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Large Timber Trestles on the Pacific Coast Extension of the Chicago, Milwaukee & St. Paul Ry.

The Chicago, Milwaukee & St. Paul Ry. has in process of construction what is known as the Pacific Coast Extension of its line from Evarts, S. D., to Seattle and Tacoma, Wash., a distance of about 1,500 miles. On a portion of the road, known as the Snoqualmie Line and extending from the summit of the Cascade Mountains down the west slope to Puget Sound, there are sections where the location has been rather bold and the consequent construction more of a pioneer nature than is usually found in present-day railroading. The accompanying views, taken along a portion of this route illustrate several of the large trestles which are very numerous along the line, and which comprise some of the highest timber trestles that have ever been built.

In the particular stretch of road where these photographs were taken there are 23 bridges and trestles in 20 miles of a very rugged, mountainous country. Most of these were built of timber cut, to the amount of ten million board feet, along the right of way, by two mills, each having a daily capacity of about 40,000 ft. B.M. These mills, as well as all of the bridge iron and supplies, had to be carried by wagon "tote" road from the Northern Pacific Ry., in hauls varying from seven to twenty miles, at an average cost of about 1 ct. per lb.

The timber trestles are of standard form, with 12 × 12-in. posts, 12 × 12-in. intermediate caps, 12 × 14-in. caps and top decks, 10 × 18 in. × 32 ft. stringers, 8 × 8 in. × 12 ft. ties, 6 × 8-in. guard rails, 6 × 10 and 4 × 12-in. longitudinal girts and all other bracing 4 × 12 ins. These were

THE MINE CREEK TRESTLE, C., M. & ST. P. RY. (155 FT. HIGH, 1,250,000 FT. B.M. TIMBER).

all spiked in place, no machine bolts being used in construction other than those in the guard rail. In construction, an aerial cableway was used, aided in places by a derrick (Fig. 4). In Fig. 3 the usual method of procedure is well shown. The pents were first framed and then packed in their proper location on the next lowest platform, with one wale and the top sway brace spiked permanently in place, to be spiked at the other end after erection. The stay planks were of 2 x 10-in. timber, and were spiked to the bent while the latter was down, so that when the bent was pulled into a vertical position the stay planks were ready to be spiked in place.

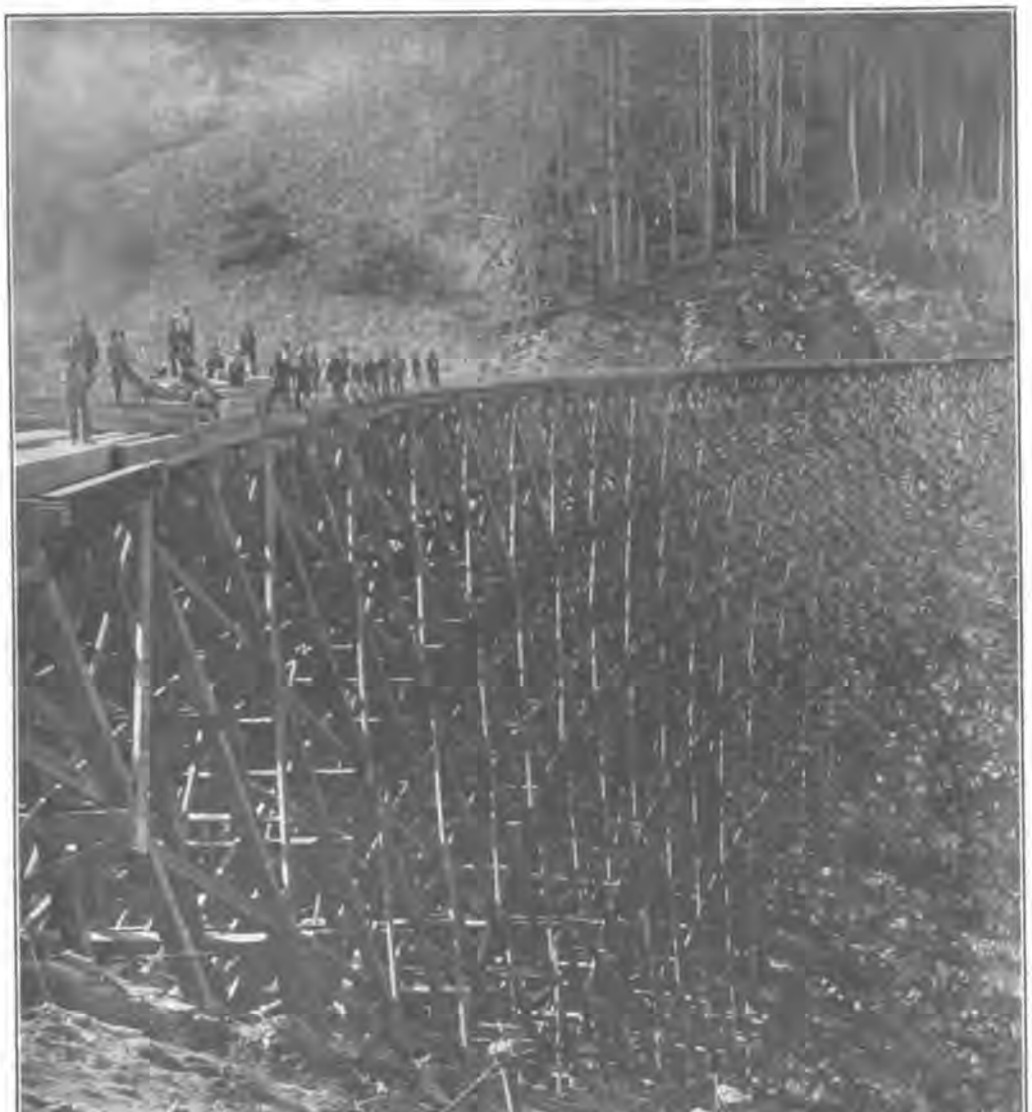

FIG. 2. A TIMBER TRESTLE, 190 FT. HIGH, ON THE PACIFIC COAST EXTENSION OF THE C., M. & ST. P. RY.

In the views, Fig. 2 shows Heason Creek trestle, which stands 190 ft. above the creek bed that it crosses. Fig. 1 is the Mine Creek trestle, with 1,250,000 ft. B.M. of timber and standing 155 ft. high. Fig. 3 is the Change Creek trestle, about 160 ft. high. Fig. 4 is the beginning of the Butt's Creek trestle.

The greater part of this portion of the work was done in six months during the summer of 1908, by J. M. Bruce & Co., Seattle, Wash., as bridge contractors under H. C. Henry, who held the general contract for construction of the line from Idaho to the Pacific. The photographs were kindly forwarded to us by J. M. Bruce & Co.

A DIVISION OF IRRIGATION for the Philippine Islands has been created in the newly organized Bureau of Public Works, according to the U. S. Reclamation Record for March, 1909. Irrigation surveys are in progress and construction is proposed.

Committee Reports: American Railway Engineering and Maintenance-of-Way Association.

Nearly all the committee reports presented at the annual meeting of this association in Chicago (March 16 to 18) were of considerable length, and several of them treated of three or four subjects. It is impracticable to present all these in abstract in the space at our disposal, but we give herewith some extracts relating to certain specific subjects. Further abstracts of some of the reports will be given separately, and a general review of their subject matter is given in our report of the proceedings:

Wooden and Steel Tanks for Railway Water Stations.*

The life of white pine tubs used in the past does not exceed 20 years. The quality used at present is inferior and will have a life of less than 20 years. The price has been increasing rapidly, even with the use of inferior lumber.

The life of cypress used in the past does not exceed 25 years; the quality at present is as good as in the past. The price has been rapidly increasing. Further increase in the price of wood tubs is to be expected in view of the rapid depletion of forests. The use of wood in tubs limits the capacity of same.

The use of steel for tanks at water stations between terminals has not been general, and at terminals only to a limited extent, usually when forming a part of a fire or general water supply system. In recent years there has been considerable development along this line and a number of tubs constructed. The life will depend on kind of material and water. The use of metal standpipes for city water supply has extended successfully over a large number of years, which presupposes satisfaction with railway tanks where the pressure is much less.

The metal specified in most of the recent railway tanks is open-hearth steel, and the life of such tanks will depend on the effect of the water. There are without doubt singular cases where the only water available, although corrosive, is used in locomotives; but such conditions are infrequent, will pass with extension of treatment, and call for special consideration.

A 16 x 30 steel tub of ¼-in. and ⅜-in. plates was erected in 1868 at the 47th St. shops of the Chicago, Rock Island & Pacific Ry., at Chicago. Although painting was very much neglected, the tub is still in service, with the prospect of doubling the present life, since only a shallow depth of pitting has occurred inside, and the outside is now being maintained. The tub was corroded most where it rested on the timber joists. A manufacturer of steel tanks gives as a conservative estimate of the life, five times that of wood, which he places at 10 or 15 years.

The prevailing size of wooden tub is 16 ft. high by 24 ft. diameter, commonly called a 50,000-gal. tub. In recent years, tubs 20 ft. by 30 ft. in diameter, designated as 100,000-gal. tubs, have been erected to some extent. Additional storage is secured by a battery of tubs of those sizes, this being due to the limit placed by difficulty in securing larger timbers.

The use of steel water tanks removes the limit placed on the size of wood, and as their use is growing the sizes of the units will be determined by the relation of consumption, cost of installation and cost of operation.

Ordinarily it is cheaper between terminals to provide storage capacity to carry over night than to use a night pumper. This requires consideration of probable increase above the maximum consumption within the life of the tub. It is believed that the consumption will in most cases at least double in 20 years, and therefore the unit would be at least 50% greater than the maximum daily consumption, which will avoid a night pumper for a considerable period without undue expense of installation, which could be offset when installed by the pumper operating two or more stations.

Track Tanks.*

The committee has received plans of six different standards of track tanks. These have been analyzed and compared, with the following results:

All are located on tangent. Track pans have, however, been installed on curves up to 2°.

All are fastened to track ties from 8 x 9 ins., 8 ft. long to 8 x 10 ins., 8 ft. 6 ins. A 2-in. dap in tie is generally made to bring top of tank level with top of rail.

The length varies from 1,200 to 1,800 ft.

The widths in clear at top are 19 ins. (4), 25 ins. (1) and 23⅝ ins. (1). The depths are 6 ins. to 7 ins. Four have straight sides and two have return lips made of channels or angles. The 19-in. section seems to give the best results.

The end inclines vary as follows: The portion beyond the pan extends from 4 ft. to 6 ft. and the portion in the pan from 6 ft. to 10 ft. In part of the plans the rate of incline is different, depending on whether it is an entrance or exit.

In all cases the water connections enter in bottom of pan. Size from 4-in. to 6-in. Expansion and contraction taken care of in five cases by rubber hose, and in one by a packed joint. Various styles of inlets: one has 2 holes 4 x ¾ x 3½ ins., with a deflector directly over inlet; one has an enlarged pipe from 6 ins. to 11 ins., with no deflector; one has a large box arranged with a deflector at top; two have a large number of ½-in. to ¾-in. holes in bottom plate.

All are heated by steam. One uses the injector principle and heats water by jet of steam before it enters pans. Three admit steam through ⅛-in. to ¼-in. nozzles pointed downward at sides of pan every 30 or 40 ft.

Grade Crossings in Paved Streets.†

For crossings where paving is required to conform to street specifications, the ties should be treated chemically to prolong their life to the greatest limit possible. They should be laid on a bed of stone or slag ballast, not less than 12 ins. deep, placed in 3-in. layers, each thoroughly rammed so as to prevent settling. An 8-in. bed of concrete (1:3:6) can be substituted for the ballast.

With the ballast and outside of the tracks, porous tile drains not less than 6 ins. diameter should be placed at intervals, leading to the nearest point from which efficient drainage can be obtained.

The support of the rail on the ties will vary with the character of paving. If stone blocks are used, a substantial cast or malleable steel chair, with a base of not less than 48 sq. ins., should be provided, fastened to the tie with suitable lag-screws, the rail fastening

*From report of the Committee on Water Service.

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†From the report of the Committee on Signs, Fences, Crossings and Cattleguards.

Fig 3. Method of Erecting Timber Trestles on Snoqualmie Line of C., M. & St. P. Ry.

to be a hook-headed bolt secured with nuts. Ties should be spaced so as to allow the joints to be supported by these chairs.

On long stretches of track laid in streets paved with stone blocks, the use of a special rail section, not less than 9 ins. in depth, is advisable, to avoid the use of the chairs mentioned. With such a rail, heavy tie-plates should be used as a protection to the ties.

On the outside of the rail, the block paving should be laid up to the level of the rail-head, but left slightly below it on the inside. An old rail or a suitable form of rolled filler should be placed to provide a flangeway, this to be fitted into the space between the head and base of the track rail. If an old rail is used, the flange should be placed as nearly vertical as possible, the paving between the rails to be limited by the flanges or fillers. The flangeway rail or filler should be supported by the same chairs carrying the track rail, with a clear opening of not less than 2 ins. Where a special rail section is used, the flangeway should be rolled as a part of it.

With asphalt paving and brick paving, the ties should be similar to and have the same foundation as described above, except that with rails of high section, the use of the cast chairs is unnecessary. A heavy tie-plate should be placed on each tie where the ordinary track rail is used.

A strip of treated timber 4 × 6 ins., fitted to the rail and placed so as to expose 3 ins. of surface next to the rail-head, should be used next to the outside rail, and this should be paved against. The strip should be ¼-in. below the rail-head. Metal flangeways should be provided as described above, and paved against in like manner.

Paving between and outside of the rails should be laid in the most approved and workmanlike manner.

Railway Construction in Relation to Snow.*

In the location and construction of railways through snow country special attention is given by the locating and construction engineers to provide against difficulties in the operation of the railway on account of snow. An embankment 2 ft. above the surface of the ground is generally sufficient.

Snow slides in mountainous country are given full consideration and, if possible, the railway is located either to avoid them or to provide for an economical snow-shed construction. In some cases the railway has been carried over snow slides, which occur in ravines, by means of spans. This method, however, has proved disastrous in a number of cases, as the spans were carried out or wrecked by the large trees that were brought down with the slide.

A very successful method has been adopted on many railways to escape snow accumulating in deep cuttings by borrowing material which they require for widening banks, filling trestles, etc., from the sides of cuttings into which snow had been drifting. A steam-shovel cut on the windward side has been sufficient to give ample space for the drifting snow to accumulate and keep clear of the tracks. In this connection it is interesting to note that snow seldom accumulates in rock cuttings that are 25 ft. or more in depth. In these cases the precipitating snow seems to be blown out of the cuttings by deflected air currents.

*From the report of the Committee on Signs, Fences, Crossings and Cattleguards.

Signal Protection for Drawbridges.*

The protection of train movements over drawbridges by interlocking is by no means a new departure in signaling, but very little progress has been made toward the establishment of uniform methods of application, the different methods in vogue having been considered good practice by all roads employing them.

The strides that have been made in the development of railway signaling devices in recent years are remarkable, but it is notable that until recently very little improvement has been made in the locking of drawbridges and lift rails. It seems strange, in the midst of all the achievements in signal devices, that a matter of such obvious importance should have received such scant attention.

In connection with drawbridges (from a transportation standpoint) the points of least security are the lift rails at their junction with the shore rails. As every consideration of safety demands that the track over the draw be as substantial as at any other point, we find the inevitable slow sign with its consequent interference with the up-to-date movements of trains as a result; and in numerous instances, a full stop, before crossing the draw, is deemed a necessary precaution.

In order to eliminate the conditions of least security, the lift rails should be connected in such a manner as to make it necessary for them to be in perfectly proper and safe position, both laterally and vertically, before they can be locked and signals given to proceed over the draw. It is important that the locking device provided be of a simple and appropriate design so that its maintenance will introduce no complications.

It is also necessary to prevent the application of power for the purpose of withdrawing the bridge latch or opening the draw while the lift rails are locked and signals indicate proceed.

Having in mind the lack of uniformity as described in the foregoing, your committee has endeavored to formulate such recommendations as would have a tendency to reduce to a minimum the number of different methods of application. But owing to the many different designs of drawbridges and methods of operation, we are unable to recommend any standard apparatus or methods of locking that would be suitable for all, and owing to the different requirements and conditions at different points, we cannot consistently recommend any uniform arrangement of signals, etc.

The standard specifications for mechanical interlocking have been so rearranged as to apply to about all drawbridge interlocking installations, so that we do not consider any special clause on this account necessary.

The following are the drawbridge recommendations which we submit:

Signals.—Signals shall be provided for all routes approaching the draw and shall be located not less than 500 ft. from draw in direction of traffic, and 200 ft. from draw in reverse direction, unless state or federal authorities prescribe otherwise.

High home signals with adequate approach information should be provided for current of traffic and dwarf signals for reverse and other routes approaching the draw.

Locking.—A locking arrangement shall be provided for each of the following purposes before signals can be cleared: (A) to insure that the bridge is in proper alinement; (B) to insure that all bridge surfacing devices are in their proper position; (C) to lock each rail in proper position for train movement; (D) to prevent the application of power for purpose of withdrawing bridge latch or opening draw.

*From the report of the Committee on Signaling and Interlocking.

FIG. 4. START OF CONSTRUCTION OF TIMBER TRESTLE ON NEW LINE IN STATE OF WASHINGTON.