

which is the ordinary standard form to-day. It is simple, easily attached, etc., and may be used as a suspended joint on two ties with four bolts, or a longer one (44 inches), with 6 bolts, is often used, resting on three ties, and although more expensive, gives better results.

A comparison was made in Sweden between :

- (1) Fish plates with Ellsworth base plate.
- (2) Angle bars.
- (3) Double deep angle bars with 2-inch extension downward between the ties.

The renewals for flattened ends in five years were (1) $6\frac{4}{10}$ p.c., (2) $14\frac{4}{10}$ p.c., (3) $17\frac{6}{10}$ p.c., but as for stiffness they were (1) $\frac{1}{3}$, (2) $\frac{2}{3}$, (3) 1. So that Nos. (2) and (3) were considered superior, particularly owing to their simplicity, but as No. 3 was easily heaved by frost and snow it was considered suitable for milder climates, and the choice rested on the angle bars.

The Fisher bridge joint has been tested quite extensively, and is found to be very stiff vertically, but weak laterally, and its various parts are rather expensive and more complicated than the angle bars. For these reasons it is not likely to find extensive favor. The Churchill joint of N. & W. R. R. is probably the most efficient joint yet designed as far as stiffness, etc., and is intended for use with 60 ft. rails. Otherwise it would be too expensive and complicated for ordinary use. The other joints shown appear to have good points, but are of less tried merit. (Also see *Engineering News*, page 178, Vol. I., 1891, for Paterson rail joint.)

We may expect, ultimately, to obtain a joint as strong as the rail itself, but how simple it can be made is for the future to show.

ARTICLE 6.—RAIL FIXTURES, ETC.

The weak spot of our track is its attachment to the ties by ordinary track spikes. Their heads are often cracked by excessive driving, re-spiking is frequent, and the ties get split and rotten much sooner than they would naturally, and while Greer, Goldie, curved, interlocking and other special spikes are improvements on the dog spike, yet the final solution would seem to be in some