" hard on, and the head guard told him afterwards " that he had not time to do so."

He also stated that " he ran this passenger train " once or twice a week, and generally passed the goods " train at Sandy ; that it is not unusual to receive " a caution signal at Tempsford for this goods train, " and after seeing the caution signal at Tempsford " he concluded it was for the goods train in front, and " when he saw the goods train in the siding at Sandy " and the distant signal at all right, he felt sure that " the signalman had forgotten to drop the station " signal." He knew nothing of the coal train. This is one of the great drawbacks against allowing a coal train to be running in advance of its appointed time.

The fact of the up-distant signal being off is not disputed. The signalman had forgotten or neglected to place it on at danger after the coal train arrived at Sandy, and the driver of the coal train had omitted to see that it was placed at danger before he commenced to shunt his train across from the up to the down road, as he should have done.

The primary cause of this collision was the neglect of the signalman, James, to place the up-distant signal at danger before he commenced to signal the coal train to shunt from the up to the down road. He had been employed two years at this station as signal man, and is said to be a good man.

As I have already stated, the driver of the coal train should have looked to the signals before he began to shunt, and the driver of the passenger train, Richard Thornton, was certainly to blame for not having kept a better look out ahead, as there is evidence that he did not sound the whistle for the guards breaks to be put on until he had travelled over nearly half the distance between the spot where the station signal is first seen from under the London and North-Western Railway bridge and the place where the collision occurred, 30 yards south of the station signal; indeed he does not deny but that he first endeavoured to whistle off the signal, and then when it was altogether too late, with the means at his disposal, he tried to pull up his train.

If the signals at this station had been fitted with a locking apparatus, by which the points of the cross-over road could not have been made use of except when the distant signals were placed at danger, the signal-man would not have been enabled to make the mistake which led to this collision, as he would have had to place the up-distant signal at danger before he could have shunted the coal train from the up to the down road.

I am of opinion that it would be highly advantageous, and tend to provide for the public safety, if the directors of the Great Northern Railway were at once to determine to have the signal arrangements on their main line thoroughly examined, and as a consequence, improved by the introduction of additional signals against sidings, &c. where necessary, with locking apparatus, &c., by which mistakes of the kind that led to this collision may be avoided.

It would be better, and ultimately more economical, to do this gradually, instead of waiting for some serious collision to occur to prove that it is necessary, as these collisions, even when there are no fatal results, are still very expensive.

I have, &c.

*The Assistant Secretary of the Board of Trade (Railway Department), Whitehall.*

W. YOLLAND, *Colonel.*

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## LANCASHIRE AND YORKSHIRE RAILWAY.

*Board of Trade*
*(Railway Department),*
*Whitehall, 17th March* 1868.

SIR,

I AM directed by the Board of Trade to transmit to you, for the consideration of the Directors of the Lancashire and Yorkshire Railway Company, the enclosed copy of the report made by Colonel Yolland, the officer appointed by the Board of Trade to inquire into the circumstances connected with the explosion of the boiler of the engine of a passenger train at Halshaw Moor station, on the Lancashire and Yorkshire Railway, on the 31st January last.

I have, &c.

*The Secretary of the Lancashire and Yorkshire Railway Company.*

R. G. W. HERBERT.

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*Board of Trade*
*(Railway Department),*
*Whitehall, 13th March* 1868.

SIR,

I HAVE the honour to report, for the information of the Board of Trade, in obedience to your minute of the 7th ultimo, the result of my inquiry into the circumstances which attended the accident that occurred at Halshaw Moor station of the Lancashire and Yorkshire Railway on the 31st January, from the explosion of the boiler of a locomotive engine (No. 115), when the driver was very seriously injured, having had one of his legs broken, and been severely scalded about the head, face, and body. He was, however, recovering from the effects of the accident when I saw him in the Salford Dispensary on the 12th ultimo. I am informed that no passengers were injured.

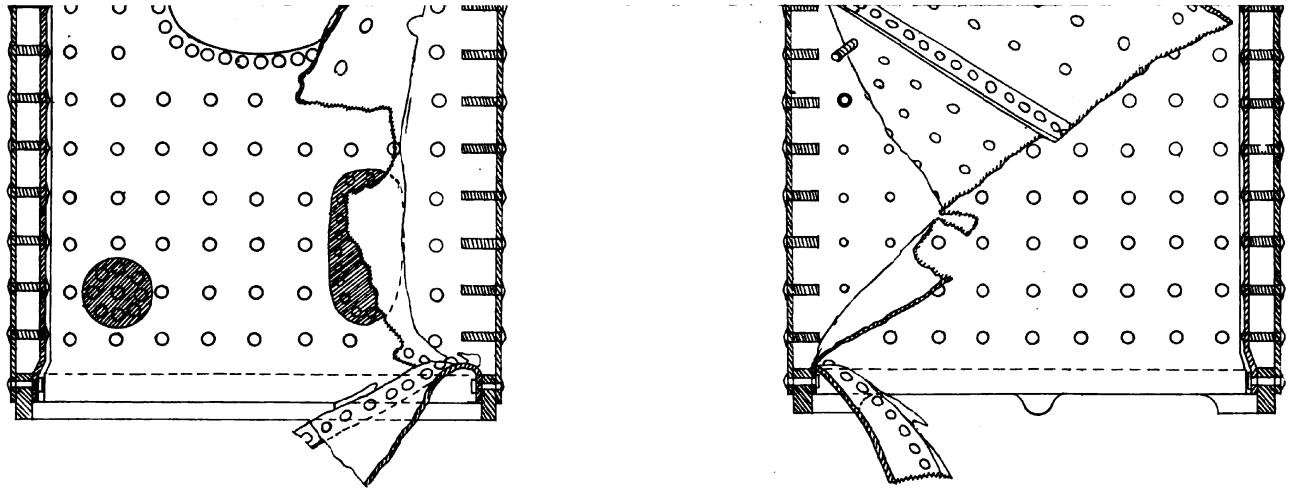
This engine was attached to a passenger train running between Manchester and Bolton on the 31st January. It left Manchester for Bolton at 7.0 a.m., and returned at 8·20 a.m.; left Salford for Bolton at 9.5 a.m., and returned at 10.15 a.m.; from Manchester at 12.20 p.m., and returned at 3.10 p.m.; left Manchester at 5.30 p.m. with 10 or 11 vehicles; and shortly after the train stopped at Halshaw Moor Station, $2\frac{1}{2}$ miles from Bolton, the explosion took place. The driver, Richard Partington, was on the foot plate at the time; he was knocked back among the coal in the tender. The fireman was on the right-hand side of the engine at the sand-box, waiting to sand, to enable the engine to start properly. The steam was shut off, but there is some uncertainty whether the engine was, or was not, blowing off steam at the moment of the explosion, at a pressure of 90 lbs on the square inch, at which the engine was worked. The engine-driver says it was blowing off steam at the time; the fireman says it was not, but had been doing so at times throughout the day; also that the gauge-glass was about half full of water when they stopped at Stone Cleugh, $\frac{3}{4}$ of a mile from Halshaw Moor; that the safety valves (2) appeared to act properly, and that there had been no leak in the fire-box during three or four weeks whilst he had been with the engine. The effect of the explosion was to lift the engine a little to the left, leaving the leading wheels of the engine and the trailing wheels of the tender still on the rails. The explosion occurred in the copper fire-box. The fire-box door was blown off, and the ash-pan and fire-bars were blown downwards on to the ground. The explosion apparently commenced on the left side of the fire-box through the third horizontal row of stay-holes, reckoned from the bottom. The lower part of this side plate was blown down upon the fire grate, and the upper part was rent from the front plate up and along the left angle, and it was then forced upwards with a portion of the tube-plate, and blown against the upper part of the tube-plate, breaking the baffler.

This engine was constructed by Messrs. Bury, Curtis, and Kennedy, of Liverpool, and delivered to

*To accompany Colonel Yolland's Report on accident on 31st January from Explosion of Locomotive Engine Boiler at Halshaw Moor Station on Lancashire & Yorkshire Railway.*

## LANCASHIRE & YORKSHIRE RAILWAY Co FEBY 15TH 1868.

SECTIONS THRO THE CENTRE OF FIRE BOX Nº 115 ENGINE



SCALE ¾ IN. 1 FOOT

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the Lancashire and Yorkshire Railway Company in January 1848, so that it had been in use 20 years at the time of the explosion.

It is a six-wheeled passenger engine, having 15-inch cylinders and 20-inch stroke; the diameter of the driving wheels being 5 feet 10 inches, and the leading and trailing wheels being of 3 feet 6 inches in diameter. The distance between the centres of the leading and driving wheels being 5 feet 10 inches, and 7 feet 4 inches between the driving and trailing wheels.

| The weight on the | Tons. | Cwts. | |
|---|---|---|---|
| Leading wheels was | 7 | 5 | In working order with water and coal. |
| Driving „ | 12 | 8 | |
| Trailing „ | 3 | 10 | |
| Total - - | 23 | 3 | |

It was provided with two safety valves, each 2½ inches in diameter, and with a steam pressure gauge by Schaffer and Buddenburg. The internal heating surface of the fire-box is 70 feet, in addition to 116 tubes, 114 of 2⅛ inches (outside), and two of 1¾ inches (outside) diameter, with a surface of 639 feet, making up a total heating surface of 709 feet.

This engine was in some accident, and the fire-box was burnt, and replaced by a new one in 1852. The engine ran with the first fire box - 70,937 miles
With the first set of tubes in the second fire-box it ran - - - 133,353 „
The second set of tubes was put in in March 1859, and the engine ran with them - - - - 170,769 „
The third set of tubes was put in in June 1863, the distance run was - 147,592 „
Total - - - 522,651 miles

up to 1868, or 451,714 miles with the fire-box which exploded on the 31st January.

The fire-box, of which there are two transverse and two longitudinal sections given in the accompanying diagram, which has been furnished me by the indoor superintendent of the locomotive department of the Lancashire and Yorkshire Railway (Mr. Yates), at my request, is 3 feet 6 inches long by 3 feet 4½ inches wide, and 4 feet 3 inches high; it is of copper, the sides and top being in one plate 12 feet 9 inches long by ½ inch thick originally. The fire-box door was thickened with ⅝-inch plate 3 ft. 1 in. by 2 feet in addition to the front plate, also ½ inch thick. The tube plate is of ⅞ inch thick, where the tubes occur, and elsewhere it is ⅝ inch thick, with an outside flange of ½ inch thick and 2½ inches wide.

The copper plate of the fire-box, and the iron plate of the outer shell, were secured in their proper position (about 2½ inches apart) by 99 stays. On the left-hand side of the fire-box, where the explosion commenced, 90 of these stays were of copper 1 inch in diameter and 5 inches apart from centre to centre, and 9 of iron of the same dimensions. Of these the iron ones had all been fractured, and remained in the copper plate, while the copper ones had been drawn through the copper plate, and these remained in the iron plate of the outer shell. The fractured iron stays were not near the part which first gave way, and the fractures were probably the result, and not the cause, of the explosion.

The thickness of the copper plate, originally ½ inch, had been reduced by wear to less than ⅛ of an inch along the line of first fracture, A, B, through the third horizontal row of stay-holes. The rivetting on the inner heads of the copper stays had been burnt away at this part; and the thickness of the plate having been so greatly reduced, the thread of the screws possessed small powers of holding, to retain the copper plate in its position.

There were two patches in the front plate, one circular, of small size, 6 inches in diameter, in the right-hand lower corner; the other, 15 inches long by 7 inches wide, in the left-hand lower corner—one patch 14 inches by 12 inches in the right-hand side plate, and one patch of irregular shape 14½ inches long by 7 inches wide in the left side plate. The explosion was not in any way connected with these patches. The engine had repeatedly had repairs effected in the fire-box, and among the last, in February 1867, 57 copper stays were put in in the fire-box, and others were repaired in different parts: in May 1867 two rows of new stays were put in, and in December 1867 some repairs were made in the fire-box stays, and the bottom corners and patches were repaired.

It is also stated that the boiler was tested by hydraulic pressure up to 130 lbs. on the square inch in March 1867, before the engine was sent out of the shop, and no leak was discovered; and it is also distinctly stated by both the driver and the fireman that there was no leakage in the fire-box up to the time of the explosion, and there is no appearance of any having existed. The rule which is said to be adopted in the Lancashire and Yorkshire Railway locomotive shops is, that when a copper fire-box is known to be reduced in thickness to ¼ of an inch it is then condemned, taken out, and replaced by a new one; but it appears desirable that a more careful examination should be made in order to ascertain the thickness of the copper plates when engines have been running for such a length of time, and for such long distances as No. 115 engine, where the plate had been reduced at one part to less than one-fourth of the original thickness. The Locomotive Superintendent, at my request, caused a hole to be drilled in the plate at the right side of the fire-box, and here the thickness had been reduced to somewhat under a quarter of an inch; so that it is apparent that the engine must have been running for some considerable time with an insufficient margin as regards the strength of the fire-box.

I have, &c.
W. YOLLAND,
*Colonel.*

*The Assistant Secretary,*
*Railway Department,*
*Board of Trade.*

## LONDON AND NORTH-WESTERN RAILWAY.

*Board of Trade*
*(Railway Department),*
*Whitehall, 22nd April* 1868.

SIR,

I AM directed by the Board of Trade to transmit to you, to be laid before the Directors of the London and North-Western Railway Company [Great Western Railway Company], the enclosed copy of the report made by Colonel Hutchinson, R.E., the officer appointed by the Board of Trade to inquire into the circumstances connected with the collision which occurred at the joint station of the London and North-Western and Great Western Railway Companies at Chester on the 25th ultimo.

I am, &c.
R. G. W. HERBERT.

*The Secretary of the London and North-Western Railway Company.*
*The Secretary of the Great Western Railway Department.*