

a disc signal for the present semaphore signal on the Clarence side of the Stockton station, such a signal being better understood by the Clarence Railway drivers; to this I do not see that there can be any objection.

The Leeds Northern Company are engaged laying down a number of sidings on the north side of their station, which when completed will much relieve the station from its present crowded state. The station arrangements are at present entirely of a temporary character. I would recommend the completion of the permanent station and platforms without loss of time, and would submit to the Company whether it would not tend much to simplify the interchange of traffic, and thereby add to safety, if they were to place their station on the main line, and have separate arrival and departure platforms.

I have, &c.

Captain Simmons, R.E.,
&c. &c.

GEO. WYNNE,
Capt. Royal Engineers.

Appendix No. 28

ACCIDENTS.

Leeds Northern
Railway.

Railway Department, Board of Trade,
Whitehall, August 12, 1852.

SIR,

I AM directed by the Lords of the Committee of Privy Council for Trade to transmit to you, for the information of the Directors of the Leeds Northern Railway Company, a copy of the report that has been received from the officer appointed by them to inquire into the circumstances which attended an accident that occurred at the junction with the Clarence Railway near Stockton-on-Tees, on the 21st ultimo.

My Lords direct me to request you to call the especial attention of the Directors to the recommendation as to the erection of a distant signal near the junction on the down line of the Clarence Railway, and also as to the necessity of stopping all trains before they draw up to the platform of the Leeds Northern Stockton station, and not permitting any up train to cross over to the platform until the signal has been given, by some person duly authorized for that purpose by the Company, that the crossings are clear.

My Lords also direct me to request you to call the attention of the Directors to the concluding paragraph in the report, recommending the completion of the permanent station arrangements at the Company's Stockton station.

I have, &c.

The Secretary of the
Leeds Northern Railway Company.

J. L. A. SIMMONS,
Capt. Royal Engineers.

Leeds Northern Railway, Secretary's Office,
Leeds, August 13, 1852.

SIR,

I BEG to acknowledge the receipt of your communication of date the 12th instant, enclosing a copy of report by Captain Wynne in reference to the circumstances connected with the recent accident at the Stockton Junction with the Clarence Railway, the recommendations conveyed in which shall have the immediate attention of the Directors and of the officials of the Company.

I have, &c.

Capt. Simmons, R.E.,
&c. &c.

S. SMILES,
Secretary.

APPENDIX No. 29.

LIVERPOOL, CROSBY, AND SOUTHPORT RAILWAY.

Railway Department, Board of Trade,
Whitehall, September 16, 1852.

SIR,

I HAVE been directed by the Lords of the Committee of Privy Council for Trade to transmit to you the enclosed copy of a report they have received from their inspecting officer of his inquiry into the accident which occurred on the Liverpool, Crosby, and Southport Railway on the 11th August from a train running off the line.

My Lords request that you will call the particular attention of the Directors of the Liverpool, Crosby, and Southport Railway Company to the recommendations of their inspecting officer, and inform them of the result of their deliberations.

I have, &c.

The Secretary of the
Liverpool, Crosby, and Southport Railway Company.

DOUGLAS GALTON,
Capt. Royal Engineers.

Appendix No. 29.

Liverpool, Crosby,
and Southport
Railway.

Appendix No. 29.

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.*Railway Department, Board of Trade,
Whitehall, September 16, 1852.*

SIR,

MY Lords direct me to transmit to you the enclosed copy of a report they have received from their inspecting officer of his inquiry into the circumstances attending an accident which occurred on the 11th of August on the Liverpool, Crosby, and Southport Railway, and to request you to call the particular attention of the Directors of the Lancashire and Yorkshire Railway Company, by whom the line is worked, to the remarks therein contained upon the danger which in his opinion exists from the use of heavy engines upon the line in its present condition, in order that they may consider what steps should be taken to obviate such danger.

I have, &c.

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

DOUGLAS GALTON,
Capt. Royal Engineers.

*Railway Department, Board of Trade,
Whitehall, September 6, 1852.*

SIR,

I HAVE the honour to report to you, for the information of the Lords of the Committee of Privy Council for Trade, the result of an inquiry which, in compliance with the instructions conveyed to me in your letter of the 26th ultimo, I made into the circumstances attending a singular accident which occurred upon the Liverpool, Crosby, and Southport Railway on the evening of the 11th ultimo.

The Liverpool, Crosby, and Southport Railway connects the joint line of the Lancashire and Yorkshire and the East Lancashire Railway Companies and the town of Liverpool with the sea bathing place of Southport, distant eighteen miles. The first portion of the railway extending to the Crosby station is double, but the remaining portion from Crosby to Southport is laid as a single line. It was upon the single portion, about three miles and a half to the southward of the Formby station, that the present accident occurred.

It appears that on the evening of the 11th ultimo the 9 p.m. passenger train for Liverpool left Southport about ten minutes late, and that the driver having only a light train of seven carriages, and being desirous of reaching Liverpool in good time in order to bring out the train which leaves that place for Southport at 10 p.m., was running at a speed of about fifty miles an hour, when suddenly he perceived something unusual in the movement of his engine, and immediately afterwards felt a smart shock as of a heavy blow, and then the engine turning to the right ran up a low bank which there bounded the line, and turning over fell back upon its left side with the smoke-box end in the direction of Southport. The tender was detached by the suddenness of the movement, and the water tank forced from the fastenings which held it to the lower framing was thrown to some distance, but fortunately fell clear of the rails. The carriages all left the line and ran forward for some distance over the level ballast, but came to a stand without any serious injury either to themselves or to the passengers.

The report of this accident forwarded by the Company to the Board of Trade stated that the engine appeared to have run for a distance of twenty yards with one pair of wheels off the line, and that then from the indentation of the surface of the rail the driving wheels appeared to have got off, and the engine, after proceeding a short distance, ran up a bank about three feet in height, and turned completely over, tearing away the funnel, spring balances, &c., but the report suggested no explanation of the causes which led to the result.

On my arrival at Liverpool on Monday last I went over the Southport line and examined the whole of the permanent way, and particularly the spot where the accident had occurred. I found that the place where the engine had left the rails was situated in the best portion of the single road, the line for a considerable distance being perfectly straight and very nearly level. At the same time, however, I found that even on this favourable portion of the single line the permanent way was by no means in good order, it was loosely fitted, the rails appearing to have worked a good deal in the chairs, and many of the joints having opened to the extent of an inch and a half. In some of these open joints I perceived that the ends of the rails had moved to within less than an inch of the edge of the joint chairs.

When the Southport Railway was constructed it was supposed that the traffic would be very light. The trains were drawn by engines weighing not more than twelve or thirteen tons, and were composed of only three or four carriages, and the arrangements of the Company were made in accordance with those anticipations. The permanent way was laid with a 64 lb. rail on yard bearings with ballast composed of light loose sand, and the station platforms were barely sufficient to accommodate such short trains. But since then Southport has become a place of much greater importance, being the most convenient watering place to Liverpool and to the manufacturing districts of Lancashire, and of the West Riding of Yorkshire, with which it has the advantage of a direct railway communication, it has become a favourite place of resort in the summer months. The town has already nearly doubled in size and is still increasing, and the traffic has outgrown all the

estimates which the Company have formed of it. The trains now frequently consist of from fifteen to twenty carriages, and are drawn by powerful engines weighing when in running order twenty-four instead of twelve or thirteen tons. The Company have been consequently obliged greatly to increase the accommodation at the stations, but as yet no change has been made in the character of the permanent way. It is evident, however, that a traffic conducted by such powerful engines and heavy trains running at high speed in both directions over a single line of very light construction must necessarily be attended with some degree of risk. The Company, I believe, are already aware of this, and are about to lay down the second line throughout. In doing so I would strongly recommend them to adopt a heavier rail than that they now use.

Having observed the general character of the line, and the nature of the traffic, I next proceeded to examine such traces of the accident as might still remain in the injuries received by the chairs and rails, with a view to finding some indication of the manner in which the mishap had originated, and at the same time I obtained on the spot from several of the servants of the Company a description of the appearances presented by the permanent way immediately after the occurrence. Those descriptions, agreeing in every respect with the result of my own observations, I now proceed to lay before you.

I have sketched the position in which the engine and carriages were found, and the appearance presented by the permanent way immediately after the accident.

It appears that the engine left the line at the point marked B, and at that point the end of the next rail shows a deep indentation, and the iron is split, as by a violent blow to the depth of several inches. The indentation corresponds exactly with the form of the flange of a wheel, and it was evident, therefore, that the engine had left the line in consequence of one of its wheels coming in contact with the end of the rail at B.

Next, tracing back the line towards Southport, it was found that the four right-hand rails, extending back to the point marked A, were bent and forced from their places, and that all the chairs which held them were broken across the bed, and from the marks on these chairs and rails it was evident that one of the wheels of the engine had got over the right-hand rail at the point marked A, and been dragged along outside it till the other wheels got off at B.



At the point marked C (corresponding to A on the right-hand rail) the track of a wheel lightly traced upon the sand was observed to run parallel to the left-hand rail, and inside it, and the chairs of the left-hand rail from C to D bear faint marks, sometimes amounting only to a slight discolouration showing where they had been touched by the tire of a passing wheel.

In order to draw a correct conclusion from these indications it now becomes necessary to consider the construction of the engines.

The Southport Railway is worked by the Lancashire and Yorkshire Company, and the engines with which that Company conduct the traffic are of the large and powerful class they find it necessary to use for the heavy loads and steep gradients of their own main lines. In order to obtain a high tractive power the cylinders are 15 inches diameter, with a 20 inch stroke, and these cylinders at the most favourable point of the revolution will exert a pull of about 3,500 lbs. upon the rim of the driving wheels. In order to meet this pull the Company's locomotive engineers place $13\frac{1}{2}$ tons out of the 24 upon the driving wheels, by which means they obtained sufficient hold to prevent the engine slipping, till the cohesion becomes less than $\frac{1}{10}$ or about $\frac{1}{6}$, a result that can only happen on very slippery rails.

But when $13\frac{1}{2}$ out of a total load of 24 tons are borne by the centre driving wheels, it is evident that if the remaining $10\frac{1}{2}$ tons were equally distributed upon the leading and the trailing wheels, the engine nicely balanced upon its centre would be continually oscillating, and would run so unsteadily as to be perfectly unsafe. To obviate this danger the Lancashire and Yorkshire Company's locomotive engineers place 8 out of the $10\frac{1}{2}$ tons upon the leading wheels, leaving thus, $2\frac{1}{2}$ tons only to be borne by the trailing wheels.

Let us now consider what would be the effect in an engine of this construction if one pair of wheels get off while the remaining four remain upon the line. In the first place, it is evident that on a perfectly straight line the driving wheels being in the centre could not get off the rails while the remaining four remained on, but it might easily happen on a very light permanent way that the wavy sinuous course of a powerful outside cylinder engine, swaying alternately to the right and left, might cause either a leading or a trailing wheel to jump over the rail. In such a case, if the leading wheels get off, it is evident that the weight upon them (8 tons) being only balanced by $2\frac{1}{2}$ tons behind would cause the front part of the engine to drop down, and the leading wheels pressed with a weight of 8 tons upon the ballast would leave behind them a very deep track, and either break or seriously injure any chairs they met with on their onward path. It appears evident, therefore, that the slight track in the sand from C to D, and the faint marks discernible upon the left-hand chairs, were not made by the heavily weighted tire of a leading wheel.

Let us next consider what would be the effect if the trailing wheels of an engine thus constructed get off the line. The weight resting upon them is only two and a half tons, and that weight is counterbalanced by a load of eight tons in front. It is evident, there-

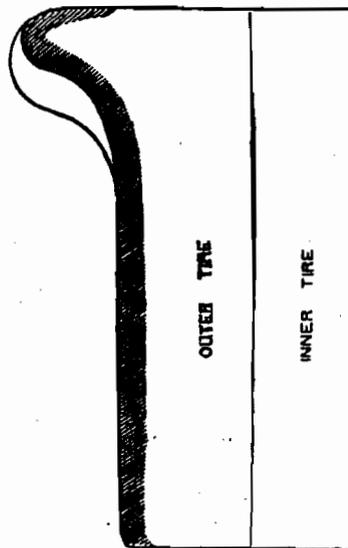
Appendix No. 29.
 ACCIDENTS.
 Liverpool, Crosby,
 and Southport
 Railway.

fore, that so long as the leading and driving wheels remain upon the rails the hinder part of the framing of the engine cannot drop down, even though the trailing wheels were swept entirely from under it. But the trailing wheels themselves, if they got off the line, would drop down through their journal boxes as far as the play of those journal boxes would let them; that is to say, about an inch and a half, and then those wheels would be borne along suspended from the framing above, their tires an inch and a half below the level of the rails, and the flanges about an inch lower. It may readily be imagined that a pair of wheels borne along in this way, sometimes touching, sometimes clearing, the ballast and the chairs, would leave precisely the slight track, and the faint markings observed between the points C and D. It appears to me, therefore, from these considerations, that the right-hand trailing wheel of the engine had got over the right-hand rail at the point marked A, and that falling down outside it had been dragged along bending the right-hand rails, and breaking the right-hand chairs, till the opening of the joint at B, consequent upon the breaking of the joint chair, caused the flange of the right-hand leading wheel to strike against the end of the next rail.

Having arrived at this conclusion from the evidence of the Company's servants, and my own examination of the permanent way, I next proceeded to Manchester to examine the engine which had gone to be repaired at the workshops of the Lancashire and Yorkshire Company. I found that the wheels had been taken out, but I was able easily to distinguish the trailing from the leading wheels by the marks every peculiarity in the axles leave upon the soft metal of the journal boxes. The leading wheels I found had been newly turned, but the turner's tools had scarcely touched the flanges, and the flange of the right-hand leading wheel bore only the mark of one blow which had scarcely dented the surface; the leading wheels might be said to be uninjured.

On examining the trailing wheels, however, I found that the right-hand trailing wheel was very much bent upon its axle, and that the flange showed several deep notches which corresponded exactly with the ridges of the ribs of the cast iron chairs. It was clear that this wheel had been bent by being dragged along outside the right-hand rail, and that the notches had been made by the ribs of the broken right-hand chairs.

On comparing the tires of the two trailing wheels I found that the flange of the right-hand wheel had worn so thin as to have been quite unsafe. I have traced a section full size of the tires of these two trailing wheels, and it will be seen that the flange of the right wheel had worn to scarcely six tenths of an inch, while that of the left-hand wheel still remained at nearly its original size. The engine had only been sent out from the Lancashire and Yorkshire Company's workshop on the 17th July, and the accident occurred upon the 11th August, when the engine had only been running about three weeks, and there was no circumstance whatever connected with the traffic to make the flanges wear so unevenly in so short a time. At first I thought that an unequal wearing might have been produced by the left-hand wheel being somewhat larger in diameter than the right, which would have the effect of continually pressing the right-hand flange against the rail; but on measuring the wheels I found that the right-hand one was fully one third of an inch more in circumference than the left, and that if there had, therefore, been any inequality of pressure it had been borne by the left-hand wheel. I could draw, therefore, no other conclusion from the insufficiency of the right-hand flange than that the Lancashire and Yorkshire Company's locomotive staff had done their work in a negligent manner. The effect of allowing this engine to work with so thin a flange must have been greatly to exaggerate the inequalities of the wavy sinuous course peculiar to all outside cylinder engines, and there were traces in several places of the thin flange having become too weak to resist the heavy blows against the rail.



Section half size of the tires of the trailing wheels.
 The inner flange is that of the right-hand trailing wheels.
 The outer line shows the flange of the left.

It appears to me, from a consideration of the several circumstances I have described, Appendix No. 29.
 that the present accident was caused,—

1st. By the insufficiency of the permanent way of the Liverpool, Crosby, and Southport Railway for the heavy traffic which now comes upon it.

2d. By the peculiar construction of the engines with which the Lancashire and Yorkshire Company conduct the traffic, a construction which can only be safe upon a very rigid line, and which is therefore most unfitted for the slight permanent way of the Southport Railway.

3d. To the neglect of the locomotive staff of the Lancashire and Yorkshire Company in sending out an engine from the workshops with the trailing wheels so much out of gauge as the great wearing away of the flange must have occasioned in the present instance, and with a flange so thin as to bend under the blows of the engine against the rail; and

Lastly. To the very high speed at which the train was running at the time the accident occurred, a speed to which the driver was perhaps driven by the delay of ten minutes which occurred at starting, and the necessity of being at Liverpool in time to take out the next train from that place. Starting from Southport at 9.10 p.m., and being timed to reach Liverpool at 9.50 p.m., the driver had to run 18 miles, and stop to take up and set down passengers at seven intermediate stations, within a space of forty minutes, and this would require an average speed when running of about 50 miles an hour.

In conclusion, I beg to recommend that the Liverpool, Crosby, and Southport Company proceed at once to lay down a second line of rails throughout, and that in doing so they adopt a much heavier rail than that now in use. I would recommend also, so long as the Company retain any of the present light rail upon their line, they draw up their time bills so as to allow of a slower speed in their passenger trains. I would recommend them also to be more careful for the future in enforcing strict punctuality in the times of arrival and departure.

To the Lancashire and Yorkshire Railway Company I would suggest that engines of the peculiar construction I have described are not safe upon a very light permanent way, and that if they continue to use such engines upon the Southport line it is probable that some more serious disaster may occur.

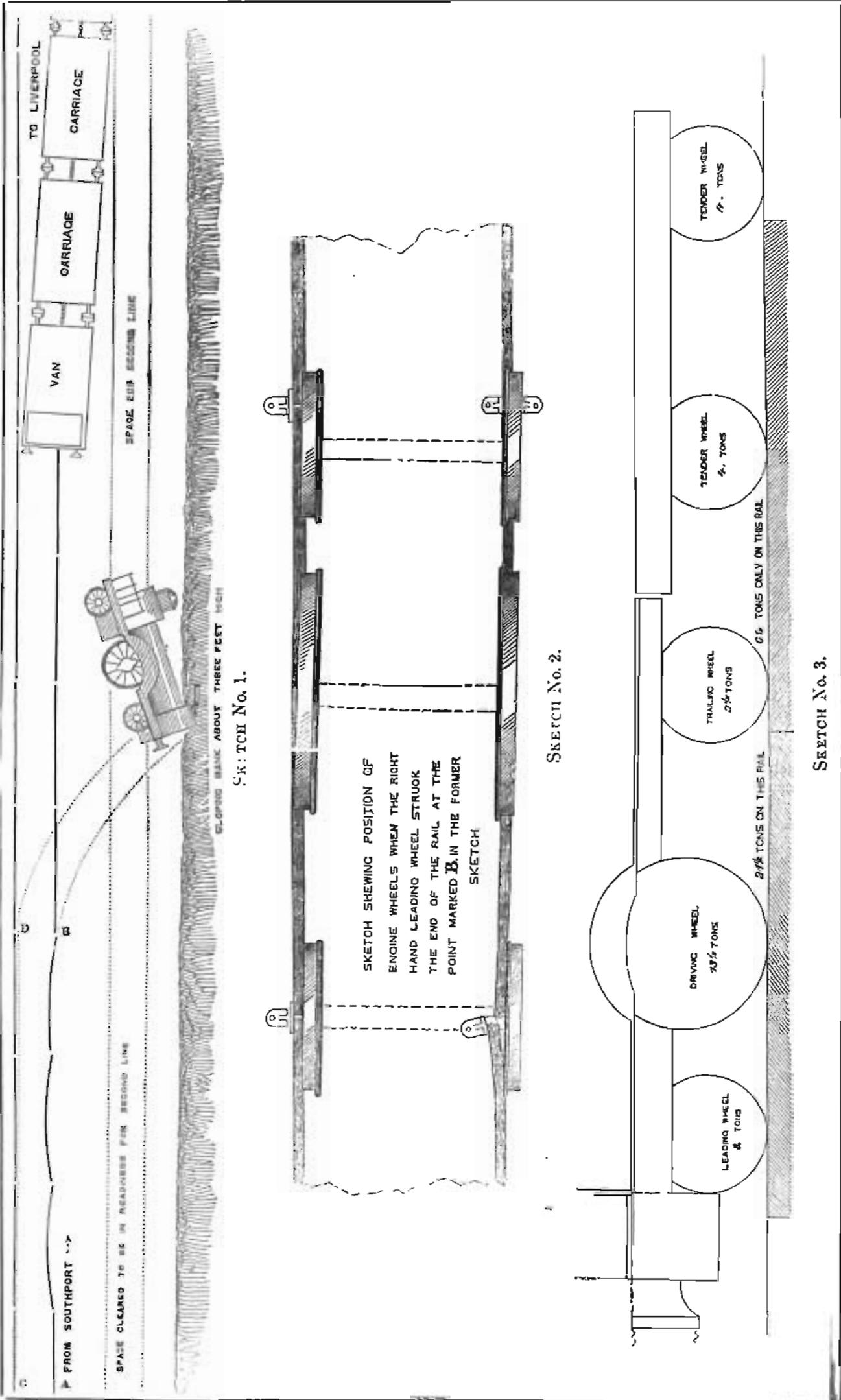
I have sketched the position of the wheels of one of these engines followed by its tender, passing over a light permanent way; it will be seen that while one rail is pressed down by a weight of $21\frac{1}{2}$ tons, the rail immediately behind it bears a weight of only $6\frac{1}{2}$ tons; the effect of such unequal loads upon a slight permanent way, loosely fitted as I have described the Southport line to have been, must necessarily be to cause some inequality in the levels of the two rails, so that the trailing wheels of the engine have to jump at every joint from a higher level to a lower. It was, I am convinced, from the circumstance of one of the wavy motions of the engine coinciding at the point marked A in the former sketch with one of these jumps at a joint that caused the right-hand trailing wheels of the engine to cross over the right-hand rail.

See Sketch 3.

I have, &c.

Douglas Galton, R.E.,
 &c. &c.

R. M. LAFFAN,
 Capt. Royal Engineers.



Lancashire, and Yorkshire Railway, Secretary's Office, Appendix No. 29.
Manchester, September 20, 1852.

SIR,

I BEG to acknowledge the receipt of your communication of the 16th inst., enclosing copy of a report from the inspecting officer of the Board of Trade of his inquiry into the circumstances attending an accident which occurred on the 11th ult. on the Liverpool, Crosby, and Southport Railway, and I have to inform you that they shall be submitted to the Directors of this Company at their next meeting.

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.

Captain Galton, R.E.,
§c. §c.

I am, &c.
JNO. DUNSTAN jun.,
Secretary.

Liverpool, Crosby, and Southport Railway,
Secretary's Office, Barned's Buildings, Sweeting Street,
Liverpool, September 22, 1852.

SIR,

I BEG to acknowledge the receipt of your letter of the 16th inst., together with the report of Captain Laffan, on the causes which led to the accident on this line on 11th ult.

The subject received the attention of this Board at a meeting held yesterday; and, as the result of the deliberation of the Directors, I am directed to inform you, that the suggestion contained in the report for the employment of a heavier description of rail has been adopted; the second line is now in progress, on which a 74 lb. rail will be used.

With a view to ensure greater punctuality in the times of arrival and departure of the trains, the committee of management have issued such instructions as they trust will remedy the inconveniences lately experienced, at the same time affording more time for the performance of the distance between Liverpool and Southport.

The suggestions to the Lancashire and Yorkshire Company's Directors will be forwarded to them, with a request from this Board that their particular attention may be directed to the subject.

Captain Galton, R.E.,
§c. §c.

I am, &c.
WM. P. YOUNG,
Secretary.

Railway Department, Board of Trade,
Whitehall, September 23, 1852.

SIR,

I HAVE been directed by the Lords of the Committee of Privy Council for Trade to acknowledge the receipt of your letter of the 22d instant, stating the course that the Directors of the Liverpool, Crosby, and Southport Railway Company have determined to adopt with reference to the recommendation of Captain Laffan, and to express their Lordships' satisfaction thereat.

The Secretary of the
Liverpool, Crosby, and Southport
Railway Company.

I have, &c.
DOUGLAS GALTON,
Capt. Royal Engineers.

Liverpool, Crosby, and Southport Railway,
Secretary's Office, Barned's Buildings, Sweeting Street,
Liverpool, September 27, 1852.

SIR,

I BEG to acknowledge the receipt of your letter of the 23d instant, expressing the satisfaction of the Lords of the Committee of Privy Council for Trade at the course pursued by the Directors of this Company, in reference to the suggestions contained in Captain Laffan's report of the 6th instant.

In conveying the result of the conclusion to which the Directors had arrived, I omitted to notice an erroneous impression conveyed by the report, with respect to the class of engines originally employed on this line of railway, which I am informed weighed upwards of twenty tons, instead of thirteen or fourteen tons, as stated in the report. On this point Captain Laffan has, therefore, been misinformed. The only engine approximating to the weight quoted, and used on the Southport Railway, was one of England's patent light engines, purchased in August 1850 as an experiment, and which was found inadequate to the conveyance of the trains when the line was opened through to Liverpool in October in the same year, and since which period she has not been running.

Should you desire any further information on this subject, I should be happy to furnish it.

Captain Galton, R.E.,
§c. §c.

I have, &c.
WM. P. YOUNG,
Secretary.

Appendix No. 29.

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.*Lancashire and Yorkshire Railway, Secretary's Office,
Manchester, November 8, 1852.*

SIR,

REFERRING to your communication of the 16th ultimo, enclosing a copy of a report from Captain Laffan, R.E., of his investigation into the circumstances of an accident which occurred on the Liverpool, Crosby, and Southport line on the 11th August last, I have been desired by the Directors of this Company to forward, for the perusal of my Lords of the Committee of Privy Council, the accompanying copies of the reports received in reply from the Company's superintendents of the locomotive department, Messrs. Jenkins and Hurst.

I have, &c.

Capt. Simmons, R.E.,
&c. &c.

JNO. DUNSTAN, jun.,
Secretary.

*Locomotive Department, Salford,
October 16, 1852.*

GENTLEMEN,

HAVING carefully read Captain Laffan's report upon the accident to the 9.0 P.M. train from Southport on the 11th August, I proceed, in compliance with your instructions, to remark upon the several points raised by that officer.

Captain Laffan says, "the Southport Railway was constructed under the supposition that the traffic would be light, and that the trains, composed of three or four carriages, were drawn by engines weighing not more than 12 or 13 tons."

Again, it is further stated, "The trains now frequently consist of fifteen or twenty carriages, and are drawn by engines weighing 24 tons, *instead* of 12 or 13."

That the above statement is incorrect the following facts will prove. The first three locomotives placed upon the Liverpool, Crosby, and Southport Railway were made by Tayleur and Co., of Warrington, having outside cylinders 16 inches diameter, and weigh, when in working order, about 24 tons.

These were followed by two others, Stephenson's patent, also having outside cylinders, and weighing 15 to 16 tons each, the same having been purchased from one of the Eastern Counties lines; after, they were pronounced unsafe by one of the Government Inspectors of Railways of that day (General Pasley), who compared their motion whilst running to "a ship at sea." The next was put on shortly before you took the line, and weighed 18 tons. The next, and only one at all corresponding to the weight given by Captain Laffan, being 12 tons 6 cwts, was England's light express engine, and it only ran a few days upon that line.

Passing on, no description given by any of the Company's servants, if attended to, could lead to such an idea as that sketched. Nor can I conceive how Captain Laffan reconciles the fact of the carriages passing by uninjured the engine in the position in which he has placed it. The lines are likewise shown different to the description given. No opening was made at B, nor at any other point, by the engine or train getting off.

"Tracing back the line towards Southport," &c. There was nothing to indicate that any wheel had "got over the right-hand rail at A," but the four right-hand rails were bent, and the chairs broken or forced outwards from their fastenings, the chairs clearly indicating that they had been struck by the flange of a tire on the inside. Had a wheel "got over the right hand rail at A" the very reverse would have been the case.

The "light tracing upon the sand, and faint marks upon the chairs inside the left hand rail C to D," were more likely to have been occasioned by a carriage wheel than by any of the engine wheels.

"In order to draw a correct conclusion," &c. Captain Laffan next considers the construction of the engine, an ordinary 15-inch cylinders outside, 20-inch stroke, its power, and by what means the Lancashire and Yorkshire Company's locomotive engineers "obtain sufficient hold to prevent its slipping, till the cohesion becomes less than $\frac{3}{4}$ or about $\frac{1}{4}$." "Supposing 3,500 lbs. to be the power exerted on the rim of the driving wheels, and 13½ tons the weight placed upon the same wheels, then $\frac{1}{4}$ of the given result would be near the mark.

In the next place, the Committee of Privy Council are informed, "that it is possible to balance an engine in such a way as to render it perfectly unsafe, and to obviate this danger the Lancashire and Yorkshire Company's locomotive engineers place 8 out of "10½ tons on the leading wheels, and 2½ tons only to be borne by the trailing wheels."

Perhaps all that is necessary to say here is, that such a mode of distributing the weight over the wheels is not peculiar to your locomotive engineers. It is absolutely necessary that the weight should preponderate in front, ~~not only to produce a steadier motion, but also to afford greater facilities for the engine adjusting itself in the event of any~~

obstruction being upon the rails, or otherwise placed in the roadway. The trail wheels are only useful to steady the overhanging weight of the firebox and footplate, a precaution which is dispensed with in the four-wheeled engines.

Passing on, it is stated, "having arrived at this conclusion from the evidence of the Company's servants," &c. I beg to say, that no evidence was given to warrant such a conclusion. The evidence given corresponded to sketch, showing exactly the appearance presented by the rails, and position of the engine, &c. after the accident had occurred, but, supposing the right-hand trailing wheel to have mounted over the rail, as here described, sketch No. 3 shows the position of the engine. The effect of this would be to raise a powerful leverage acting upon the trailing wheels, the right driving wheel being the fulcrum, and the left leading wheel the weight to be raised. Plainly showing, that under such circumstances the engine should have taken an opposite course, and, in all probability, would have rolled over upon the line, instead of clearing it sufficiently, and so instantly as to allow the carriages to pass by uninjured.

Referring to sketch No. 1, it will be observed, the whole train left the rails at B, out no opening was made, as shown by Captain Laffan, nor was the chair broken; the tie nails gave way, and the chair turned upon its bed, still embracing both rails, and the key remaining in its place.

The broken chair, marked E, clearly explains in what way the indentations were made in the right trailing wheel flange.

Between A and B many chairs were broken, as shown by E, the outer part going with the rail, left the inner part fast to the sleepers; here the road was forced out of gauge, and the flange of the trailing wheel having worn thinner than the others, and consequently deeper, was brought in contact with the broken chairs, leaving "the deep notches" referred to.

The upsetting of the engine, or its being forced onwards after it had turned over on its side, would be more likely to bend the trailing axle, than by dragging it along in an upright position.

Captain Laffan illustrates, by a sketch, the position of one of your engines, followed by its tender, and goes on to show that these "passing over a slight permanent way loosely fitted" has a tendency to depress the rails, so as to lead the trailing wheels from a "higher to a lower level," at every joint; and finally ascribes the cause of the accident to "one of these jumps at a joint," having caused the right-hand trailing wheel of the engine to cross over the right-hand rail.

We have already seen that no wheel got over the rail at the point named, let us now see how far the theory advanced is correct as to the irregularities produced, by placing the wheels in the position described.

The annexed sketch, No. 2, presents a 15-foot rail, bearing two pairs of the engine wheels, $21\frac{1}{2}$ tons; and it is evident from this, that if we take the centre at A, we have 40 tons at E, against $13\frac{1}{2}$ tons at B; the result of this is to raise the rail at C, and taking the next rail, we get $2\frac{1}{2}$ tons at D, resting on centre E, against nothing at F; the result of this would be to lower the end of the rail at D, the jumping point, and thus lead the trailing wheels from a lower to a higher level, and not from a higher to a lower as stated by Captain Laffan. Taking another view of the thing, and suppose no fittings existed, but that the rails were laid loose upon the sand, or even floating on water, the result would be just the same.

Again, reasoning as if the trailing wheels were the cause of the accident, Captain Laffan says, "the engine had only been sent out of the Company's workshops about three weeks before the accident occurred," &c. &c.

Time has little to do with the wearing of tires; we have many in use, some ranging up to seven years old, are still perfectly safe, and in good order. From the 17th July to 11th August the engine ran 3,495 miles, and we have had tires completely worn out in the same distance. There is no mystery as to how the wheels varied in their diameter. The one, by Captain Laffan's own showing, has been trending upon the large end of the cone, and shearing the flange as it revolved, whilst the other must have been running upon the smaller end, and partly ground it away upon the rails in proportion to the difference in the two diameters rolling upon the rails.

I infer from Captain Laffan's report, that he entertains an unfavourable opinion of outside cylinder engines generally, and upon the peculiar construction of those used by the Lancashire and Yorkshire Railway Company in particular.

This is a question that has during the last twenty years occupied the attention of eminent mechanical engineers, and it has not yet been decided whether the inside or the outside cylinder engine is the safest. Under these circumstances, any opinion offered can only be taken for what it is worth; and in the meantime, the fact of the same class of engines having run during the last five years and a half from 5,000,000 to 6,000,000 of miles, and that too upon rails of all weights, from 50 lbs. to 90 lbs. per yard, and laid upon various foundations and bearings, and the fact, that no accident of a similar nature

Appendix No. 29. to that of the 11th August having happened to any one of them, is a far better authority
 ACCIDENTS. on their security or safety than any theoretical opinion, or even an opinion from a
 professional and experienced engineer.

Liverpool, Crosby,
 and Southport
 Railway.

Having touched upon the several points bearing upon the cause of the mishap, I conclude that Captain Laffan, having begun his report upon false data, could scarcely be expected to arrive at a correct conclusion as to the real cause.

I shall now state the particulars attending the accident, as related to me by the driver of the train on the following morning, and by others who were on the spot immediately after the occurrence, and from my own inspection of the line, engine, &c. &c., as they lay on my arrival.

Thomas Maddock, the driver, could say nothing more than that he left Southport at 10 minutes past 9 o'clock, and was driving at a speed of about forty miles an hour, when he felt an unusual motion on the engine, next a sudden shock, as if it had run into or over something, and in the same instant he was thrown upon the ground, and became insensible.

Mr. Bibby, the Southport Company's engineer, who lives at Waterloo, was on the ground in a short time, also, our locomotive foreman from Liverpool; both made a careful inspection to see if the train had been thrown off by some obstruction, but nothing was found to warrant such a conclusion.

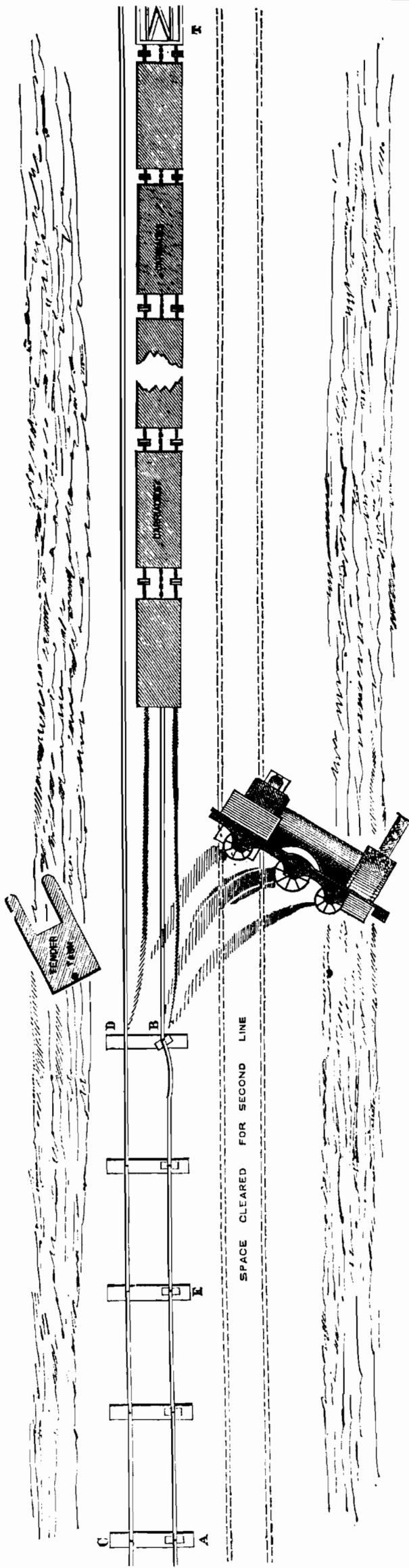
On turning to the permanent way, several chairs were broken between A and B, three of the rails slightly bent, the fourth very much so, and in shape, as shown by sketch No. 1, leaving a break upon the inner surface of the next rail; upon this break the right leading wheel of the engine mounted, and ran off the rails suddenly; the right leading side of the engine had then mounted upon the bank, and its hinder end having been carried round upon the front end of the tender, was lodged cleared off the rails altogether, and the remainder of the tender was forced onwards by the carriages, for some distance beyond where the engine lay; everything showed that the right hind part and the right front of the tender had been in contact as described; under the foot-plate all was cleared away by the frame of the tender, and over it the hand railing, &c. had been taken off by the water tank, which was projected to the opposite side of the line, and the right side of the tender framing was broken downwards to the first axle, bearing on the same side.

The question then is, how were the rails disturbed in the first instance? It would be presumption in me to offer a definite answer to such a question; we have, however, many instances on record of engines of every description getting off the rails, sometimes leaving the rails and wheels in perfect order, at others, as in the Southport case, the rails have been bent, and the roadway broken up, but, in almost every instance, the real cause has been left a matter of conjecture, and so it is with the one we have been discussing.

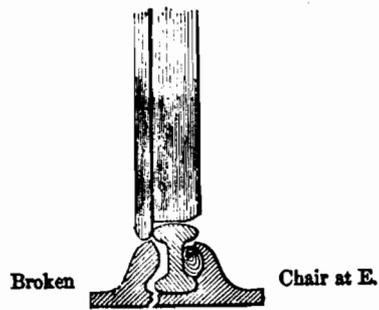
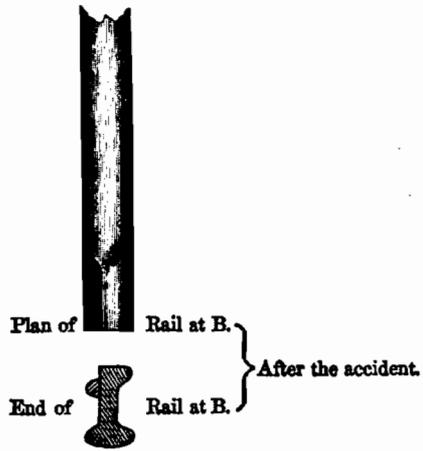
*The Directors of the
 Lancashire and Yorkshire Railway Company.*

I have, &c.
 WM. HURST.

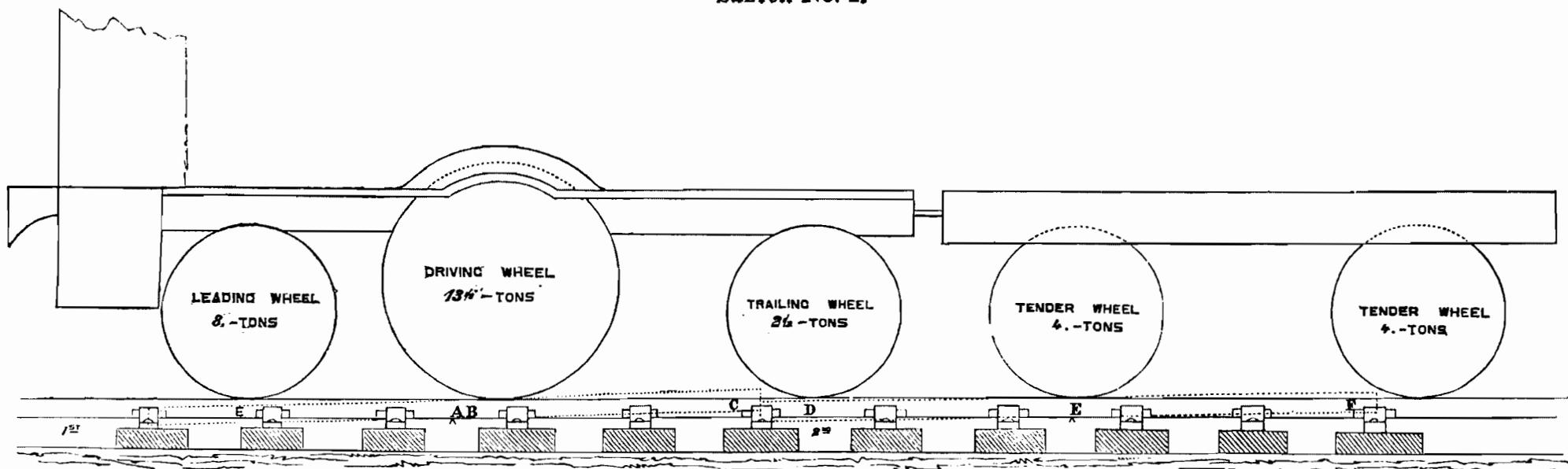
SKETCH No. 1.



T Tender frame.

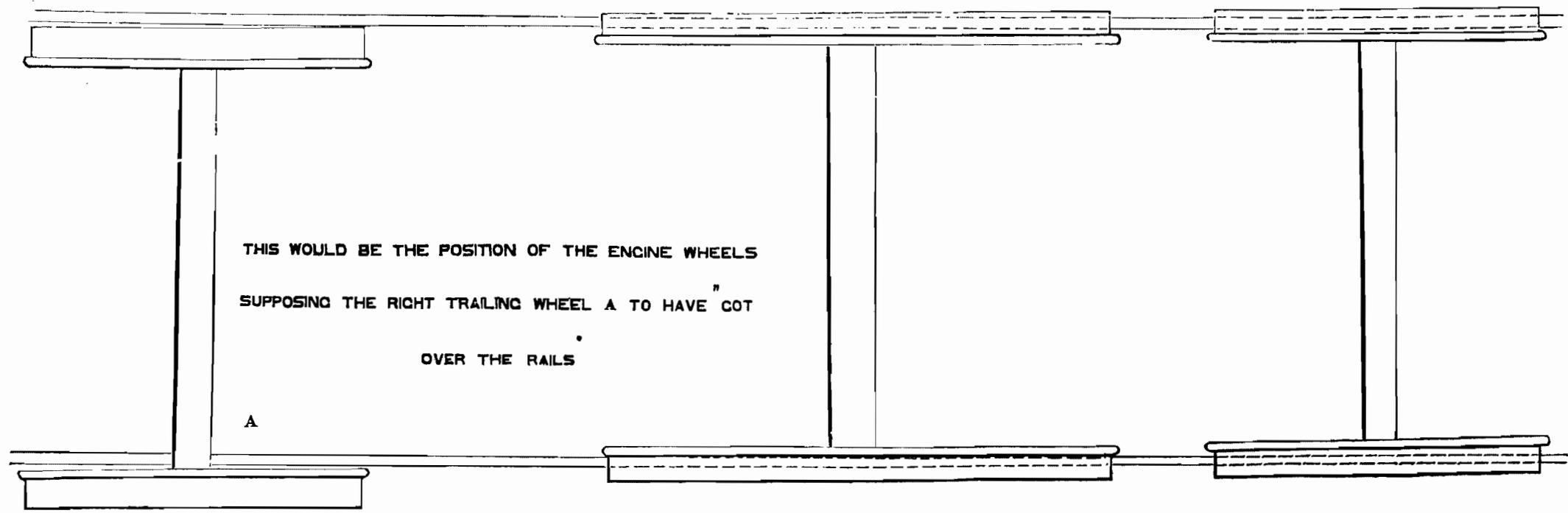


SKETCH No. 2.



The dotted lines show the position the rails would have assumed had they been closely fitted.

SKETCH No. 3.



THIS WOULD BE THE POSITION OF THE ENGINE WHEELS
 SUPPOSING THE RIGHT TRAILING WHEEL A TO HAVE "COT"
 OVER THE RAILS

A

Remarks on Captain Laffan's Report respecting No. 60 Engine running off the Southport Line, August 11, 1852. Appendix No. 29.

*Lancashire and Yorkshire Railway, Locomotive Department,
November 2, 1852.*

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.

SIR,

IN looking over the report of Captain Laffan on the above engine, I beg to say that I entirely disagree with him upon many points, and also on the manner in which he conducted his investigation at the workshops.

In the first place, in taking the circumference of the two wheels, he took his tape and wrapped it round the wheels. These, being conical, I told him he could not get the circumference correct,—that by moving the tape to or from the flange the size would alter proportionately more or less.

I procured (in his presence) a proper gauge with slide points, and measured a certain distance from the edge of tire, and found that instead of their variation being one third of an inch in their circumference it was just one sixteenth of an inch in diameter, which was under one fourth of an inch in the circumference, this being in favour of the thinnest flange to keep it from pressing on the rail; often a greater difference than this is found in new wheels.

In the next place, the mode he adopted for ascertaining the thickness of the flange, I disapprove of; he did it by shaping or bending a piece of sealing wax round the flange, and afterwards laying the wax on paper, and marking it round with a pencil, by which method some of the thickness was lost. I told him I would get a template made to fit the flange correctly, but he approved of his own system best.

He also states that the wheels were out of gauge; this I deny; they were perfectly correct; but it is impossible to obviate the wearing of flanges. In this case the flange had nothing to do with the accident, being quite sound in every part. Another statement in his report is, that the weight on the driving wheels was thirteen tons and a half, on the leading, eight tons, and on the trailing, two tons and a half, making a total of twenty-four tons.

But to prove the incorrectness of this, I weighed one of the same class of engines then in working condition. The total weight was twenty-two tons sixteen hundredweight.

The driving tires being part worn, I called the total about twenty-three tons, distributed, as near as I could weigh it on the machine, thus; weight on the driving wheels, twelve tons and a half, on the leading, seven and a half, and on the trailing, three tons.

The report also says "that the position of the wheels (as sketched in the margin) would cause an inequality in the level of the rails." The figures, however, are wrong. The tender, when full loaded, will be nearly thirteen tons; taking it as in average working trim, say, ten tons; then five tons upon one pair of wheels, and three tons upon the trailing wheels of the engines, will make eight tons, instead of six and a half, as shown in the sketch; again twelve tons and a half on the driving wheels, and seven and a half on the leading, makes in all twenty tons instead of twenty-one and a half.

This also is calculated upon a wrong principle, if we should take the rails as being supported at each end *only*; I should make the weight upon the joint between the two rails, about eight tons and a quarter, that is, one half of the weight of the driving wheels, and (from the position of the leading) say one fourth of their burden, as it is impossible for the weight to be supported by one end of the rails and none on the other, as figured on the sketch.

But the rails are not supported at each end *only*, they have also intermediate bearings, and the large wheels (according to the sketch) have gone over two of the cross bearers, and it appears to me very plain, that instead of the weight being greater upon the end of the rail where the driving wheel stands, it is less than the weight of the trail wheels upon the other rail, from their position. (Which is so much in favour of the peculiar construction of the engine, as so called in the report).

In another part of the report it is stated, "that if the leading wheels had gone off the rails first it would overbalance the engine, from the great weight upon the front, and would leave behind a very deep track in the ballast." This, however, would not be the case; he must not have taken into consideration that the engine is coupled to the tender by a strong draw-bar, and the engine can only lift a certain distance to accommodate the springs and the working of the engine without also lifting the end of the tender, which would far more than compensate the difference of the weight upon the front and the trail wheels. As to the cause of the engine getting off the line, it is, in my opinion, quite a matter of conjecture, and no one can arrive at any satisfactory conclusion. There is no question but an engine going at a great velocity will oscillate, and is easier to be displaced by coming in contact with any substance on the rail, or from the effect of a bad joint.

It is stated in one part of the report that "to obviate the oscillating motion of the engines the Lancashire and Yorkshire Company have so distributed the weight upon the wheels so as to overcome it." And in another place he states, "that engines of the peculiar construction" (as he described) "are not safe upon a light permanent way."

But I beg to say, that I consider those engines safe where the road is good and fit for any other class of engines to travel on.

We have had already sufficient proof of this, from the fact of this class of engines having travelled about 6,000,000 miles, and a large portion of the above mileage over a much

Appendix No. 29. lighter rail than that of the Southport, without being once off the road, with the exception of the case now under notice.

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.

Capt. Laws, R.N.,

I have, &c.

WM. JENKINS.

*Railway Department, Board of Trade,
Whitehall, November 12, 1852.*

SIR,

I AM directed by the Lords of the Committee of Privy Council for Trade to acknowledge the receipt of your letter of the 8th instant, transmitting copies of the reports received by the Directors of the Lancashire and Yorkshire Railway Company from the Company's superintendents of the locomotive department, relative to the accident which occurred on the Liverpool, Crosby, and Southport line on the 11th August last.

I am directed to inform you, that Captain Laffan, having perused those reports has discovered nothing in them to cause him to alter the opinion expressed in his report as to the cause of this accident, and the negligence on the part of the locomotive staff of the Company; and it only remains, therefore, for their Lordships to impress upon the Company the recommendations of their officer, that so long as the present permanent way is retained upon the Southport Railway they should draw up their time bills so as to allow the passenger trains to travel at a slower speed than that which appeared to be requisite at the time the report was made to enable the trains to be worked with punctuality.

My Lords also direct me to request you to point out to the Directors the very great responsibility which must attach to them if they continue to employ on the Southport Railway the class of engines described in Captain Laffan's report, so long as the light permanent way with which that line is now laid remains in use, and if any accident should occur in any measure attributable to the insufficiency of the permanent way to bear the engines in question.

My Lords direct me also to urge upon the Directors the necessity of having the permanent way better maintained than it appears from the report to have been at the time of the accident; and I am to observe, that it appears to their Lordships that especial attention should be given to it in consideration of its not having been constructed of so heavy a character as usual.

My Lords direct me also to observe, that it would appear from the report that the high speed of the train may in some measure be attributed to the want of punctuality in starting the train from Southport; and I am to request you to point out to the Directors that this accident adds another to the list of accidents with respect to which their Lordships have had occasion to call the attention of the Directors to a want of punctuality as one of the causes concurring to produce them; and I am to request you again to urge upon the Directors that it is most essential, both for the safety and convenience of passengers, that punctuality should be strictly maintained.

I have, &c.

J. L. A. SIMMONS,

Capt. Royal Engineers.

The Secretary of the

Lancashire and Yorkshire Railway Company.

*Lancashire and Yorkshire Railway, Secretary's Office,
Manchester, November 19, 1852.*

SIR,

REFERRING to your communication of the 12th instant, on the subject of the accident which occurred on the Liverpool, Crosby, and Southport Railway on the 11th August last, I have been instructed to forward, for the information of my Lords of the Committee of Privy Council, the accompanying copy of a letter which has been this day transmitted to the Directors of the Liverpool, Crosby, and Southport Railway Company.

I have, &c.

JNO. DUNSTAN jun.,

Secretary.

Captain Simmons, R.E.,

&c. &c.

*Lancashire and Yorkshire Railway, Secretary's Office,
Manchester, November 19, 1852.*

SIR,

I HAVE been instructed by the Directors of this Company to draw the attention of your Board to the fact that great stress is laid by the Railway Department of the Board of Trade, in its correspondence with this Company on the subject of the accident which occurred on the Liverpool, Crosby, and Southport line on the 11th August last, upon the "light and insufficient" character of the permanent way on that line, and as their Lordships feel it incumbent upon them to urge upon this Company, with whom in reality the defect pointed out does not rest, the necessity of increased care and caution under the circumstances, it appears to the Directors of this Company at once indispensable that your Board should undertake the strengthening of the permanent way by the insertion of an additional sleeper under each rail, or by some other equally effective method; and I am to request that your Board will adopt without further delay the measures necessary for the accomplishment of so important an object.

I have, &c.

JNO. DUNSTAN jun.,

Secretary.

The Secretary of the

Liverpool, Crosby, and Southport Railway Company.

SIR

I AM directed by the Lords of the Committee of Privy Council for Trade to request that you will inform their Lordships what steps the Directors of the Liverpool, Crosby, and Southport Railway Company propose taking with reference to a communication addressed to them by the Lancashire and Yorkshire Railway Company, dated the 19th inst., on the subject of the accident which occurred on the Liverpool, Crosby, and Southport Railway on the 11th of August last, a copy of which has been transmitted to this Department.

*The Secretary of the
Liverpool, Crosby, and Southport Railway Company.*

*Railway Department, Board of Trade,
Whitehall, November 20, 1852.*

I have, &c.
J. L. A. SIMMONS,
Capt. Royal Engineers.

Appendix No. 29.

ACCIDENTS.

Liverpool, Crosby,
and Southport
Railway.

SIR,

I AM directed by this Board to acknowledge the receipt of your letters of 20th instant, both of which were submitted at a meeting held to-day. In reply I have been instructed to state, 1st, with respect to the Seaforth accident, that the result of the report of the officers of the Lancashire and Yorkshire Railway shall be duly communicated, a committee having been called to receive the report; 2dly, with respect to the character of the permanent way, I am desired to state that the desirability of strengthening the present or employing additional bearings is now under the consideration of the Board, and it is hoped that in the course of a few days their Lordships will be in possession of the decision arrived at.

*Captain Simmons. R.E.,
&c. &c.*

I have, &c.
WM. P. YOUNG,
Secretary.

APPENDIX No. 30.

LONDON AND NORTH WESTERN RAILWAY.

SIR,

I AM directed by the Lords of the Committee of Privy Council for Trade to transmit to you, for the information of the Directors of the London and North Western Railway Company, the accompanying extracts from a report they have received from the Inspecting Officer appointed by their Lordships to inquire into the circumstances attending an accident that occurred at the Euston Station on the 3d instant, and to request you to call to the attention of the Directors the observations contained in them relative to the construction of the machinery for applying the break, and to the manner in which the incline from Camden Town to the Euston Station is now worked.

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

*Railway Department, Board of Trade,
Whitehall, March 12, 1852.*

I have, &c.
J. L. A. SIMMONS,
Capt. Royal Engineers.

Appendix No. 30

ACCIDENTS.

London and North
Western Railway.

*Extracts from Captain Wynne's Report on an Accident at the Euston Station on the 3d March,
in consequence of a Train having run into the Station at too great a speed.*

"The accident being attributable in the first instance to the break not acting I examined into the cause of failure, and I found that the rack-work on the end of the horizontal bar which communicates the power to the axle that works the breaking blocks had been thrown out of gear, which appears to have been done when the break was first turned off, and to have been caused by giving the heavy hand-wheel which works the break too violent a whirl round in turning off the break.

"The bar carrying the rack is unprovided with any stop to prevent its being drawn away from the pinion which works into it, but there are stops to each of the blocks to prevent them sliding too far back, and which of course act throughout the whole combination of the leverage, and would under ordinary circumstances have kept the rack in gear; but it will be understood how, the bar being suddenly brought up by the stops I have described, it would then, if the initial power was unexpended, receive a concussion in the direction of its length, the effect of which would be felt at any weak point in the bar. Such a point presented itself at the far end, where a screw had been cut; and this part of the bar bent so much as to draw the rack-work at the other end away from the pinion, and the break consequently failed to act when it was required. Had there been a stop at the end of the bar, somewhere near the rack, it would have been able to have resisted a much greater concussion, and this is a point to which it may be desirable to draw the attention of the Company.