



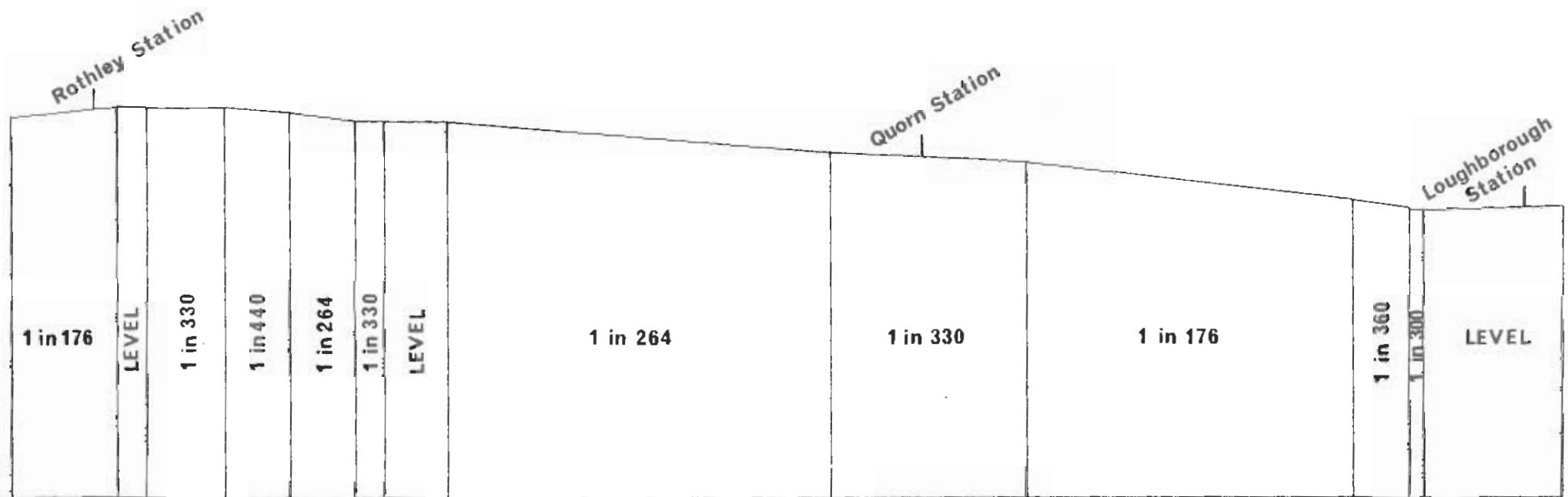
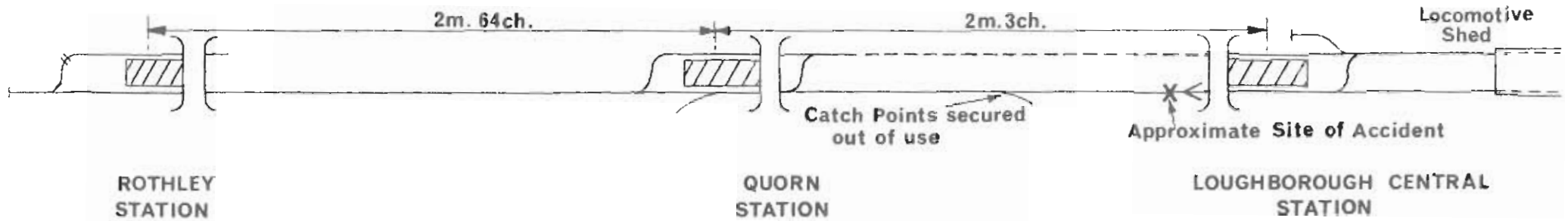
REPORT ON PERSONNEL ACCIDENT
THAT OCCURRED ON 7TH MARCH 1976
NEAR LOUGHBOROUGH
IN THE LONDON MIDLAND REGION OF
BRITISH RAILWAYS

SUMMARY

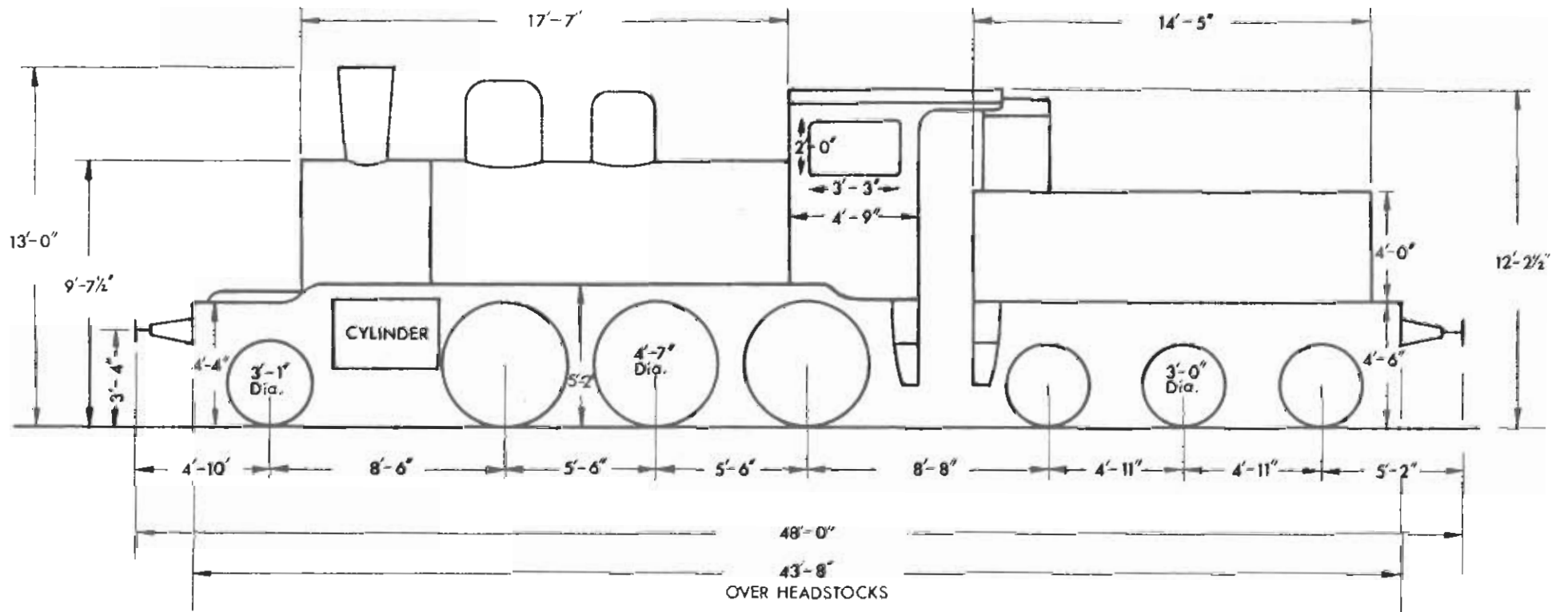
Time and Weather	14.59.
Nature of Accident	As a steam locomotive No 377, 'King Haakon 7' was hauling a train from Loughborough Central station an explosion occurred in the firebox and the cab was immediately enveloped in steam and water and sprayed with burning coal. Three of four men who were in the cab were injured as a result.
Casualties	R Anderson, who was firing the locomotive and who is aged 28; severely scalded. M Mountford, who was acting as a trainee fireman and who is aged 28; severely scalded, dislocated right shoulder and right arm fractured. D Hinton, who was acting as driver-instructor and who is aged 28; minor scalds. The fourth man who was driving the locomotive, apart from a slight scald on his left wrist escaped injury.
Type of Motive Power	Steam
Conclusions	The locomotive was being worked with a boiler pressure of 170 lbs/in ² and the accident occurred when a brass fusible plug blew out of the crown plate, leaving a 1½ inch diameter hole from which a high velocity jet of steam and water escaped. The plug had been badly fitted by a man who was unskilled in boilersmith's work and who did not have any suitable tools.
Recommendations	1. It should be an enforced requirement that any railway, working steam locomotives, must have the services of a suitably qualified person in order that the boilers may be maintained by laid down schedules of examinations, or, if no such person is available the work must be carried out by contract by a firm with suitably qualified staff having knowledge of locomotive boiler maintenance. 2. Schedules of steam locomotive boiler and mechanical maintenance should be drawn up and carried out by all steam-operated railways; these schedules to be based on the British Railways document MP11, suitably amended in accordance with the amount of time the locomotives are in steam.

SECTION OF FORMER GREAT CENTRAL RAILWAY
ON WHICH THE TRAIN WAS BEING WORKED

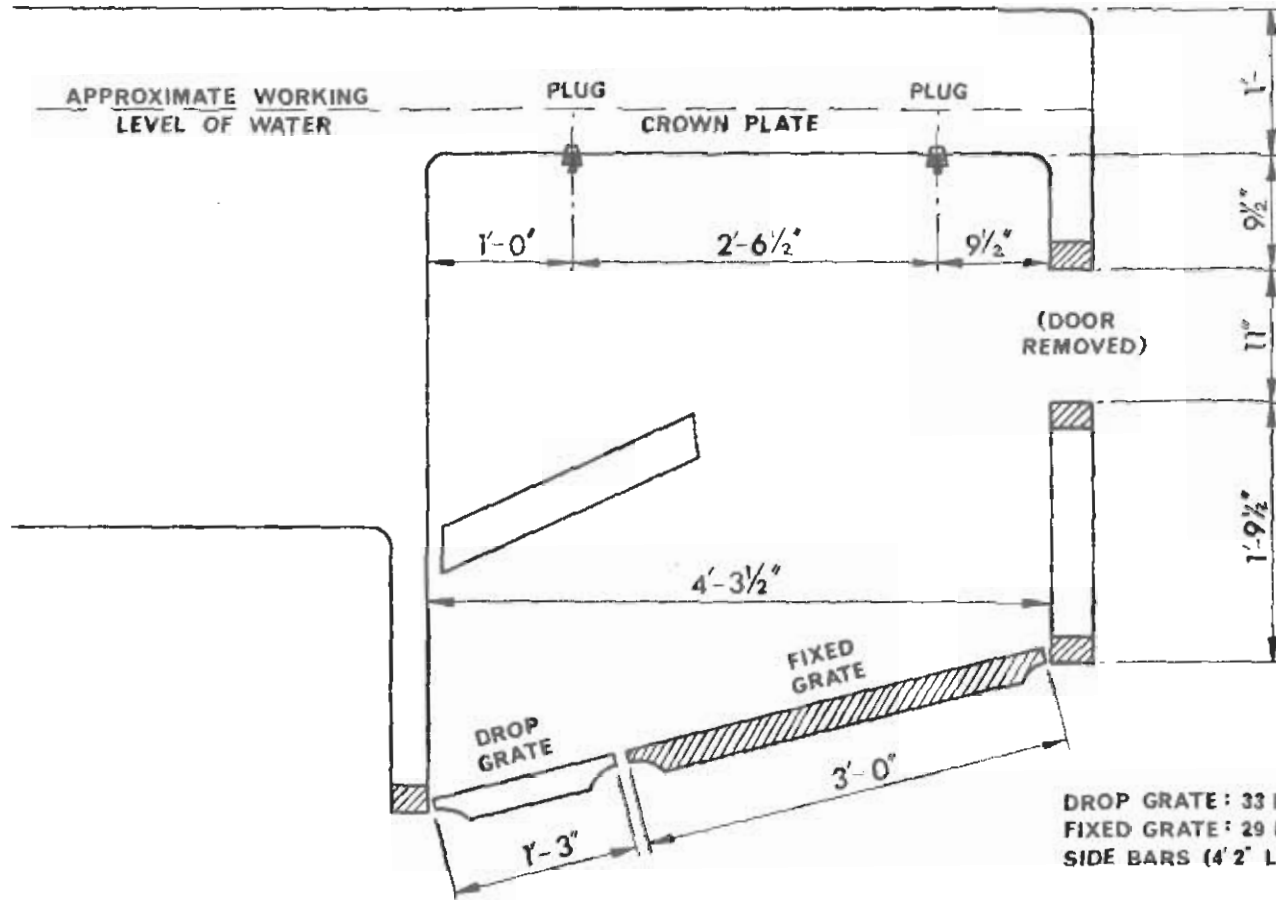
Sketch 'A'



ACCIDENT TO R. ANDERSON, M. MOUNTFORD AND D. HINTON
NEAR LOUGHBOROUGH ON 7th MARCH 1976
LOCOMOTIVE No.377 'KING HAAKON 7'



DIMENSIONS OF THE LOCOMOTIVE 'KING HAAKON' 7's FIREBOX
GRATE AREA sq.ft. HEATING SURFACE 985 sq.ft.





RI ~~2/5/0690~~
2/2/01510

RAILWAY INSPECTORATE
DEPARTMENT OF THE ENVIRONMENT
2 MARSHAM STREET
LONDON SW1P 3EB

28th June 1976

Sir,

I have the honour to report for the information of the Secretary of State, in accordance with the Order of 22nd March 1976, the result of my Inquiry into the accident that occurred on 7th March 1976 to R Anderson, M Mountford and D Hinton of the Main Line Steam Trust near Loughborough in the London Midland Region of British Railways.

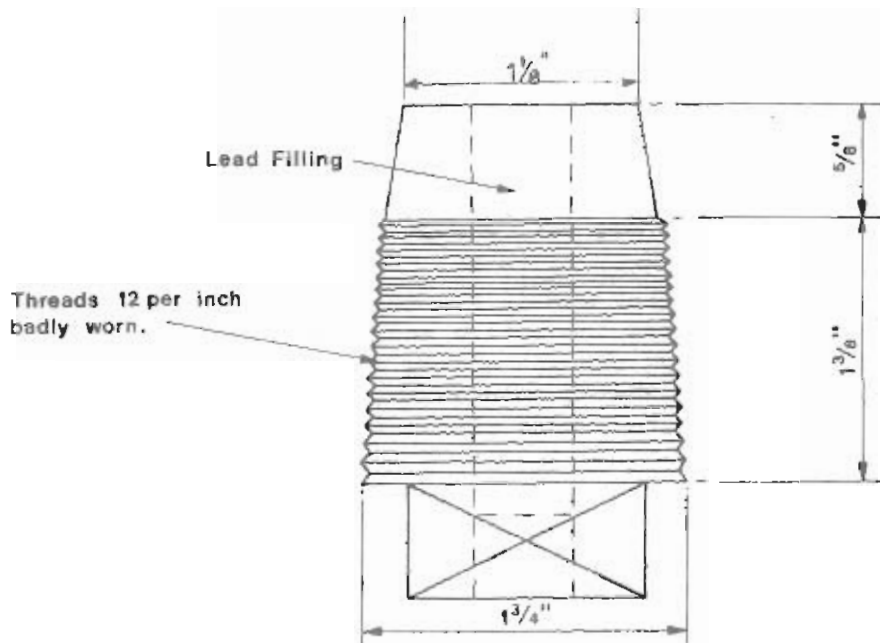
2. Loughborough Central station lies about 10 miles to the north of Leicester, on a stretch of line that used to be a part of the former Great Central Railway. A steam locomotive, No. 377 and named 'King Haakon 7' was working the 14.50 (southbound) Main Line Steam Trust passenger train of 175 tons from Loughborough to Rothley when, a mile from Loughborough Station, a brass fusible plug blew out of the firebox crown plate, leaving a $1\frac{5}{8}$ inch diameter hole in the plate above the brick arch. The locomotive was being worked with a boiler pressure of about 170 lbs/in² and the high velocity jet of steam and water that escaped from the hole forced open the firehole door, enveloped the cab, and blew burning coal on to the footplate. Anderson, Mountford and Hinton were three of four men in the cab, the fourth man being P Smith. Anderson, who was firing the locomotive and who is aged 28, was severely scalded. Mountford, aged 28 who was acting as a trainee fireman, also sustained severe scalds; he clambered outside the steam-filled cab but fell from it and landed heavily on the ground, dislocating his shoulder and fracturing his right arm. When I held my Inquiry 5 weeks later both Anderson and Mountford were still in hospital recovering from their injuries. Hinton, who was acting as a driver-instructor and who is aged 28, sustained some minor scalds, and was off work for a few days as a result. Smith, who is aged 42 and who was driving the locomotive, scrambled through one of the cab windows with only a slight scald on his left wrist and although he, too, fell heavily on the ground alongside the track he escaped further injury; he had first pushed the vacuum brake handle to the ON position, however, and the brake application quickly brought the train to rest. There were no passenger casualties amongst any of the 200 people who were travelling in the 5 coaches that the locomotive was hauling at the time. The site of the accident is depicted on the attached sketch 'A'.

3. Locomotive King Haakon 7 is of Norwegian origin and has a 2-6-0 wheel arrangement; its outline, together with its outline dimensions, is shown on attached sketch 'B'. It was in service in Norway up to 1969, when it was then brought to England by a private purchaser who had it restored and sent to Loughborough in March 1973. The Main Line Steam Trust took charge of it and began to work it on 24th June 1973 to haul trains at weekends and Bank Holidays along the approximately $2\frac{1}{2}$ miles stretch of line between Loughborough and Quorn; on 3rd January 1976 an additional $2\frac{1}{2}$ miles of the line was opened by the Trust for working trains beyond Quorn as far as Rothley. Although the operation of the railway has to be carried out under the supervision of

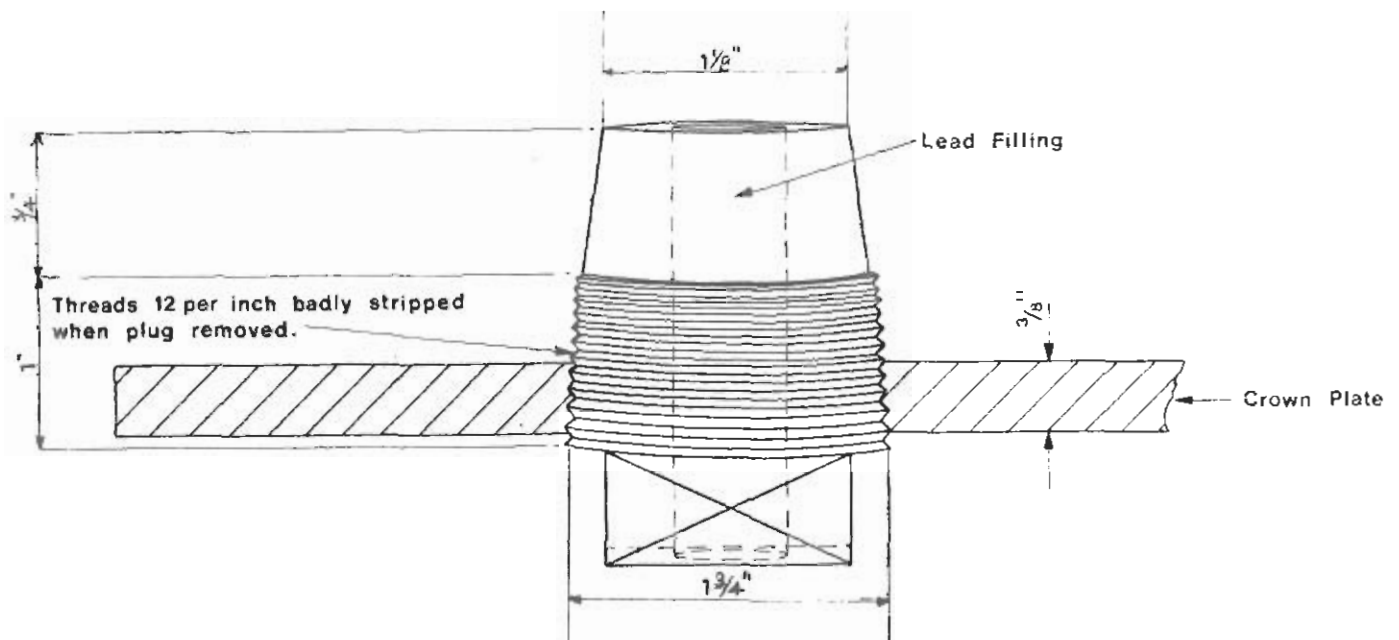


British Railways who own the line and are statutorily responsible for it the Trust are responsible for the maintenance of the locomotives that they use to work the trains.

4. On 10th March 1976, in company with a British Railways chief boiler inspector, Mr J Williams, I examined the firebox of the locomotive. It is of steel welded construction. The steel crown plate, which is $\frac{3}{8}$ inch in thickness, had not been damaged; this was probably because the downward rush of steam and water more or less extinguished the fire before all the water on top of the firebox was lost. The crown plate has places for two brass fusible plugs; both along the centre line of the firebox. I found that the fore plug, which was the plug that had blown out, had been 12 inches from the tube plate and that the rear plug, which was still in place, was $7\frac{1}{2}$ inches from the back of the firebox, almost immediately above the firehole doorway. Sketch 'C', which gives the outline of the firebox and some of its dimensions is attached and shows the positions of the two plugs; the following sketch depicts the plug that was blown out and as it was found after the accident in the dead ashes of the fire.



The crown plate, of nominal $\frac{3}{8}$ inch thickness, had wasted to $\frac{5}{16}$ inch around the fore plug hole which, at the best, would have allowed of only four threads of the plug being in contact. I found, however, that most of the plug's threads in the contact area were filled with rust and dirt, indicating that the plug had been fitting in its hole very badly and had, indeed, been loose. The back plug which, as previously stated, was in place when I went into the firebox, showed no signs of leaking around its threads and its lead filling was intact. It had the appearance of being cross-threaded in the hole, however, more or less as shown by the following sketch.



Mr Williams had this plug removed for me, when I then saw that many of its threads were badly stripped.

5. The last boiler inspection was carried out on 6th April 1975 when the locomotive was being re-tubed by the Main Line Steam Trust's volunteer staff. While this work was in progress Mr J R Oliver, an Engineering Surveyor to the Insurers of the locomotive, asked for the two fusible plugs to be removed in order that they might be examined and the condition of the fusible element determined, and also that the crown plate threads might be examined and any crown plate wastage determined. The plug that was towards the tube plate had to be cut out by drilling and a new plug was made by one of the volunteer staff, using the old plug as a guide. A qualified boilermaker was not available to carry out the examinations for which Mr Oliver had asked and when the new plug was completed Hinton, who is a British Railways guard, and who works for the Trust as one of their volunteers, although not qualified in boiler work, accepted the task of fitting the new plug and at the same time replacing the plug in the hole that was towards the firehole.

6. Hinton obtained two screw cutting taps that were marked and dimensioned as follows:-

- i. Marked:- $1\frac{3}{8}$ in, 12 tpi, BRW, 28 RW. Dimensioned:- Min. dia $1\frac{3}{8}$ in Max. dia. $1\frac{3}{4}$ in, 3 in tap length, ie taper of 1 in 8
- ii. Marked:- $1\frac{1}{2}$ in, 12 tpi, BRW, 1 RW. Dimensioned:- Min. dia $1\frac{1}{2}$ in Max. dia. $1\frac{7}{8}$ in, 3 in tap length, ie taper of 1 in 8



Hinton said that he used one of these taps to re-form the firebox crown plate fusible plug hole threads; he could not say which tap he had employed but, whichever tap it was, it left the screwed plug holes with a 1 in 8 taper. The fusible plug that he fitted into the 1 in 8 tapered hole towards the tube plate had, itself, a taper of 1 in 12; thus when the top thread of the plug was tight the bottom thread inside the hole was loose all around by 1/64 inch. At the fire hole end of the crown plate he fitted a fusible plug tapered at 1 in 20 into a 1 in 8 tapered and tapped hole and when the top of the plug was tight the bottom of the threads would have been loose by 1/32 inch all round, and in addition he left this plug screwed in cross-threaded.

7. However, when Hinton had finished this work and the re-tubing was completed Mr Oliver in the belief that both fusible plugs had been withdrawn, examined and refitted by a boilermith asked for a hydraulic pressure test of the boiler and this was carried out at 230 lbs/in² in his presence on 14th April 1975. The pressure was satisfactorily maintained for 30 minutes without any undue leakage or deflection taking place and Mr Oliver issued a boiler certificate to this effect. On 2nd May 1975 the boiler was steam-tested again in Mr Oliver's presence and a 'In Order' certificate was issued by him declaring the boiler suitable for service. There is no record of the fusible plugs having been withdrawn from this date to the date of the accident.

8. The examination and fitting of the plugs should have been done by a qualified boilermith and the accident occurred because the task was attempted by a man unskilled in boilermiths work. At the present time the Main Line Steam Trust does not have a man qualified in boiler maintenance to work for them but the standard of maintenance of a locomotive boiler must be exacting, as there must be a large margin of safety; it should be remembered by all who have dealings with steam locomotives that when steam is raised to a pressure of 170 lbs/in² its temperature is not that of a boiling kettle, which is 212°F; it is, in fact, about 375°F. Steam locomotives should not, in my opinion, be operated unless a man qualified in boiler work having all the proper tools of his trade to hand, is available to maintain their boilers in accordance with stringent laid down schedules of examination or satisfactory arrangements for repairs and maintenance are arranged with a firm with suitably qualified staff having knowledge of locomotive boiler repairs. In addition, steam locomotive boiler and mechanical schedules of examinations should be drawn up based on the British Railways document MP11; the schedules to be adhered to should be suitably amended in accordance with the period of time the locomotives are in steam or mileage run where mileage examinations are required.

I have the honour to be,
Sir,
Your obedient Servant,

F. J. W. Brown
F J W BROWN

The Permanent Secretary
Department of the Environment