

testing the "feel" of the train at a time when he knew that within a short distance it would be necessary to make a substantial reduction in speed. He was then of the opinion that he was about 30 chains from the curve. His evidence is that the crash occurred practically simultaneously with the release of the brakes, which indicates that he was about 200 ft. from the point of derailment when he applied the brakes, and that, accordingly, he had misjudged his position by about 27 chains. Expressed in another way, the driver had underestimated his speed to such an extent as to cause him to think that he had travelled a distance of 60 chains when he had in fact travelled a distance of 87 chains. On this basis his 40 miles per hour becomes 58 mile per hour. As previously stated, with a ground haze and banks of low-lying fog hiding the fences and small objects which would be within the beam of the headlight, it would be a very easy matter to lose track of one's actual position. The driver's principal sensation at the time of the accident was that of the engine sliding from under him, which is what would almost certainly be the case when, under the influence of centrifugal force, it overturned.

This is an appropriate place to say that, throughout his entire evidence, the driver displayed a frankness and sincerity which is to be commended. His general evidence is more consistent with the ascertained facts and with other evidence on which reliance can be placed than that of any other single witness who deposed to the matters covered by him. It would appear that the only point in which the driver was at fault previous to his losing track of his actual location was the estimation of his speed at Ratana at 40 miles per hour. His candour is manifested by his free admission (and this applies also to the guard) as to the speed in this locality, for both men knew, and had ample opportunity to have the matter brought before them, that the train should not then have been travelling at more than 35 miles per hour.

(d) We come now to the evidence which the wreck itself provided.

The opinion of Mr. Wansbrough, who carefully examined the site and the wreckage and investigated the characteristics of friction, decelerating bodies, &c., was that the vehicles could not have reached the position which they did reach after the derailment unless their speed at the time of the derailment of the engine had been at least 50 miles per hour. The engine was derailed, it bumped on its left-hand set of wheels over the sleepers for a considerable distance, then ran along the clay of the formation, a track totally unsuitable for such traffic. Its left-hand side then struck the batter of a clay cutting, along which it was deflected, plunging into the clay as it went. It gradually buried its forward end in the ground until it came to rest at an angle of about 45°, with nearly half its buffer-beam, cow-catcher &c., entirely buried not in soft earth, but in hard clay. At a point, not precisely fixable, between their position at the time of the derailment of the engine, and their position at the time at which the engine, followed by the leading car, came to rest, the second and succeeding cars were wrenched apart from the leading car, severing the couplings and the Westinghouse-brake hose between the leading car and the second car. The second car struck the uptilted buffer-beam of the leading car with sufficient force to tear off more than half of its front wall and all the side of its leading compartment. This semi-oblique force was sufficient to drive the second car over to the right of the line, breaking the fishbolts and displacing one of the rails in the process. The third struck the same object, was subjected to almost the same destruction, and in its turn was forced over to the right. By the time that the fourth car arrived at the immovable body its speed, and that, of course, of all the following portion of the train coupled to it, was considerably diminished, and the damage it received was consequently less, but it also was forced over to the right. These cars, in addition to having their superstructures subjected to terrific blows against the leading car, had their bogies smashed, in some cases completely wrecked, and had to travel the remainder of the distance sliding along the ground and against the batter on the right-hand side of the track. The total distance travelled by the second car and the following vehicles, after they had reached the positions which it is probable they occupied when disconnection from the engine and leading car took place, was over 250 ft. and may have been over 300 ft. This distance was travelled in spite of the fact that the brakes were automatically operating to the fullest extent possible in the circumstances, and in spite of the fact that three of the cars were subjected to the battering previously described. Neither the progress of the engine and the first car nor that of the rest of the train, in the circumstances respectively applying, would have been possible except with an initial speed in excess of 50 miles per hour.

COMMENTS ON TECHNICAL EVIDENCE.

Train disasters attributable to overturning due to excessive speed on curves are, fortunately, extremely rare; a fact remarked upon by the Inspecting Officer of the Board of Trade when reviewing the circumstances of the catastrophe at Salisbury, on the London and South Western Railway, in 1906—an accident that in its main features bears a remarkable similarity to that now under consideration.

It follows that where overturning is suspected the technical analysis must necessarily be pressed much further than a mere review of the facts that may be disclosed by inspections of track and mechanical equipment and a consideration of the conflicting statements and impressions of persons who may have been directly or indirectly concerned in or affected by the accident.

The most important contributions towards such an analysis have been submitted by Messrs. Wansbrough and Gard, Designing Engineers in the Civil and Mechanical Engineering branches respectively.

In respect of the particular question of the overturning speed of the A.B. engine, the detailed computation based on the actual characteristics of the engine was naturally provided by the Designing Engineer in the Mechanical Branch. Mr. Gard's estimate of the speed at which the locomotive concerned would overturn as being approximately fifty miles per hour on a 6·4 chains curve has been reached by following established principles, is based on adequate data in respect of the design and the sprung and unsprung weights of the engine, and can be accepted as substantially correct.