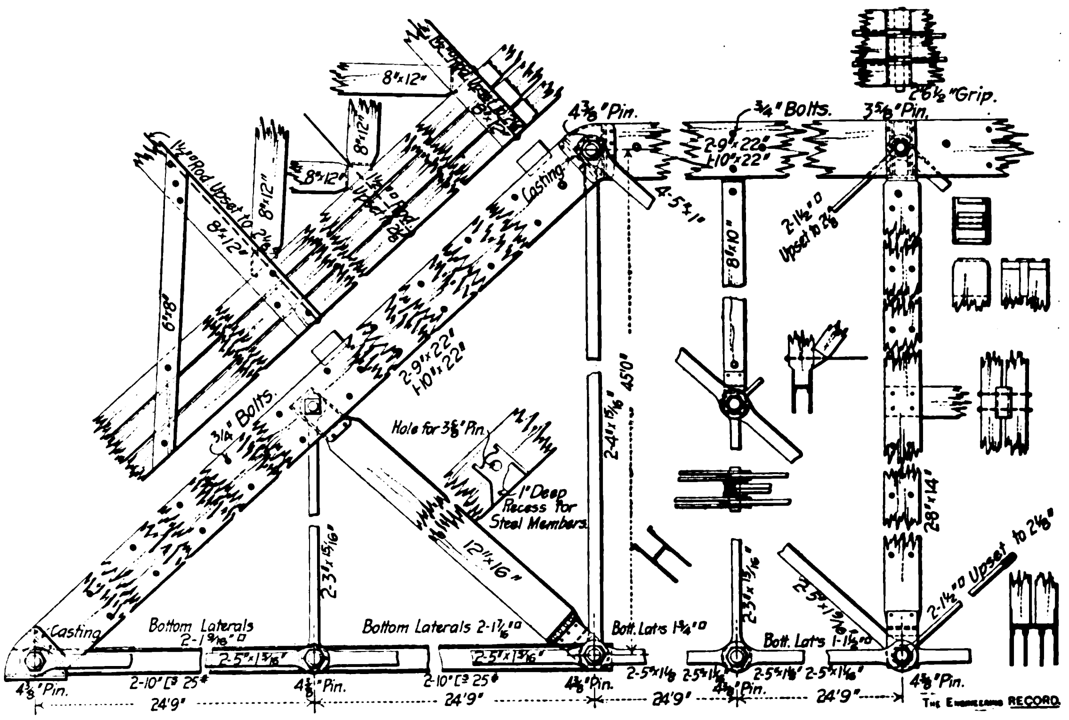
The Northport Bridge.

The Northport bridge is a single-track combination Pratt-truss structure carrying the Columbia & Red Mountain Railway across the Columbia River at Northport, Wash. It has a total length of 2,100-feet, including three channel spans of 250 feet each, three side spans of 150 feet each, and a timber trestle approach. It crosses the Columbia in a flat valley where at low-water stage the river has a width of less than 700 feet and a depth of about 13 feet, high water being 25 feet deeper.

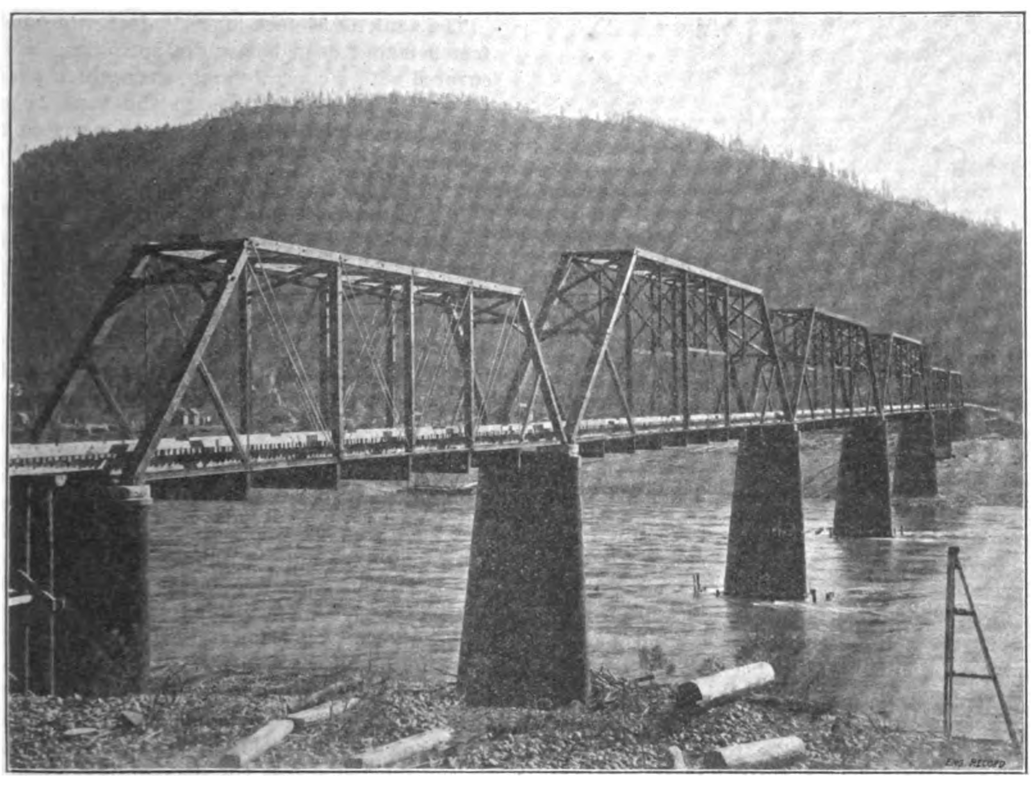
All of the piers have pile foundations. Those of the long spans are surmounted with timber grillages and had their submerged masonry built on them in timber coffer dams which were left in place for permanent protections after construction. These piers have a height of about 64 feet above low water, and for this portion of their height are of concrete cased with a riveted steel shell. Those for the short spans each consist of two separate steel-sheathed concrete cylinders about 6 feet in diameter, braced together above the surface of the ground with solid stiffened web plates and united at the top by a plate girder floorbeam. This intersects the steel cylinder plates and projects inside the pier to take bearing on the masonry without depending on any connections with the shell.

The steel shells of the large piers are 5 x 23 feet on top and 10 x 32 feet 8 inches on the bottom, with rounded ends. The upstream end is battered 7 feet 2 inches and is reinforced by a 48 x ¼-inch cutwater-plate riveted on the whole height of the center line. The shell has a height of 61 feet and is battered 1:24 on the other three sides. It is built of 5-foot courses of ¼-inch steel plates, 4 feet wide on the upstream end and 5 feet wide elsewhere, with staggered vertical joints. The upper edge of each course is stiffened by an inside 3 x 3 x ¼-inch belt angle with its horizontal flange up, which is secured to the lapped joint of both courses of plates by ⅝-inch button-head bolts 6 inches apart. There are five ¾-inch transverse tie rods through the pier at each course, which pass through the belt angles and have nut bearings on the outside of the shell.

The piles in the trestle approaches and in the pier foundations were driven by an overhanging machine which consisted substantially of standard 40-foot leads mounted on a horizontal timber bed-frame 50 feet long, which was trussed in the form of an inverted king-post by a pair of vertical posts and inclined tension rods. The vertical posts were braced together with a horizontal sill, cap and knee-braces, and were secured to the bottom pieces by small tenons so that they could be shifted readily to correspond to different panel lengths. The hoisting engine was set at the rear extremity of the base and served as a counterweight, enabling the leads to be projected as much as 20 feet beyond the last finished bent. The machine was thus capable of use as a traveling derrick, and with it the trestle timber was handled and the steel lifted for the small piers.



Details of the End Panels of the 250-Foot Span.



Combination Bridge at Northport.

The bridge was erected on fixed trestle falsework about 60 feet high from the low-water level to the top of the caps. In each bent there was a transverse row of six vertical piles, capped 19 feet above low water by a 12 x 12-inch timber 40 feet long, spliced on the center of one of the middle piles. The three piles on each side of the center line were X-braced above the water level with single 4 x 12-inch planks bolted on. A framed trestle with two vertical and two outside battered 10 x 12-inch posts was set on top of the pile cap, X-braced in two vertical panels with single 4 x 12-inch planks, and capped with a 12 x 12-inch timber 24 feet long.

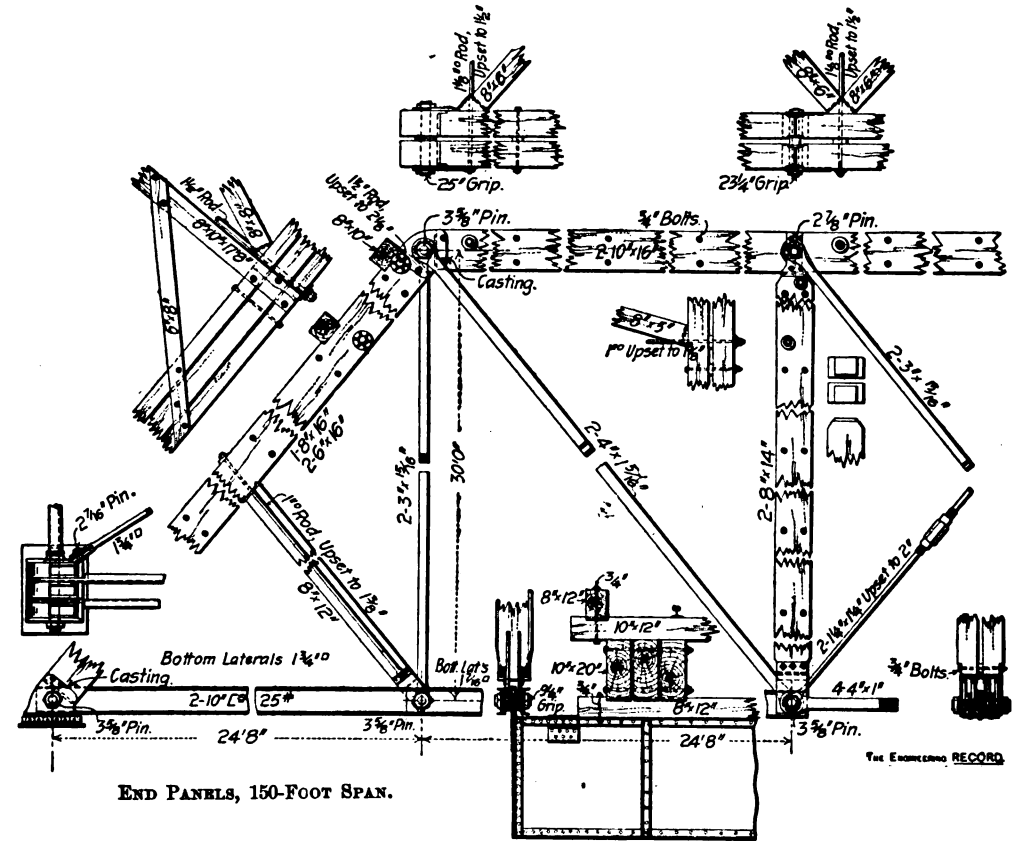
Neither piles nor trestle posts were mortised or scabbed to the caps, but their joints were secured by ¾-inch bolts and by 10-inch ship spikes through overlapping ends of the diagonal bracing planks at these points. At each end of the trestle cap, directly above the top of the inclined post, there was a pair of 10 x 24-inch stringers separated 1 inch and having a 4 x 12-inch plank laid on top in the center to receive the traveler rail. The tops of the trestle bents were also connected by two lines of 12 x 12-inch longitudinal timbers and by a material track on pony bents in the center line. The panel points of the trusses were supported directly from the trestle caps and were wedged up to camber heights of 2 inches and 3½ inches for the 150-foot and the 250-foot spans, respectively.

After the first 250-foot span was swung three bents of the falsework were washed out, but the stringers and track rails remained connected together by their splices, forming a kind of suspension bridge across the gap. Afterward several more bents were washed out in this and the next span, but they were replaced and the erection completed without damage to the permanent structure.

The erection traveler was of the ordinary striding type and was composed entirely of timber except bolts, spikes and wheels. It had a 20 x 52-foot clearance, and was 40 feet wide, 62 feet high and 76 feet long over all. The outside posts battered upward 8 feet and the overhead transverse trusses were 9¼ feet deep. It differed from ordinary travelers in having four transverse bents connected together by the double sills with single 12-inch double-flange wheels under each post, by two lines of 7 x 9-inch and four lines of 8 x 12-inch timbers on top, and by two lines of double 4 x 12-inch planks at intermediate points of each of the four posts. The latter braces divided the sides of the traveler into three panels vertically, and each of these panels was X-braced with single 3 x 12-

inch planks in the panels between the end bents and the bents adjacent to them. The traveler thus virtually consisted of two towers and an unbraced center panel connected together by the longitudinal struts, a feature which enabled it to be easily separated in halves and each part used independently as a complete lighter traveler.

The main spans are built with steel tension members and floorbeams and wooden compression members and stringers; the top-chord connections are made with castings and pins and the top lateral systems are horizontal Howe trusses. The bottom lateral system is composed of the floorbeams and steel diagonal rods, and, in the long spans, the portals and sway-brace frames have crossed timber diagonal struts in the vertical transverse planes. Cast iron is used for the compression connections only, the lower ends of all the vertical posts being provided with riveted steel-pin bearings. Most of the wooden main truss members are bolted at both ends to the pin connections, and are made in two or more pieces for easy renewal while



END PANELS, 150-FOOT SPAN.

in service, without impairing the integrity of the bridge.

The top-chord and end-post timbers are all fitted at each end to enter shallow sockets in the connection castings and take full end bearings on their webs, while they are secured transversely by short flanges 1 inch thick, which are let in flush with their surfaces and are extended on the outsides so as to make room for through bolts. The lower end of the end post engages a pedestal having its pin extended on the inside to receive a wing plate for the lateral diagonal attachment, and screwing into a 5-inch heavy pipe which serves as an end lateral strut. The end post is over 38 feet long, and is supported against undue flexure by an inclined strut in the middle, which bears at the upper end on a cast plate with ribs gained into the side of the end post. The lower end of this strut bears on a steel yoke connecting it to the lower-chord pin and having side flanges through which a pair of tension rods are put. These extend each side of the strut parallel with it and through the end post, and terminate on the upper side of it, where they take bearings on beveled washers; they have nuts at each end and are adjusted to bring initial pressure on the strut.

The portal consists of horizontal transverse struts, bolted across the face of the end posts, and diagonal X-brace timbers bearing against angle blocks on their inner faces. There are also two rods parallel to the horizontal struts which pass through the end posts and angle blocks and take bearing with nuts and washers on the outside, and two knee-braces bolted across the upper surfaces of the end posts and horizontal struts. The end-post timbers are spaced 1 inch apart, with cast-iron fillers, and are carefully recessed to receive the steel bars packed between them. The top-chord casting at each intermediate panel point consists virtually of a vertical transverse web ¾ inch thick, with side flanges to engage the chord ends, and a horizontal bottom web to receive the end of the vertical post. There is a vertical longitudinal flange on each end of these webs to receive the connection bolts, so that a horizontal section of the casting at any point is I-shaped and a vertical section is an inverted T. At each panel point there are two castings, one for each line of timbers, and they are let into the sides of the timbers, so that their surfaces are half an inch inside those of the chord pieces; the latter are recessed that amount so as to receive the diagonal bars snug against the surface of the castings.

There are twice as many panels in the top lateral system as there are in the main top-chord system connections, therefore one lateral truss panel point comes at each main connection and one midway between. The bearings of the vertical posts are not equal to their cross-sections and they are not bolted to the connection pieces at the top. At the bottom they are bolted to a riveted steel saddle-piece made of angles and plates with intermediate diaphragms and reinforcement angles. The floorbeams are suspended from the lower chord pins by end plates, and have timber cushions on their top flanges to receive the track stringers, each of which consists of three lines of 10 x 24-inch beams, each 24¾ feet long.

The 250-foot spans correspond in general construction to the 150-foot spans, but differ chiefly in having the trusses divided into sub-panels; in having double-web pin castings like rectangular tubes in the top chords, and in having deeper portals and sway-brace frames.

Mr. E. J. Roberts is the chief engineer of the Columbia & Red Mountain Railway, and the bridge was built and erected by the San Francisco Bridge Company, of which Mr. J. McMullen is president, Mr. H. Krusi chief engineer, and Mr. J. B. C. Lockwood, Seattle, Wash., assistant engineer.

The Septic Tank System at Glencoe, Ill.

About eighteen months ago Mr. Frank Winds, of Winnetka, Ill., was retained by the village of Glencoe to design a system of sewerage and sewage disposal. The plans he submitted for the treatment of the sewage provided for a septic tank, followed by filtration through eight primary and secondary beds. The bids on the work, as designed, exceeded the available funds of the village. The Cameron Septic Tank Company, of Chicago, of which Mr. H. D. Wyllie is general manager, then offered to put in a disposal plant on its own designs at a somewhat lower figure than the bids on the plant originally described, and its offer was accepted. The sewerage and sewage disposal systems are now in operation, and the following details of the latter are made public with the company's consent.

The works were designed to serve a population of 600, the maximum flow of sewage and storm water provided for being 25,000 gallons per day. They consist of one grit chamber, one septic tank and four high and four low-level aerating bacterial filters, all of which are built in concrete. They are located at the foot of a steep bluff on the shore of Lake Michigan.

The main outfall sewer discharges into the grit chamber, which is 6 feet long, 3 feet wide and 4 feet 9 inches deep. From this chamber two channels lead off to the tank, into which the sewage is delivered by two special inlet pipes about 3 feet below the springing.

The tank is 56 feet long, 10 feet wide and 6 feet 9 inches deep below the springing, and is covered with a concrete arch, over which a layer of soil is spread. Access to the tank is provided by two manholes, with sealing covers, but these are not intended to be opened except for the purpose of inspection.

In the tank the solids present in the sewage are separated and retained, and the organic matter is acted upon by the liquefying organisms present, by which it is broken down into simpler substances, capable of being dealt with by filtration. The effluent, thus largely freed from solids in suspension, passes off through a slotted cast-iron pipe, laid horizontally across the end of the tank 2 feet 3 inches below the springing, into the effluent collecting channel.

Any mineral detritus which may escape from the grit chamber, together with the insoluble residue from the sewage solids, accumulate slowly in the tank. A similar tank has been in use in Exeter, England, for over five years without such an accumulation of deposit as to require removal. It is therefore not expected that the deposit in the tank at Glencoe will need to be removed except at very long intervals. In order that this may be done when necessary without draining off the liquid contents, a slotted pipe is constructed across the end, at the bottom of the tank, from which a 6-inch pipe is led off to the cleansing well. By opening a valve in the latter, the deposit from the end of the tank may be drawn off. The deposit, which is banked against the end of the tank being thus removed, the remainder should be left until it in turn drifts forward.

The effluent chamber, 2 feet wide and 4 feet long, is constructed as shown in the illustrations, and the tank effluent passes therefrom by the main effluent carrier to the admission valve chambers of the filters.

The four high-level filters are each 17 feet