the deck or through type, depending on the location. Pin connected trusses, which in the past was the prevailing type of railway bridge, is now, except in special cases, rarely used, the solid riveted design giving a more rigid and lasting structure.

None but the highest grade of open hearth steel is permitted to be used in these bridges, and this is subject to



Concrete Piers Grand Trunk Pacific Railway Bridge Across North Saskatchewan River at Clover Bar.

rigid inspection through all its phases of manufacture. It must conform to a certain chemical analysis, that required by the Department of Railways and Canals being Phosphorus, not to exceed in Acid Steel 0.05, in Basic Steel 0.04; Sulphur not to exceed, in Acid Steel 0.05, in Basic Steel 0.05, and Manganese 0.60. It must also have an ultimate tensile strength of not less than 58,000 lbs. per square inch and an elastic limit of 50 per cent. of the ultimate strength, and must bend cold, or after being heated to a red heat and cooled in water, 180 degrees around a circle whose diameter is equal in thickness to the test piece, without showing signs of fracture. In addition to meeting these requirements each step of its manufacture ,fabrication and erection is closely inspected, so that when the structure is complete it is as nearly perfect from an engineering standpoint as can be produced.

The Canadian Pacific Railway have now in service on their main line from the east boundary of the province to Laggan, at the summit of the mountains, twenty-seven steel structures aggregating a total length of 4,792 feet, the largest of which is the crossing of the South Saskatchewan River at Medicine Hat. This bridge consists of three spans of 217 feet each and one swing span of 296 feet 6 inches. There are also on four crossings of the Bow River spans exceeding 200 feet.

On the north and south line of this system, viz., from McLeod to Edmonton, there are seven steel structures aggregating a total length of 1,504 feet. On the Crow's Nest section there are three structures with an aggregate length of 7,260 feet 6 inches, this within a distance of thirty-three miles. One of these structures, that crossing the Belly River at Lethbridge, has a length of 5,327 feet 7¾ inches, and a height of 314 feet; and that over the Old Man River, a length of 1,890 feet 6 inches, and height of 146 feet.

These structures make a total length of steel bridges on this railway in the province of 13,556 feet 6 inches, or 2.57 miles, and represent a total weight of 24,534 tons. Adding to this the combined railway and traffic bridge about to be constructed over the North Saskatchewan between the cities of Strathcona and Edmonton, the above is increased to a total length of 16,243 feet 6 inches or 3.03 miles, and the weight to 32,534 tons.

The most important of these structures is the Lethbridge Viaduct. The viaduct across the Old Man River between Lethbridge and McLeod, and the bridge about to be built between Strathcona and Edmonton.

The viaduct at Lethbridge, which was opened for traffic in November 1909, forms part of a new line built between Lethbridge and McLeod and is part of the Crow's Nest branch of the C.P.R. The old line between these two points followed the south bank of the Belly River as far as the St. Mary's River, thence up the Old Man River to McLeod. There were on this line between Lethbridge and McLeod twenty timber bridges with an aggregate length of 12,063 Many of these bridges were Howe truss spans with, feet. in a number of cases, a height of over 100 feet. As these crossed streams and ravines with steep cut banks of a sliding nature, the expense of maintaining this stretch of roadbed was excessive. The life of these structures had expired, and the expense of rebuilding these, together with the poor alignment and grades of the line, decided the company to adopt a new location, which saves 5.26 miles and cuts out 1,735 degress of curvature, besides securing a maximum grade of 0.40 per cent. against a virtual grade on the old



Three 175-Feet Spans over the Maw River at McLeod Highway Bridge.

line of 1.20 per cent. On this new line at the City of Lethbridge is the viaduct referred to. The width of the river valley proper at the point of crossing is approximately one mile from plateau to plateau. The banks are steep and in many places almost vertical, while the river bottoms 300 feet below are entirely covered at flood time. The alignment of the bridge is on a tangent with a grade of 0.4 per cent. rising westward. The structure consists of 44 plate girder spans 67 feet 1 inch long, 22 plate girder spans 98 feet 10 inches