THE KETTLE VALLEY RAILWAY WOODEN BRIDGES.

1935

March, 1935

Canadian Railway AND Marine World

Reconstruction, Under Traffic, of Bridge on 12-Degree Curve over 180-ft. Canyon, Canadian Pacific Railway

A notable bridge replacement carried out by the Canadian Pacific within recent years was that on the Carmi Subdivision, Kettle Valley Division, British Columbia District, at mile 87.4 from Midway. When the line was built in 1912, a timber trestle was installed, the alignment being on a 12-degree curve throughout its length, with an 0.4% grade rising eastward. A view of the original trestle is given in the accompanying fig. 1. Total length was 720 ft., and the greatest height in the center of the canyon is approximately 180 ft. The original wooden trestle consisted of a series of framed timber bents and the usual stringer construction, with spans of 15 ft. center to center throughout, the accompanying fig. 1 demonstrating the longitudinal bracing. The trestle was maintained from completion in 1912 until 1931, but in that year it was decided to replace it by a steel structure. The substructure was completed in 1931, and the superstructure work was carried out in 1932.

The new bridge, which has been provided, consists of five steel towers of 45 ft. spans, one concrete pier at the east approach, and a concrete abutment at each end. The spans of the steel trestle were made of such length as to suit the topography and to secure location of the new pedestals clear of the old timber bents. The spans are of varying length, those at each end being 45 ft. long, and the intermediate ones being 75 ft., 90 ft., and 124 ft. long respectively. Each span has its girders at 15 ft. 8-5/16 in. center to center. The floor system consists of rivetted cross beams and I beam stringers attached to the main girders about half way up their depth. Thus, the top flanges of the girders project about 18 in. above deck level; this forms a valuable safety feature, supplementing the usual guard rails attached to the surface of the ties. The tops of the bents were made at uniform elevation below base of rail, and all open spans were given sloping bottom chords, with their ends matching tower spans as to depth.

The design of the steel follows ordinary, standard practice, with spherical pier members on the pedestals to give a good bearing independent of the finished surface of the latter, as well as the usual Canadian Pacific standard key-bearings under the plate girder spans supported on the towers, which ensures that the reactions from the plate girder spans are at all times located over the webs of the columns comprising the towers. The structure being on a 12-degree curve throughout requires a 2½-in. superelevation of the outer rail. Combination of these conditions presented a somewhat complicated structure in the designing office, and created several difficult problems in the process of erection.

Fig. 1. The original timber trestle, built in 1912, mile 87.4, Carmi Subdivision, Canadian Pacific Railway.

How the Work was Done.

In beginning the reconstruction work, the pedestals for the new bridge were laid out in the canyon, this having been extremely difficult work on account of the forest of timber which was in place, and also on account of the large amount of debris, consisting of broken rock, mud and undergrowth which had accumulated under and around the timber trestle. Excavation was made to a safe depth, as necessary, in this detritus, and forms were built and concrete poured. Extreme care had to be taken in carrying on this work, as it was necessary to proceed without endangering the safety of a single bent in the existing structure.

While the building of the substructure was proceeding, the fabrication of the steel for the superstructure of the new bridge was being carried out in the bridge company's shop. The steel began to arrive on the site on May 11, 1932, and the active work of erection commenced. The first thing done was removal of the superelevation in the track on the deck of the timber structure, the excess elevation in the outer rail having been removed by raising the inner rail to

MARCH 1935

were made of such length as to suit the topography and to secure location of the new pedestals clear of the old timber bents. The spans are of varying length, those at each end being 45 ft. long, and the intermediate ones being 75 ft., 90 ft., and 124 ft. long respectively. Each span has its girders at 15 ft. 8-5/16 in. center to center. The floor system consists of rivetted cross beams and I beam stringers attached to the main girders about half way up their depth. Thus, the top flanges of the girders project about 18 in. above deck level; this forms a valuable safety feature, supplementing the usual guard rails attached to the surface of the ties. The tops of the bents were made at uniform elevation below base of rail, and all open spans were given sloping bottom chords, with their ends matching tower spans as to depth.

The design of the steel follows ordinary, standard practice, with spheri-

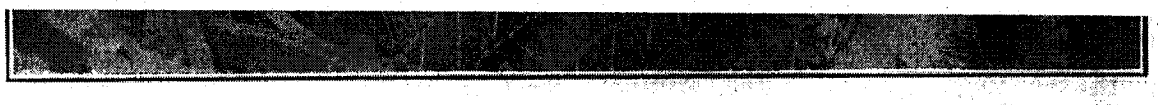


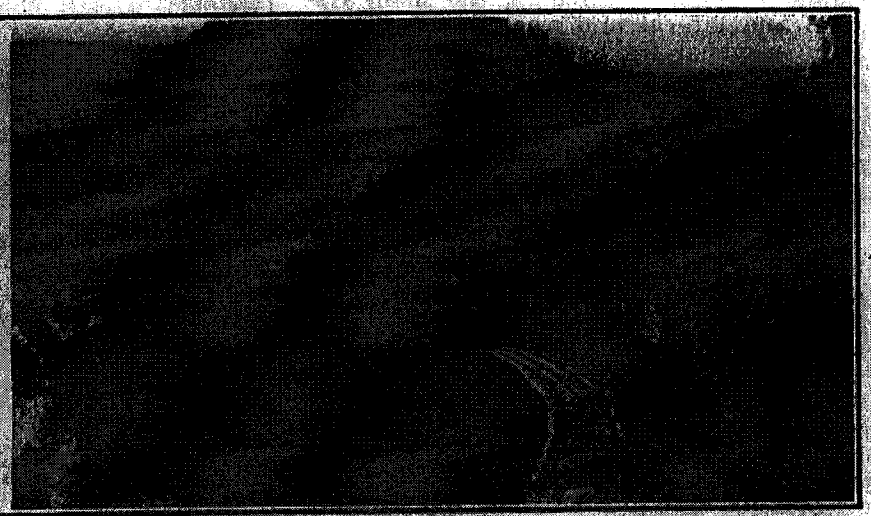
Fig. 1. The original timber trestle, built in 1912, mile 87.4, Carmi Subdivision, Canadian Pacific Railway.

that the reactions from the plate girder spans are at all times located over the webs of the columns comprising the towers. The structure being on a 12-degree curve throughout requires a 2½-in. superelevation of the outer rail. Combination of these conditions presented a somewhat complicated structure in the designing office, and created several difficult problems in the process of erection.

How the Work was Done.

In beginning the reconstruction work, the pedestals for the new bridge were laid out in the canyon, this having been extremely difficult work on account of the forest of timber which was in place, were built and concrete poured. Extreme care had to be taken in carrying on this work, as it was necessary to proceed without endangering the safety of a single bent in the existing structure.

While the building of the substructure was proceeding, the fabrication of the steel for the superstructure of the new bridge was being carried out in the bridge company's shop. The steel began to arrive on the site on May 11, 1932, and the active work of erection commenced. The first thing done was removal of the superelevation in the track on the deck of the timber structure, the excess elevation in the outer rail having been removed by raising the inner rail to



Left, Fig. 2, showing steel spans in place at the ends of the bridge. Right, Fig. 3, another view of the span insertion work.

MARCH 1935

Fig. 4. The steel trestle completed, with the greater part of the timber of the original structure still in place.

The manner in which the steel towers are closely surrounded by the timber framing of the original trestle gives one an idea of the care and ingenuity demanded in this bridge reconstruction job.

provide a level track on which the erecting derricks travelled. As they moved at slow speed, superelevation was not necessary, nor was it convenient for their operation.

The pedestals in the substructure for the new trestle were located carefully to clear all timber bents, and for this reason it was necessary only for the steel bents to be landed on the pedestals with their component bracing, transverse and longitudinal. In instances where this bracing interfered with the timber work of the original structure, the timber was judiciously cut or removed. When all the steel towers were completed by proceeding in this manner, the work had been brought to the point where it was ready for the placing of the new longitudinal spans.

These steel spans were placed by two 20-ton capacity, single-boom, self-propelling derricks, working simultaneously from each end of the bridge, continuing until the work met at the center of the structure. The installation operations necessitated the opening of the deck of the old bridge between trains by raising a sufficient number of the 15 ft. timber spans to permit the installation of a new [illegible] but so carefully was the work carried out by the same derricks which installed the steel spans, from the deck of the new bridge. The dismantling proceeded span by span from the deck downward, fig. 4 showing the situation shortly after the demolition work had been well started. This was completed on Aug. 10, and, as erection had not begun until May 11, it can be said that the reconstruction work, from beginning of steel erection to complete demolition of the old structure, was completed in the period May 11-Aug. 10. The steel erection, however, took only 2½ months. The total tonnage of steel handled was 1,115 tons.

Engineers and Contractors.

The new bridge, shown in fig. 5, was designed in the Canadian Pacific Railway Engineering Department, J. M. R. Fairbairn being Chief Engineer and P. B. Motley, Engineer of Bridges. The substructure was built in the summer of 1931 by A. H. Green Co., Ltd., Nelson, B.C. The steel fabrication and erection was carried out by the Canadian Bridge Co., Walkerville, Ont., F. W. Parr having been Superintendent of Erection for that company, in charge of the work at the site.

Canadian Pacific House Party Tours.—The second house party tour for Canadian Pacific employes and pensioners was concluded Jan. 2, it having been as successful as the first. On the first tour, those participating proceeded from Quebec, on the ss. Empress of Britain, to England, in September last, while on the second tour the party proceeded to the Orient from Vancouver and Victoria, Dec. 15, 1934, on the ss. Empress of Japan. The party returned to Canada on the ss. Empress of Canada, arriving Vancouver Jan. 2. Those who made the trip to the Orient were very enthusiastic about it, and are planning a tour to Manila. They came across many Canadians, including a number of C.P.R. former employes, on the Oriental trip, and renewed acquaintances, an interesting example of this having been the experience of R. D. Smith, a former master mechanic at Medicine Hat, who retired three years ago; in Hawaii, he discovered that the master mechanic of the narrow gauge railway there was the son of Robert Bartlett, a former C.P.R. employe with whom he had worked years ago in New Brunswick.

Veteran Locomotive men meet.—On Feb. 7, a large number of Ontario and Quebec locomotive men attended a dinner at Smiths Falls, Ont., held under the joint auspices of Divisions 381 and 658, Brotherhood of Locomotive Engineers. Men who operated locomotives on Canadian railways as long ago as 1880 were among those present. Features of the proceedings were presentations of 40-year service badges to two retired locomotive men, and of canes to others.

Mobile Railway Warehouses.—London, Midland and Scottish Ry. has provided, as a service to manufacturers and traders who are engaged in intensive short sales campaigns in particular areas, and desire to keep stock in the areas where warehouse accommodation is limited, parcel vans 30 ft. long, with a storage capacity of approximately 25 sq. yd., that have been converted into mobile warehouse suitable for storage of commodities of all kinds.

MARCH 1935

trestle gives one an idea of the ...

provide a level track on which the erecting derricks travelled. As they moved at slow speed, superelevation was not necessary, nor was it convenient for their operation.

The pedestals in the substructure for the new trestle were located carefully to clear all timber bents, and for this reason it was necessary only for the steel bents to be landed on the pedestals with their component bracing, transverse and longitudinal. In instances where this bracing interfered with the timber work of the original structure, the timber was judiciously cut or removed. When all the steel towers were completed by proceeding in this manner, the work had been brought to the point where it was ready for the placing of the new longitudinal spans.

These steel spans were placed by two 20-ton capacity, single-boom, self-propelling derricks, working simultaneously from each end of the bridge, continuing until the work met at the center of the structure. The installation operations necessitated the opening of the deck of the old bridge between trains by raising a sufficient number of the 15 ft. timber spans to permit the installation of a new steel span, but so carefully was the work planned and executed that no delay whatever was experienced by traffic. In placing the spans, each one was handled girder by girder, and when they were landed on their bearings, the floor system and lateral and sway bracing were put in panel by panel, the installation of the wooden floor following closely that of the steel. While the erection of the steel was going forward, rivetting was started and followed along closely. The span installation work is well illustrated by the accompanying figs. 2, 3 and 4. Fig. 2 shows the work in its early stages. In fig. 3 the reader is enabled to obtain a good idea of what 12 degrees of curvature means. Fig. 4 shows the work in an advanced stage, close inspection showing the manner in which the steel towers were built up within the timber framing of the original trestle.

Demolition of Original Trestle.

The work of dismantling the original timber structure had already commenced with the erection of the steel, and was carried out by the same derricks which installed the steel spans, from the deck of the new bridge. The dismantling proceeded span by span from the deck downward, fig. 4 showing the situation shortly after the demolition work had been well started. This was completed on Aug. 10, and, as erection had not begun until May 11, it can be said that the reconstruction work, from beginning of steel erection to complete demolition of the old structure, was completed in the period May 11-Aug. 10. The steel erection, however, took only 2½ months. The total tonnage of steel handled was 1,115 tons.

Engineers and Contractors.

The new bridge, shown in fig. 5, was designed in the Canadian Pacific Railway Engineering Department, J. M. R. Fairbairn being Chief Engineer and P. B. Motley, Engineer of Bridges. The substructure was built in the summer of 1931 by A. H. Green Co., Ltd., Nelson, B.C. The steel fabrication and erection was carried out by the Canadian Bridge

C.P.R. employe with whom he had worked years ago in New Brunswick.

Veteran Locomotive men meet.—On Feb. 7, a large number of Ontario and Quebec locomotive men attended a dinner at Smiths Falls, Ont., held under the joint auspices of Divisions 381 and 658, Brotherhood of Locomotive Engineers. Men who operated locomotives on Canadian railways as long ago as 1880 were among those present. Features of the proceedings were presentations of 40-year service badges to two retired locomotive men, and of canes to others.

Mobile Railway Warehouses.—London, Midland and Scottish Ry. has provided, as a service to manufacturers and traders who are engaged in intensive short sales campaigns in particular areas, and desire to keep stock in the areas where warehouse accommodation is limited, parcel vans 30 ft. long, with a storage capacity of approximately 25 sq. yd., that have been converted into mobile warehouse suitable for storage of commodities of all kinds.

Fig. 5. The completed steel structure, with all traces of the timber trestle removed.