

LANCASHIRE AND YORKSHIRE RAILWAY.

Railway Department (Board of Trade),
8, Richmond Terrace, Whitehall, London, S.W.,
10th August, 1903.

Sir,

I HAVE the honour to report, for the information of the Board of Trade, in compliance with the Order of the 16th July, the result of my inquiry into the causes of the accident which occurred on the 15th July to an express passenger train which was derailed at Waterloo on the Lancashire and Yorkshire Railway.

In this case the 4.30 p.m. express from Liverpool to Southport was derailed just as it was approaching Waterloo Station on the down line.

The train consisted of a four-wheels-coupled tank engine with a radial axle at each end, travelling chimney first, and of six bogie carriages, the first and last being third brakes with the brake compartment of the first carriage next the engine.

The automatic vacuum brake was in use on the train, actuating blocks on the four coupled wheels of the engine and on all the carriage wheels.

Six passengers and the fireman were killed or have since died, and 112 passengers and the driver and three other servants of the Company were injured.

On leaving the rails the engine mounted the ramp of the island platform, knocking down the supports of a foot overbridge and turning completely round came to rest with its right-hand trailing end projecting over the platform, and the two leading carriages being forced by the engine, had their compartments wrecked, which no doubt was the cause of the fatal injuries received by the passengers. The coping of the platform was disturbed for some yards, and the permanent way much twisted.

Details of damage to rolling stock and permanent way are given in the Appendix.

Description.

The down line approaching Waterloo runs nearly from east to west and is first on a slight falling gradient to the centre of the Crosby Road overbridge and then on a rising one of 1 in 162 to just inside the station where it runs on the level.

The distance from this overbridge to the end of the island platform and foot-overbridge is 200 yards.

Before reaching the Crosby Road bridge the down line is on a short curve of 47 chains radius to the left, then there is 40 yards of straight line, and then from a point 15 yards east of the bridge it is on a curve to the right first of 40 chains radius for a distance of 80 yards, and then of 23 chains radius for a distance of 200 yards, and then of 83 chains radius through the station.

The amount of super-elevation of the outer rail on the 23 chain curve at the time of the accident was stated to be $2\frac{1}{2}$ inches.

The total length of the train was 120 yards, and at the moment of derailment the engine was approaching the foot-overbridge at the east end of the platform, so that most of the train was on the 23 chain curve.

The permanent way when laid down in 1894 consisted of 85 lb. rails in 30 ft. lengths, laid on creosoted fir sleepers 9 ft. by 10 in. by 5 in., eleven to a rail length, with cast iron chairs weighing 56 lbs. each fastened to the sleepers by two steel spikes and two trenails. The rails had worn down to a weight of a little over 77 lbs. per yard.

The ballast consisted of cinders.

The tank engine was of a type much in use on this line ; it had four coupled wheels with a rigid wheel base of 8 ft. 7 in. and two radial axles, one at either end, at a distance of 7 ft. $10\frac{1}{2}$ in. from the nearer of the coupled wheels, so that the total wheel base was 24 ft. 4 in. ; the total length over buffers was 38 ft. $11\frac{1}{2}$ in.

Its weight in working order was 59 tons 3 cwt., of which 17 tons 7 cwt. and 17 tons 8 cwt. were on the leading and trailing axles of the coupled wheels, 12 tons 6 cwt. on the leading radial and 12 tons 2 cwt. on the trailing radial axle.

The springs on the axles of the coupled wheels are low down under the axle boxes, and they are carried in yokes which are attached to the axle boxes by a yoke pin. The springs are in two portions, the top half presses against part of the engine frame and the lower half against the bottom of the yoke called the bridle, in which is a screw pin for adjustment.

The springs are carried so low down, that if an engine is derailed, when the flanges of the wheels are on the chairs, the head of the adjusting pins are touching the rails.

Evidence.

Mr. H. A. Hoy, Chief Mechanical Engineer for the Lancashire and Yorkshire Company, states: Engine No. 670 working the 4.30 p.m. express from Liverpool to Southport on July 15th, is a four-wheels-coupled radial double ended engine, that is a radial wheel at each end. The lateral play is $1\frac{1}{2}$ on each side of the centre line, and that is a total play of 3. We have 270 engines of this type. They are a good class of engine for this particular class of traffic and for taking a considerable load at any reasonable speed and over any reasonable curve. They have run 61 millions of miles all over our system, and this particular engine was built in August, 1899. It was last in the shops on June 18th, 1902, for general repairs and boiler changed, and went out on September 19th of the same year. Since this it has run 31,760 miles, making a total mileage of 135,506. The first engine of this kind was built in 1889, and the latest was built in 1901. I examined the engine after the accident. Taking the front portion of the engine first I found the left leading wheel showing indentations on the flange, indicating that it had struck or run over some obstruction. There were marks more or less equidistant round the wheel. I also found the outside of the wheel with abrasions, showing that it had evidently been rubbing hard against something rough. I also found the left-hand driving spring, the right-hand driving spring and the right-hand trailing driving spring missing. The radial plates which guide the front axle-box were somewhat expanded and damaged by contact, probably with the platform. I also found on the right leading wheel a portion of the axle-box pin missing. The pin found and produced is an axle-box pin and it represents a third of the pin. It is unmistakably the missing portion. This pin is intended to secure the bottom portion of the axle-box. There were no marks on the right-hand leading wheel. Both axles of the coupled wheels are bent. Owing to the present position of the engine I have not been able to examine half the tyres of the driving wheels. The spring found no doubt belongs to the engine, but I am unable to say to which side it belongs. I found the left-hand leading spring was not in its place, and the right-hand leading spring somewhat displaced. It is impossible for the wheel to which the spring belongs to have run over it, and that which was found had no appearance of having been run over. In this kind of spring it is impossible for the buckle to break, but it is a common occurrence for springs to be dropped. I have not been able to examine the front radial check spring arrangements by reason of that portion of the gear being damaged by contact with the platform. I have never known one of these springs to break, but if such were to happen the engine would yaw about to a dangerous degree. The rigid fixed wheel base is 8 feet 7 inches, and the total wheel base is 24 feet 4 inches. The weight on the trailing driving wheel is 17 tons 7 cwt., and on the driving 17 tons 8 cwt. The right-hand leading wheel shows no indication of that wheel having run over anything. After my examination of the engine my impression is that it ran over some obstruction, either something lying on the rails or something belonging to itself. If it jumped over anything in front it could not belong to any part of the engine. I do not think it possible for the broken pin to have derailed the engine had it

run over it. We found nothing from the engine which indicates having been run over, and the three springs shew no signs of anything of that sort. I am of opinion that the rear coupled-wheel ran over something, but it was impossible for this wheel to have run over its own spring. I do not believe that the curve, the condition of the road, the speed of the train, or the class of engine working the train, had anything to do with the derailment.

Wm. Parr, 124, Priory Grove, Anfield, Liverpool, states: I am in the employment of the National Telephone Company. I was up a telephone pole near the foot-overbridge when I first heard the 4.30 p.m. Liverpool to Southport express passenger train whistling and I looked at the train which appeared to be coming in the ordinary way. I noticed the engine swaying from one side to the other soon after it came through the bridge. The leading wheel of the right-hand side of the engine left the rails first. I had a front view of the engine and it gave a slight jump after three or four rolling motions. The engine seemed to be going towards the up-line, but came back towards its own line. My impression is that the engine left the rails at the south side of the down home signal and travelled off the road until it came to the platform. I cannot say what happened after this as I was descending the pole. As soon as I had got down the pole I saw the train was at a standstill off the line. I am certain the engine came off the line before any of the carriages.

John Martin, permanent way inspector, states: I have been in the service 29 years, and have been inspector in charge of No. 11 district for 10 years. I arrived at Waterloo at 5 p.m. on July 15th. The first thing I did was to look at the road where the derailment had taken place. How I found this was from the marks on the sleepers and the marks on the chairs, and from this point, going back in the Liverpool direction, I examined the road up to the tunnel, and found everything in good order. I had no gauge with me then, but I went back to the end of the platform for one, and then tried the gauge and found it right, that was up to where the rails were torn up with the coaches. I found the cant all right. The cant is $2\frac{1}{2}$. There is no check rail on the curve. After I had gauged the road I was walking to and fro, when I picked up a broken piece of casting, which I believe belongs to a spring. It was in the six-foot, about two feet six inches from the rail. I afterwards came back along with a goods inspector, and was walking back towards the station when I picked up the pin produced. It was greasy, and lying up close against the inside rail in the four-foot. My own opinion is that the engine ran over something on the six-foot rail which lifted it up. In my examination of the road, I found that for about 50 yards the sleepers in the four-foot were cut in two. Speaking roughly, five yards' length of the road where the derailment occurred was slewed outwards about one inch, and it ran out to nothing. I attribute this to a wheel slipping down by the side of the rail, because it had bent the rails at that point. The road at this place was relaid in 1894 with 85-lb. rails; they now weigh 77 lbs. per yard. I was over the length of road the day before, and it was in good order, and

there was nothing to call the platelayers' attention to. A complaint was made about May 22nd of the state of the road at this point, and I went over the ground. I examined the road then myself with the platelayers, and put the curve into adjustment by slacking the bolts, and found the cause was the expansion of the rails from heat. No complaints have been made since then. About 1894 we had some pegs placed near the outer rail at a distance of nine feet from the rail, and we had a staff made to gauge the rails. All the pegs are now there with the exception of about two, which were displaced by the accident. We have had occasion to move them since the mishap, but previous to the accident they had not been altered since they were put in.

Charles Kershaw, sub-ganger, states: I have been in the service five years, and have been working on this length for three weeks. On the date of the accident I was working on the down road between the tunnel and the footbridge doing general repairs. We were just continuing the ordinary repairs where we had left off the day before. I saw the 4.30 p.m. express from Liverpool to Southport approaching, and was standing in the six-foot at the time, near the down home signal. The train was travelling very fast, faster than ever I saw him. I should say he was going at 60 miles an hour. The ganger passed a remark to me about the speed; he said, "Just look at the train, how fast he is going. I could not say where the engine came off the rails. It was on the road passing us. When the train came off I ran to the station and saw the road was blocked, and I then assisted to clear it. There was no obstruction whatever for the train to run over, and we had plenty of time to get clear of the rails when the train was approaching. We had been doing repairs to the joints, and had finished what we were doing. The road was thoroughly sound. During the three weeks I have been with the gang we have worked on this line between the footbridge and the tunnel, but only with ordinary repairs. The engine was just wobbling when it came out of the bridge.

James Kershaw, foreman platelayer, states: I have been in the service 32 years and all the time on the length between Crosby Station and Seaforth. I have been a foreman platelayer for 10 years. On the afternoon of the accident, my gang was working on the portion of the line between the tunnel and the footbridge at Waterloo Station. We had been working on the down line doing ordinary repairs but we had finished and there was nothing more wanted doing when the 4.30 p.m. express from Liverpool to Southport came up. I was near the home signal post and stood in the six-foot when I saw the express coming. He was coming very rapidly, faster than I ever saw him, and I pointed this out to the second ganger. He was going 60 miles an hour. The engine was rocking a little entering the bridge. I did not see the engine come off the rails or where it came off the road, as I could not see for ashes and dust. The tail of the train had passed me before I noticed anything wrong. We had been packing up joints all day and had started where we left off the day before. All joints were packed when the express came up. After the accident I went and telephoned to Mr. Martin and also for the platelayers at each end to give assistance. I then came back and examined the road and found it all right except where the train came off. The sleepers were cut and the rails put out. I did not see any marks on the rails. I saw the first

chair which was marked and for that length of rail the road was slightly displaced to the outside of the curve. I examined the next length going towards the tunnel and also through the bridge and this was all right, and the road on the other side of the broken chair was not much damaged, only for the length of the sleepers. We had not changed any sleepers on the day in question. The most the road had moved was about one to one-and-a-half inches. I gauge and try the cant throughout the whole of my length every week. The road was true to gauge after the accident and the cant was right. There was a side drain lowered in at this point about two months ago but it was a long way clear of the sleeper ends, and during this work we slackened all trains. The length of line in question has given very little trouble. The engine was not off the road until near the cabin.

John Wadsworth, signal fitter, states: I have been in the service 13 years. On July 15th I travelled with the 4.30 p.m. express from Liverpool to Southport, and rode in a third-class compartment about the middle of the second carriage from the engine. When we got about the down home signal at Waterloo, I felt a peculiar jerk and a few seconds afterwards another more violent side jerk. After that the carriage was no doubt off the road entirely, as it jumped and rolled about. I said to the five passengers in the compartment, "We are off the road, hold fast." I was not injured but simply shaken. I could not describe what the jerk was like, it was like something pulling at the carriage. There was nothing unusual on the journey up to this point. My opinion is that the carriages were pulled off by the engine, but I could not account for the engine coming off. I formed my opinion from the situation in which I saw the engine. I should say we were going at quite 50 miles an hour. I did not notice anything until the first jerk and this was after we had passed the bridge. I did not notice anything where the curves reverse. I was near the window and got hold of the rack and the window frame, the window being down at the time.

George Shepherd, passenger guard, states: I have been in the service since 1864, and a guard nearly 11 years. On July 15th I came on duty at 4 p.m. to work until about 11 p.m., having previously come off duty at 11 p.m. on the 14th inst. I was guard of the 4.30 p.m. express from Liverpool to Southport, which was formed with six bogie carriages, with the vacuum brake on all wheels, and the vacuum gauge registered about 20 inches. We left Liverpool to time, and the driver was slackened by distant signals at Exchange Junction and also at Sandhills, No. 1, but there was no loss of time; the home signals being off. The train travelled smoothly, and we passed through Seaforth Station at 4.37½, as I looked at my watch there. I put on my hand brake, which is my custom, going down Seaforth Bank to keep the shackles tight. I watched the train take the turn, and after I had lost sight of the engine round the curve I felt a jolt, which made me think something was wrong. This was just about the nearest bridge to Waterloo Station. On feeling the jolt I put my hand out and put on the vacuum brake. I was just about the bridge when I put on the vacuum brake, and immediately afterwards the train came to a dead stop. I did not feel the van come off the road, but the leading bogie was off when the train stopped. I was knocked against the partition of my van. Inspector Ingham, of the Carriage and Works

Department, was travelling along with me and he was sitting at the time with his back to the engine. I am well accustomed to these express trains. Nothing exceptional occurred on the journey to the point of the accident, and the train travelled at the ordinary speed. We are timed to do the journey to Birkdale in 20 minutes, which is $17\frac{1}{4}$ miles, so we have to run up to 60 miles an hour most of the way, and the usual speed through Waterloo Station is 50 miles an hour, which I should think the driver was running on this occasion. I always put on the hand brake to keep the couplings tight down the Seaforth Bank. The drivers put on steam again when they get on to the straight in Waterloo Station. I noticed no unusual swaying of the train. Two months prior to the accident I had occasion to report the curve at this point, as just before entering the station the left side of the rail gave a dip. Since then I have not felt anything unusual. After the accident I went back to protect my train. When I was returning to the train I found a spring in the six-foot close to my van. It was partly buried in the ballast. I did not take particular notice of it at the time. On Friday morning, July 17th, I went to enquire after the driver at the hospital, and had a conversation with him as to whether he had applied the vacuum, and he stated he had not time to do so as he was thrown away from it. I had no conversation with the driver as to the probable cause of the accident, but he told me he had not felt anything before the engine gave a jump. He did not say at what point he felt the jump.

Driver Lloyd states: I was driver with the 4.30 p.m. express from Liverpool to Southport on July 15th. I left Liverpool on time, and was booked to get to Birkdale at 4.50 p.m. My usual speed through Waterloo is from 45 to 50 miles per hour. I did not shut off steam going down the bank from Seaforth Junction, but I had the engine in mid-gear. Just approaching the footbridge at Waterloo I felt something wrong with the engine. It gave a sudden leap up just as we

were approaching the footbridge and left the rails. I felt no grinding noise. The engine simply seemed to jump and mount up bodily. There did not seem to be any kind of jerk, it lifted all of a sudden. After this I do not remember anything more. My engine was a four-wheels-coupled radial tank, and it runs very smoothly, and I did not notice anything unusual in the running of it on this day. There was no special yawing motion. I have felt the road before at this point a bit rough. This was in May, and I reported it at the time. I got off the engine when it had stopped at the platform.

John Fairclough, signalman, states: I am a signalman at Seaforth Station box. On the 15th of July I came on duty at 2 p.m. to work until 10 p.m. I had come off duty at 10 p.m. the previous day. The 4.30 p.m. express from Liverpool to Southport was offered to me at 4.31 from Marsh Lane Junction, accepted at 31 and I received entering section at 36, it passed my box at 37. My box is at the north end of the station.

James Carr, passenger guard, states: I was guard in charge of the 4.15 p.m. train from Liverpool to Crosby on July 15th, which was the previous train to run over the line prior to the accident. I passed through Waterloo at 4.30 p.m. I did not notice anything particular about the way our train travelled over the line between the bridge and Waterloo Station, and I did not notice anyone working about the line. I did not feel anything unusual there on previous days.

George Ray, driver, states: I am a driver in the service of the Lancashire and Yorkshire Company, and I was driver of the 4.15 p.m. Liverpool to Crosby on July 15th, and passed through Waterloo at 4.30 p.m. I did not notice anything unusual in the running of my train. We stopped at Waterloo. I have never noticed anything unusual with the track. When I ran express trains over this length, I ran about 40 miles an hour.

Conclusion.

The train derailed on this occasion was an express from Liverpool to Southport, timed to run the $17\frac{1}{4}$ miles to Birkdale, the first stop after leaving Liverpool in 20 minutes, so that a high rate of speed had to be maintained throughout. According to the driver and guard the usual speed of the train through Waterloo is about 50 miles an hour, and they state the train was running at about that speed when the derailment occurred, though a foreman platelayer, who was watching it approach, states it was running faster than usual, and estimated the speed at 60 miles an hour.

From the evidence of the driver, guard, and Kershaw, the foreman platelayer, who witnessed the accident, it would seem that the engine did not leave the rails until close to the foot-overbridge at the eastern end of the platform, when it was derailed to the right, or to the inside of the 23 chain curve on which it was running, dragging the carriages after it. It ran up the ramp at the end of the platform, demolished the columns supporting the overbridge and the steps leading from the bridge to the platform and turned completely round, the leading end facing east. When the carriages came to rest the two leading ones had been forced past the trailing end of the engine which projected over the platform and were completely wrecked by it, the third was between the engine and the overbridge, and the remaining three had not passed the overbridge. All were derailed, but the rear bogie of the last one was on the rails.

From the damage done to the permanent way it is evident that all the train was derailed to the right or to the inside of the curve on which it was travelling, and judging by the absence of marks on the right leading wheel and right leading coupled wheel, the front of the engine must have jumped clear of the chairs when derailed. The driver states that all he felt was the engine suddenly jump up bodily and leave the rails, without any previous warning of anything being wrong.

Nothing was found indicating that any obstruction existed on the line near the

point of derailment, and the permanent way was, as far as can be judged, in good order, the gang having just finished doing ordinary repairs to that length of line. Enquiry was made as to any missing tools belonging to the gang and all were accounted for. Although the line from Liverpool to Southport is in process of being fitted for electric traction, no work had been commenced near Waterloo, nor were any rails or material lying on or near the line, and no excavation of any kind existed anywhere near the portion of the line on which the derailment occurred.

On the line being examined after the accident an axle box pin was found lying close alongside the inside rail of the down line 138 yards back from the foot-overbridge at the station. 73 yards nearer the station, or 65 yards from the bridge, a spring bridle of one of the coupled wheels was found in the 6 ft. space close to the inside rail of the down line, and 19 yards nearer the station, or 46 yards from the bridge, a whole spring of one of the coupled wheels was found also close to the inside rail nearly buried in the ballast. The pin was broken and had apparently been run over; the spring bridle was broken off close to the bottom of the yoke with the adjusting pin still in it; the spring was practically uninjured, and neither bridle nor spring had been run over. The spring was close to where the rear of the last carriage came to a stand.

The engine was much knocked about and from a subsequent examination I made of it in company with Mr. Hoy, the chief mechanical engineer of the Company, I found that the right leading wheel had no marks on it, while the left leading wheel was marked with deep grooves nearly equi-distant from each other, and apparently caused by running over the chairs. The inside of this wheel was also much worn by rubbing against the rails.

The right driving wheel had no marks but the left was cut in places, and the inside was much worn by rubbing against the rails.

The right trailing coupled wheel had a few burrs and the left practically no marks.

Both the wheels of the trailing radial axle had several marks and burrs cut in them.

Both the controlling radial springs were intact, but the front radial axle box was smashed up, apparently by contact with the platform, as it was marked by bricks and mortar.

All the bridles of the four yokes of the springs of the coupled wheels were broken off, the one picked up 65 yards from the overbridge belonged to the right trailing coupled wheel.

The spring picked up belonged to the right driving wheel and had marks on it and had a plate displaced.

The axle box pin picked up belonged to the right leading wheel.

The permanent way was much damaged for a length of 36 yards before reaching the foot-overbridge; the sleepers and chairs broken, and the rails badly twisted and bent; one rail, commencing at a point 32 yards from the bridge being abraded on the inside and broken in two places, a piece of the head of the rail being cut right out, showing that the damage must have been done by a heavy driving wheel of the engine.

Further back from this point for a distance of 48 yards the damage was slight, the wheel marks being in the centre of the sleepers in the 4 ft. and at the ends next the 6 ft. space and no chairs being broken. The first signs of derailment were 92 yards from the bridge where there were two diagonal marks on the rails towards the 6 ft., and four chairs of the inner rail broken on the outside, and three of the outer rail on the inside, probably caused by the wheels of the carriages when they were dragged off the rails.

Judging by the marks on the permanent way and the position in which the broken bridle and the spring were found, *i.e.*, the bridle 29 yards and the spring 10 yards further back than where the permanent way was badly damaged, I am of opinion that these must be regarded as indicating the probable cause of the derailment.

The axle box pin found was not sufficient of itself to cause a derailment and it was found some distance back from the first marks on the rails.

Once the portion of the weight of the engine carried by any one spring was taken off an axle box, the corresponding wheel would be more liable to jump the rail, especially when the engine was running 50 miles an hour round a 23 chain curve with only two-and-a-half inches of super-elevation, as a larger proportion of the weight would be thrown on to the outer wheels.

I think that as there were no marks on the right leading and right driving wheels, the right trailing coupled wheel was the first to jump the right-hand rail on to the chairs, and the right driving and right leading wheels would then be carried still more to the right clear of the chairs. It was the bridle of the spring on the axle box of the right trailing coupled wheel that was found 65 yards from the footbridge, and once this bridle had broken the spring supported by it would immediately drop off.

The spring found 19 yards further on than this bridle, or 46 yards from the footbridge, belonged to the right driving wheel, and may have been dropped by its

bridle being broken by coming in contact with the right hand rail, when the engine was derailed. If this were the case, it would fix the point of derailment at about 50 yards from the overbridge.

I consider the dropping of the spring of the right trailing coupled wheel must be regarded as the most probable cause of the derailment, as judging from the damage to the permanent way I do not consider that excessive speed alone can account for the derailment, as had the engine mounted or burst the outer rail, it, and the carriages behind, would have been derailed on the outside of the curve, viz., to the left, whereas the contrary was the case.

The curve in question was graduated, starting at 40 chains radius for a length of 80 yards before changing to 23 chains radius with a maximum super-elevation of two-and-a-half inches. (The super-elevation was three inches when I tested it on the day of the inquiry.) A speed of 50 miles an hour round such a curve is not desirable, and as at present constructed, speed on it should not exceed 35 miles an hour.

The Assistant Secretary,
Railway Department, Board of Trade.

I have, &c.,
E. DRUITT,
Major, R.E.

APPENDIX.

Damage to Engine No. 670.—Driving wheels out of gauge $\frac{3}{8}$ inch, trailing wheels one inch at one side, $\frac{1}{2}$ inch at the other; smoke box door, smoke box front, chimney, and all contents bent, broken and carried away, all retaining bolts to cylinders broken; dome cover clothing damaged and retaining stud on dome cover broken; safety valve broken, pillar knocked off; cab damaged badly in front, all windows broken and brass framings bent; boiler clothing, front ring torn and hand rails broken and bent; left side tank, skirting damaged and side plate dented; bunker manhole bent and back shell plate stove in, stay in water tank at back twisted, hand-rail at back twisted; main train pipe damaged and broken off at both ends and bent and twisted along framing; equilibrium pipe, left side, broken off at both flanges and missing; both steps on left side broken off and framing bent; outside rods bent and strained on both sides; whistle carried away, pillar and all connections; all lifeguards bent and bolts broken; all cylinder cocks damaged and rods broken and twisted; leading radial, cast iron, box broken across middle and on left side parallel to journal; left trailing sand box front lug broken and sand pipe broken off at flange; left driving spring link broken and spring missing; left leading sand box valve broken and pipe missing; copper feed pipe from tank carried away on left side; left leading radial spring link broken and spring check spring buckle broken; left cylinder, cover broken and covering plate stove in; leading shackle and hook bent and broken, buffer beam slightly bent inwards; fall plate bent; boiler loose from cylinders, all bolts broken; right leading spring link bent; right leading steps broken and framing bent; sand box valve broken and pipe missing; right stirrup link and swing link burred up with dints in them; sand rods, cab to leading sand box broken and bent; right driving spring link and spring broken; brake shaft bracket, left side, stud broken; trailing brake cross bar and adjustable coupling rod bent; right copper feed pipe from tank twisted and bent; outside framing, right side, torn and badly damaged; right side tank loose from framing and

cab, but not badly damaged; equilibrium pipe, right side, broken at flanges and missing; right trailing steps broken and framing bent, sand box broken, valve and pipe missing; main vacuum pan broken and all connections under foot-plate; pick-up torn down, breeches pipe broken, scoops damaged, pan in pieces, and all connections, screen bent; trailing radial check spring buckle bent; trailing shackle broken and part missing; right trailing buffer torn off and buffer beam at corner torn out and bent.

On foot-plate.—Whistle stand and all connections torn off; vacuum pipe connections to ejector damaged, gauge broken; steam sander cock and pipes; pick-up cock connections damaged; feed valve rods on side tanks broken and twisted; damper rod bracket and rod broken and twisted; stand for reversing screw on tank bent and strained; foot-plate boards torn up; trailing, bunker, handrail and lamp brackets broken and bent, leading lamp brackets twisted.

Bogie, third class van, No. 2,963.—Body, under-frame and both bogies smashed.

Bogie, third class, No. 1,207.—Body, under-frame and both bogies smashed.

Bogie, first class, No. 43.—Two end panels, corner pillar, end quarter framing panels, end framing, bottom quarter panels, seven footboards, six lamp tops and globes, two axle-boxes, one buffer rod, vacuum, steam, &c. pipes, and one end step broken; door handle, one axle-guard, one drawbar, two buffers and bogie bed hang joint pins bent; and bogie bed springs, &c. displaced.

Bogie, composite, No. 421.—One headstock, one standing pillar, two door pillars, one door panel, four footboards, one axle-box and end framing broken; two buffer rods, drawbar, foot-board leg irons, one axle-guard leg, and brake-work, &c., bent.

Bogie, composite, No. 665.—One buffer rod, one drawbar, two footboards and three casing bolts broken; roof, one headstock, two bogie beds, springs, brakework, &c., damaged.

Bogie, third class van, No. 2,908.—One bogie off the road.

DAMAGE TO PERMANENT WAY.

One rail broken; 11 rails bent and twisted damaged; four fish plates badly bent; eight fish
68 chairs broken; 115 sleepers more or less bolts broken.