all streams on its route. The first steel highway bridges erected were of the pin connected type, but of late years the solid riveted type of truss has beeen adopted, giving a more rigid and efficient structure.

In the older provinces the erection of steel bridges is under the control of the respective municipalities, and each bridge is built under a separate specification as to type and loading. This gives rise to a great variety of structures with lack of uniformity as to strength, so that a heavy engine, while it may safely pass over the bridges in one section of the country, in the adjoining municipality may be unable to do so.

The Government of the Province of Alberta wisely foresaw these conditions and retained the control of and erection of all highway bridges. The type of bridge which has been erected for the past five years is a solid riveted truss with steel floor joists and designed to carry a 24-ton traction engine. In design the pony truss is used up to a length of 100 feet, but for lengths beyond that the through truss of the lattice type is used with straight top chords up to spans of 160 feet; beyond that the top chord is curved, commonly known as a camel-back truss. The building of the substructures and the erection of steel is done entirely by day labour under the direction of the Department of Public Works. In all important bridges concrete is used for the piers and abutments, and only in the minor structures pile abutments are built to be replaced later by concrete.

In the erection of pony truss spans very little plant is required and on single spans of 125 or 130 feet, where it would not pay to install an erecting plant, a light upper false work is erected and the upper steel raised with a gin pole by horses, and the rivetting is done by hand. On the larger spans, however, the erection is done by a steam derrick travelling on the floor system. The derrick is equipped with a 40 or 50-foot boom and has a capacity of about three tons. By this method the use of upper false work is eliminated and the span erected in a shorter time. Usually twenty hours will suffice to erect and bolt up and swing a 175 or 200 feet span. The rivetting is done by air, a small portable three-gun air compressor being used. This machine, while the compressor is small, has an especially large receiver so that a good reserve is always on hand to draw from. The pressure used, 100 lbs., is easily maintained. Steam is furnished to the compressor from any ordinary hoisting engine boiler at the work. Where the exigencies of the case demanded, owing to the ice promising to go out at any time and strip the falsework, the falsework was set up and two 125-feet spans erected and swung in forty hours by a crew of eleven men and two teams.

Among the largest highway bridges in the province may be mentioned the bridge crossing the South Saskatchewan at Medicine Hat, five spans of 180 feet each; across the Belly River at Taber, four spans of 175 feet with 400 feet of pile approach; across the Old Man River at McLeod, three 175-feet spans; across the Belly River at Lethbridge, four 175-feet spans with an 80-feet span at each end; four 175-feet spans across the North Saskatchewan at Edmonton; and across the Red Deer River at Red Deer, two 200-feet spans with 500 feet of pile approach and one 35-feet plate girder. These bridges have usually an 18-feet clear roadway between the trusses. There is now being built across the Bow River a bridge of two 185-feet spans with a 30-feet roadway.

In the province there are at present: One span 35 feet, nine spans 50 feet, twenty-two 60 feet, one 70 feet, thirty-four 80 feet, twelve 90-feet, fifteen 100 feet, two 110 feet, two 112 feet, one 114 feet, forty-seven 125 feet, twelve 135 feet, two 150 feet, two 160 feet, twenty 175 feet, five 180 feet, two 185 feet, two 200 feet, and one 250 feet span, giving a total length of 21,068 feet, or 3.99 miles, and a weight of 13,754,500 lbs., or 6,877.25 tons.

Combining railway and highway bridges there is a total length of steel work of 8.72 miles and a total weight of 51,556.25 tons. Putting this steel at a cost erected of five cents per pound, gives a value of $5.155,625, or invested in railway bridges steel, $4,467,900, and in highways $687,725; and taking the present population of the province as 400,000, this amount represents an investment of $12.90 per capita.

As stated in the forepart of this paper the principal streams of the province have their origin in the mountain ranges of the west. They have a rapid fall to the prairie and have carried down vast quantities of gravel, which in some cases extends a distance of 400 miles from the foothills. This gravel, which forms the beds of these rivers, has a depth of from one to twenty feet. Near the mountains the gravel rests on a rock bottom, while on the prairie the underlying stratum is a hard shale which provides a good foundation for building purposes. The gravel is usually coarser near the bottom and in the majority of cases there lies immediately on top of the rock or shale a bed of large boulders. The work in the construction of bridge piers is practically the same for highway as for railway bridges with the exception that in some cases railway bridge piers have a slightly larger base. Thus far all piers in the province have been constructed by the open crib process, sufficient depth not being required to install the air lock and pneumatic caisson. Where the depth of gravel overlying the shale does not exceed two or three feet, this may be first cleaned off and a crib floated into place, sunk and the bottom sealed, after which pumps may be installed and the excavation carried down to the required depth.

Where, however, the gravel exceeds the above depth, it is advisable to drive sheet piling through the gravel into the hardpan or shale. The method usually adopted is to drive around the outside of the pier a row of round anchor piles spaced about eight feet centres; on these is bolted a heavy wailing. Where two rows of sheet piling are necessary wailings are bolted on both sides and packed out to leave a space of from three to four feet clear between the rows of piling. The outside row is first driven and firmly bolted to the wailing. If the pumps will control the water the pier may then be excavated to the required depth. However, in any case where the gravel is deep, it is always advisable to excavate as deep as possible before driving the inner row, as by doing this there is a better chance of getting the last row well driven into the impervious bottom stratum. After both rows of sheet piling are driven the space between the rows should be well filled with a good class of clay puddle well packed, as the proper placing of this puddle often determines the success of the cofferdam. Two rows of sheet piling well puddled will generally control the water, so that any leakages can be readily handled by the pumps. The sheet piling used by the Department of Public Works is 6 inches thick by 12 inches effective width, has a 1½-inch tongue and groove and is made from coast fir. This solid pile is preferable to what is known as the Wakefield pile, which consists of three planks nailed together to form the tongue and groove. These latter do not stand heavy driving and are apt to separate and besides are just as expensive. This width has been found the most efficient and stands up better against the hammer in driving, while at the same time progress is made, as a pile 12 inches wide can be driven in the same time as a narrower one. The success of driving sheet piling depends a great deal upon their proper pointing. They should be pointed to give just sufficient draw, so that the one being driven will force itself up tight against the previous one and at the same time not be pointed too fine to cause the point to readily broom up.