



MINISTRY OF TRANSPORT

RAILWAY ACCIDENTS

REPORT ON THE ACCIDENT

which occurred on

7th December 1948, between

COWDEN & HEVER

in the

SOUTHERN REGION

BRITISH RAILWAYS

LONDON : HIS MAJESTY'S STATIONERY OFFICE

1949

TWOPENCE NET

BRITISH RAILWAYS
SOUTHERN REGION

MINISTRY OF TRANSPORT,
Berkeley Square House,
London, W.1.,
11th April, 1949.

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order dated 11th December, 1948, the result of my Inquiry into the accident which occurred at about 11.30 a.m. on the 7th December, 1948 in Mark Beach Tunnel between Cowden and Hever Stations on the Oxted-Tunbridge Wells line in the Southern Region, British Railways.

1. Tank Engine No. 2028 was travelling light from Tunbridge Wells to New Cross and was about half way through the tunnel, which is three quarters of a mile long, when one of the large smoke tubes collapsed. The cab was filled with steam and flames, and Driver Albert Broadway, who happened to be opposite the fire hole, closing the regulator, had his face, arms and legs badly scalded. His fireman, Donald Croker, was in the corner of the cab and escaped injury. The engine was coasting down a falling gradient towards London, but Broadway was able to apply the brake and bring it to stand before he and Croker were compelled to leave the footplate.

2. Croker was sent immediately to protect the engine in the rear, but had not proceeded far owing to the darkness, when he was re-called by Broadway who noticed that conditions on the footplate were improving and decided to try and run the engine by gravity into daylight. The movement was slow and before they reached the London end of the tunnel, they were joined on the footplate by Peter Cooper, the length ganger, who had heard the engine stop and immediately went towards it to ascertain the cause. At his suggestion the engine was allowed to run through Hever Station towards Edenbridge where he knew there would be better facilities for dealing with Driver Broadway's injuries.

3. A change of gradient, a short distance from Edenbridge station, brought the engine to rest 20 yards from the up home signal from which point it was drawn into the station and placed in a siding by the engine of a down train. Meanwhile, as the result of a message sent by Cooper through one of his lengthmen an ambulance arrived at Edenbridge station almost as soon as the injured man, and he was in hospital within half an hour of the accident, which reflects credit on all concerned.

4. The engine, which is Class L3, with a 4.4.2. wheel arrangement, was being sent to New Cross shops for a few minor mechanical repairs. It had run nearly 87,000 miles since it returned to traffic on 17th May 1945 after general repairs in Brighton Works. It was still in fairly good order. The boiler was last examined by the District Boiler Inspector James Clements, on the 4th October, who reported that the copper ends and beads of the large tubes were wearing thin and, as a result of the only recommendation made by him, the ferrules were renewed.

5. The fortnightly examination of the fire box by the local boilersmith at Tunbridge Wells was carried out by Walter Collingwood on the day before the accident, when the boiler was being washed out. Apart from initialling the Engine History Sheet, Collingwood, who has since retired, made no comments on his examination, from which it may be assumed that he noticed nothing amiss. He was regarded as thoroughly reliable and had had 45 years experience of boilerwork.

6. The tube which failed was the second from the right in the middle row. It was of steel, 4½ in. outside diameter, with a copper portion, some 10 in. long, brazed on to the firebox end. The fracture extended round ¼ of the circumference of the steel tube, close to the brazing, and was due to corrosion on the waterside. It was one of a complete set of 21 new large tubes fitted to the engine during the last general repair when a new copper firebox was also provided. When the rest of these tubes were drawn after the accident, practically all were found to be badly corroded circumferentially near the brazing, and several collapsed while being removed. In addition there was an unusual amount of pitting further along most of the tubes. The small tubes were also drawn, but were in good condition having been renewed in November, 1947.

7. The Chief Chemist of the C.M.E. Department, Southern Region, analysed the fractured tube, and after comparing it favourably with the specification for such tubes concluded his report with the observation that "there is nothing abnormal in the composition of the steel, which is of good quality." This was only to be expected as it was clear from the condition of the other large tubes that the corrosion, which led to this accident was not restricted to the tube which failed, but was common to the set as a whole. It was therefore thought desirable to investigate whether other engines of the same class, doing more or less the same work, were similarly affected. The entire set of large tubes was accordingly drawn from engines No. 2022, and No. 2027 which had run 84,532, and 69,674 miles respectively since their last general repair; in addition three large and seven small tubes were drawn at random for examination from all the other engines of the same class, irrespective of work or location.

8. I inspected the two sets of tubes at Eastleigh Works with the following results :—

ENGINE NO. 2022 : (new large tubes fitted in January 1945) the steel was slightly wasted due to corrosion near the copper ends, with occasional pitting further along some of the tubes, but in the opinion of the Boiler Shop Foreman they could have remained in service another 18 months or 2 years.

ENGINE NO. 2027 : (a set of secondhand large tubes, with new copper ends, fitted in November 1945). The tubes were in good condition with practically no corrosion or pitting. Secondhand tubes are generally those taken from boilers of greater length, which enables the brazed ends, where corrosion is most likely to occur due to electrolytic action, to be cut off before being used a second time. The tubes had therefore been in service for probably eight or nine years at least.

9. I did not personally inspect the tubes taken from the other engines for sampling, but was informed that they were in reasonably good condition and it was not considered necessary to have any additional tubes drawn. From these investigations it became evident that the conditions which led to this failure were peculiar to engine No. 2028, which is one of eleven of the same class stationed at Tunbridge Wells, and normally would have been maintained on more or less the same work.

10. Since May, however, this engine has been subjected to anti-foam trials by the I.C.I. and when the firm were notified of this tube failure by the Chief Mechanical Engineer of the Southern Region, they replied as follows :—

“We also confirm the view of your own staff, namely that these anti-foam materials cannot, because of their nature, have caused the “necking” which led to the rapid failure of the super heater tube of this locomotive. The active ingredient in these anti-foams consists of a small percentage of organic materials, for example polyamides. British Patents Nos. 568, 318 and 568,510 describe a number of these materials. As you may know from published information, anti-foam materials of the above types are extensively used by the American Railways apparently without ill effects. You have also been using anti-foam materials supplied by us for several years, for example at Ramsgate and Horsham, without trouble”.

11. While the actual test chemicals may not have affected the tubes, the trials probably had a bearing on the accident in so much as the engine was restricted to a special turn of duty for the time being, introducing water conditions differing in important respects from those applicable to the other Tunbridge Wells engines of the same class. The water taken by these engines as a whole may be regarded as non-corrosive with the exception of that at Three Bridges which has a high amount of dissolved carbon dioxide associated with a high iron content, and is, on that account, detrimental to steel. There are only two daily turns which take the Tunbridge Wells 1.3 class engines to Three Bridges, and normally they would be worked by all the engines in rotation. Throughout the trial period, however, engine No. 2028 was kept exclusively on one of these turns which included nearly an hour's wait at Three Bridges twice daily, and as the water there is popular with enginemmen, in view of its anti-priming properties, every opportunity was probably taken to replenish the tanks with it.

12. I do not suggest, however, that heavy corrosion of the tubes on this engine was solely due to Three Bridges water taken during the period of six months. I am inclined to the view that it started at an early stage after the engine left the works, due to some conditions which cannot now be traced. This led to the comparatively early renewal of the small tubes after 2½ years service, but left its effect on the large tubes and rendered them particularly susceptible to the corrosive nature of the Three Bridges water, during the last few months, when it was taken regularly in fairly large quantities.

13. The failure of a large tube in traffic appears to be almost without precedent, and it is seldom that they become sufficiently thin to develop “pin-holes,” which is the usual warning given by small tubes. In fact, Boiler Inspector Clements, who has served in this capacity for ten years, after more than 35 years previous experience as a running-shed boilermith, could recall only one instance of a pin-hole in a large tube. The failure may, therefore, be regarded as exceptional and, in the light of past experience, I consider that all reasonable precautions were taken. It has, however, revealed possibilities, and the method of examining these tubes should be reviewed. Unless a reliable means can be found for determining their condition without disturbing them, sampling may have to be resorted to more freely in future. In that connection the behaviour of the small tubes ought to be a useful guide, and should be studied more closely.

14. While these suggestions are intended to discover corroded tubes before any harm results, the desirability of extending the installation of water treatment plants where necessary to prevent such corrosion so far as possible should not be overlooked.

I have the honour to be, Sir,

Your obedient Servant,

J. L. M. MOORE.

The Secretary,
Ministry of Transport.