

ing of the rail ends at the joints take place, in consequence of which the rails are subjected to percussive blows, the chairs not unfrequently are broken, the spikes drawn, and the whole track is liable to be injuriously thrown out of line and level. This circumstance of climate goes to prove the necessity of a more perfect system of permanent way in this country than where the seasons are more temperate. And hence we may account for the otherwise remarkable fact, that America when compared with England has been so much more prolific in compound rails, and similar expedients, to remedy the objections above named.

Amongst other expedients which have been tried to lessen the evils referred to, the application of fishing plates at the joints has been found, when they are kept in perfect order, to answer an excellent purpose. The fishing plates, however, are liable to get deranged, as the bolts by which they are fastened readily become loose through the vibration of the rails, and in this state they are of little service. When this expedient was discussed at a meeting of the Institution of Civil Engineers held last year in England, it was stated that "a recent examination of some brackets and fish plates which had been laid down about twelve months, and were secured by bolts and nuts, showed, that in 125 pairs of joints, each pair having 8 bolts, 261 bolts were loose, and 6 were out altogether, though they had been tightened up within 48 hours. The number of loose bolts at each joint varied from 1 to 8. It was contended, therefore, that bolts and nuts, such as were ordinarily used, were unsafe, inefficient, and expensive fastenings for connecting together the parts of a permanent way, and that they were not to be relied on."

Compound rails of various kinds have been tried of late years on some American roads to overcome the defects of the ordinary rail track. They have been found, when newly laid and in good order, to be remarkably smooth to ride over, and easy on the engines and rolling stock, but as the plan of their construction required that they should be secured with the same description of fastenings as those used with the fishing plates above referred to, they soon got out of order, were difficult and expensive to keep in repair, and are now, I believe, but little used. The Plate shows different patterns of compound rails which have been tried, six on American railways and one on the Great Western in Canada. They are all, with slight modifications, designed after the same general plan, that is, two halves joined together vertically, breaking joint longitudinally, and fastened with bolts and nuts.