacing of these upon open floor I Beam spans. It is usually possible to remove these I Beams and replace them with flat slab bridges, carrying the ballast across the bridge and making a uniform track surface. The I Beams can be used for other purposes or at least they have a salvage value that goes toward reducing the cost of the improvement. I have in mind a certain stretch of railroad of about thirty-six miles that has over twenty small openings from six to twenty-five feet made up with of I Beams with open floors. However carefully the track work was kept up it meant a bad riding track as each one of the bridges represented an unyielding space that was very noticeable to the travelling public.

There is no class of reinforced concrete construction, however, that is entitled to more careful and intelligent supervision in the construction of the same than flat slab bridge. When concrete began to displace stone masonry unfortunately the sole idea of constructing engineers was to see how cheaply they could build structures in concrete. Apparently many engineers were so anxious to prove the superiority of concrete in both cost and durability that they frequently sacrificed the latter for the former. It is generally recognized to-day that to produce satisfactory concrete construction it is necessary to use the utmost intelligence and care in the selection of the materials and the execution of the work. Unfortunately reinforced concrete construction has, in the past, been exploited from the commercial side rather than from the engineering. This, I think, was largely due to the various patented types of reinforcing material. Concerns marketing reinforcing material looked upon it from the commercial side only and furnished all sorts of information as to not only the good points of their particular shape or type of reinforcing but also formulæ and information as to the construction of reinforced concrete that would apparently enable any one, engineer or otherwise, to undertake the work of designing and building reinforced concrete structures. Happily, we are passing out of that stage of development and it is now being generally recognized that it is necessary to have engineers of experience and trained to correctly design any reinforced engineering structure.

POWERFUL FREIGHT LOCOMOTIVES.

Serious consideration given to railway economics has shown that specific locomotive design is a potent factor in operating expense reduction and it is to this fact that the difference in a fast passenger locomotive and a mountain freighter are due. In fact, the locomotive of to-day may be divided into many classes; each class calling for particular differences which have been developed and have proved that a locomotive designed for a certain class of work gives better results than one taken from another section of the line and applied to the same class of work.

Thus it is that the great wheat belt of Western Canada has called for a locomotive that will haul grain in that section to the best advantage, and the management of the Canadian Northern Railway have commissioned the Canada Foundry Company, Ltd., of Toronto, to construct twenty locomotives similar to the one forming the illustration to this article.



These monsters are among the largest locomotives operating in the Dominion, and differ, in the main, from smaller types only in their massive proportions and fuel-carrying facilities.

They are built for a standard gauge of 4 feet 8½ inches, and have a total wheel base (locomotive) of 25 feet 5 inches. The cylinders are of simple design. 24 in. by 32 in., and the boiler is of the extended wagon top with a working pressure of 180 pounds to the square inch; the boiler contains 272 two-inch tubes, while the smoke stack has a diameter of 17 inches.

When these machines were designed, the British Columbian Cabinet had not issued the edict that will compel all locomotives operating in that province to burn oil, hence, the fire grates of these locomotives have been designed to consume bituminous coal; but as they have been designed specially for wheat haulage in the prairie provinces, it is not likely that their fuel consuming facilities will have to be changed.

The driving wheels, of which there are six, have a diameter of sixty-three inches and a thickness of three and a half inches, the piston valves regulating the admission of steam to the cylinders have a diameter of twelve inches.

As may be readily seen from the cut, the design of the tender has been prepared in such a manner as to allow of exceedingly long haulages without stoppage for water or fuel; the water carrying capacity allows 6,000 imperial gallons to be taken at one time, together with ten tons of coal.

The total length of the engine and tender is about 65 ft.