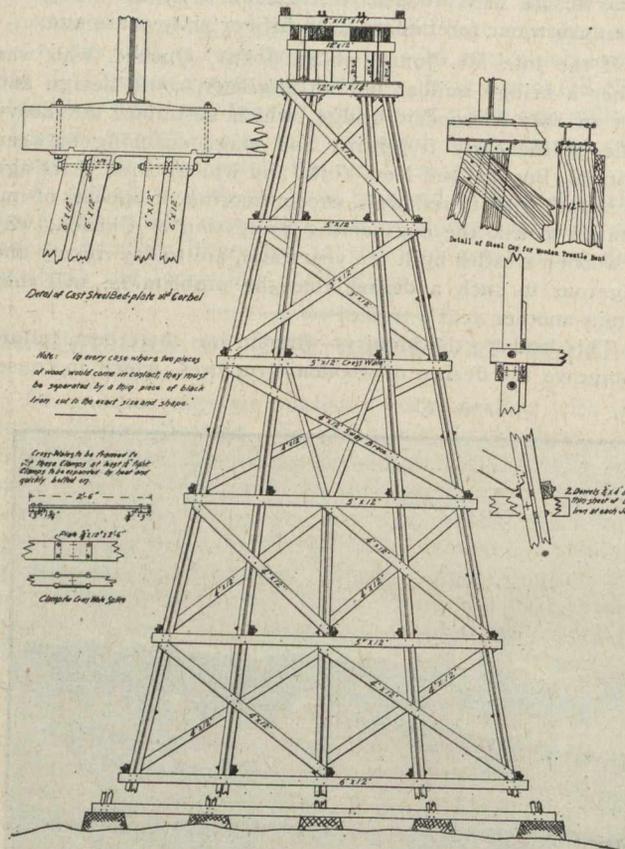


structed to-day with all the defects outlined in this article and are liable to the same fate as their predecessors.

Another defect is that one bent is piled on the top of another with cap sills intervening between the posts of each bent, subjecting the fibres of the cap sill to the crushing effects of the weight above. This principle is wrong, the weight should be sustained end wood on end wood from the foundation to the top. The side wood contracts and expands in response to changes of climate so that one day it



may be higher or lower than another, owing to the swelling or shrinking of the wood which is being crushed side-wise.

Yet another objectionable feature of modern wooden structures is that the cap sills alluded to above, are spliced underneath the main cap sill with a short piece of 12 x 12. It is decidedly unwise to have two pieces of timbers, one directly over the other, on the same plane, as this permits water to enter between the joints of the two pieces and the result is decay. All these defects have a tendency to shorten the life of the structure.

If these structures were properly designed and built, they would be perfectly safe at least for twenty-five years, with ordinary care and the occasional renewal of faulty material.

To insure a twenty-five year life to a wooden structure I would carry the load directly on two pairs of batter posts. On the windy or prairie section, I would give the outer posts a batter of three inches to the foot, and the inner posts a batter of an inch and a half to the foot. In bents up to one hundred feet in height I would have each post consist of two pieces 6 x 12 inches. I would divide the bent into bays every fifteen feet of height. At these bays I would have cross-wales 6 x 12 inches, one on each side of the bent. Diagonally between them I would have sway-braces 4 x 12 inches, as shown on plan.

I would have no end wood crushing into side wood at a strain greater than one hundred pounds to the square inch. Each post piece should be thirty feet in length, with joint in the middle of its mate piece as shown on plan. In the designs of these structures I would impose an arbitrary rule that no two pieces of wood should come in contact, I would interpose a thin sheet of black iron. Where steel girders are used instead of wooden stringers, I would have a cast steel bed plate rest on top of the cap to distribute the load along end wise of the cap to obviate unduly crushing the cap side-wise of the grain. Underneath the cap I would place a cast

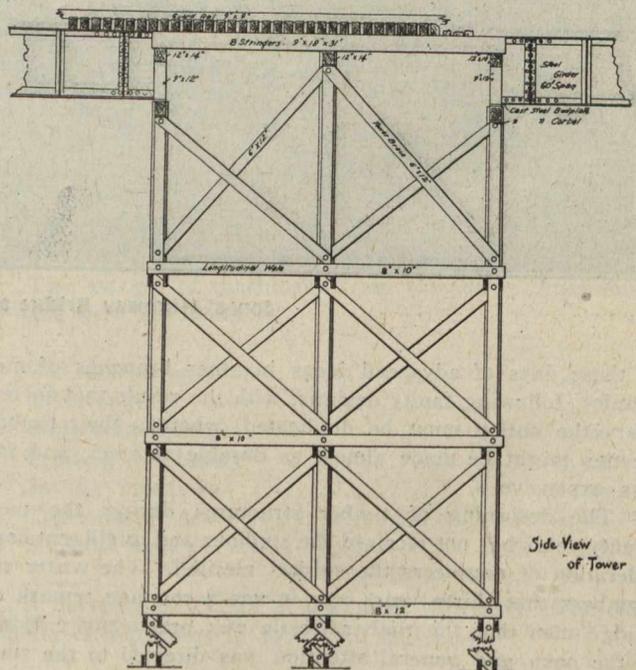
steel corbel to distribute the strain due from the weight crushing down on the end wood of the posts—see detail in plan, cast steel plate and corbel.

For the ordinary rough and ready style of foundations, viz. ; piles of any old kind of pile timber picked up along the right of way, and hammered into the mud and cut off—I would substitute the following:—I would have every bent resting on concrete pedestals. On the top of these I would place a piece of iron, either rolled or cast, for the end wood of the posts to rest on directly, without the interposition of a sill.

The ordinary railway trestle in a timber country, as a rule, is rushed through without any attention being given to design, or the slightest care as to foundations. Piles are procured from the neighborhood and driven a few feet below the surface, a sill is placed on top of these piles and posts erected from the sill, then two, three and in some cases four bents are carried on this sill, one above the other, the sill being sustained by the piles. The result is a flexible, yielding, unstable foundation. The sill is subject to almost daily wetting and drying. In its wet condition it is crushed together by the weight of the posts, and when dry it shrinks. The wood is spongy and soft at times, and allows of a vertical movement throughout the whole bent. This vertical movement (occasioned by the rebound of the sill after the load is removed) disarranges the diagonal sway-braces and permits lateral vibration of the whole bent, which ultimately becomes so shaky that the only remedy is a new bent. Such renewal is only a repetition of the previous inefficient method of construction.

The writer has seen some trestles on the prairies west of Winnipeg, similar to the sketch, with a batter of two inches to the foot. The load being carried on three plumb posts, and the two batter posts are evidently intended as braces with a batter of only two inches to the foot. Ten years from now these trestles will be a source of anxiety and annoyance to the railway company operating the line, and of danger to the travelling public.

As the greater portion of the material will have to be procured from British Columbia, from which point the freight rates are excessive, the timber should be planed and sized before shipping as the saved freight would about equal the labor of planing and sizing. Seasoned lumber is not neces-



sary as whenever two pieces of wood would otherwise come in contact, a piece of thin black sheet iron is introduced. The oxidization of this iron furnishes paint, which preserves the timber. We now have a structure which is perfectly painted in all unexposed places. After the structure has stood a year, and is thoroughly seasoned, the exposed surface should be painted with fire-proof paint, or white-washed with lime, or