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TASMANIA.

MAIN LINE RAILWAY.

ENGINEERS' REPORT.

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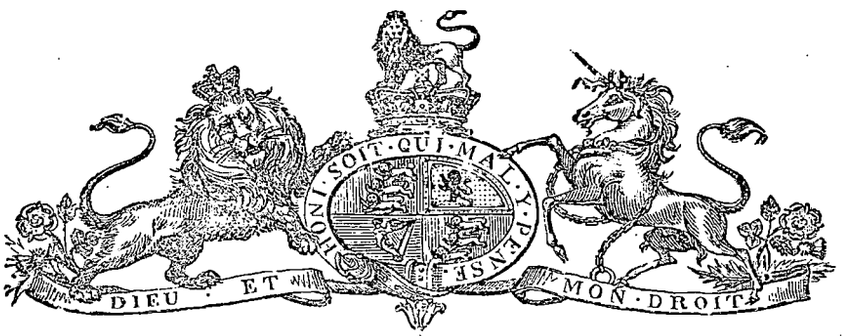

REPORT OF THE ENGINEERS ON THE MAIN LINE RAILWAY.

Launceston, 1st July, 1869.

SIR,

IN your letter to us dated September, 1868, marked B. 1367, we were instructed as follows :—

"In accordance with the provisions of 'The Main Line Railway Survey Act,' the Governor has been pleased to appoint the Members of your Firm Engineers and Surveyors for the purpose of making the Survey of a Line of Railway between Hobart Town and Launceston.

"You are requested at once to commence the Survey of a Line of Railway from the most convenient point of departure on the Line of the Launceston and Western Railway to Hobart Town.

"In effecting that Survey, whilst having regard to existing centres of population, and the character of the country, you are requested to select the route which is likely to prove most economical and permanently beneficial to the Colony."

We have now the honor to report that, in accordance with these instructions, we have carefully examined the country, and have surveyed, in detail, a Line of Railway from Hobart Town to Longford, of which we beg to submit herewith the Plan and Section, together with a Map showing the general Route of the Line surveyed, and the various other lines of country examined; and our estimate of the Cost of construction.

It will be convenient to arrange our Report in the following order :—

A.—1. Description of the Route selected for detailed Survey; and,
2. The lines of country examined.

B.—Estimate of the Cost of construction, with remarks.

C.—Observations on the Gauge, and general character of the Road.

D.—General observations on the proposed undertaking.

A.—1. *The Route selected.*

The Line that we recommend for adoption commences at Hobart Town on the Public Reserve, bounded by Park-street and the continuation of Macquarie and Liverpool-streets. We propose to construct the Station for passengers and light goods upon this site; and for the heavier goods traffic, and that to and from the shipping, to carry a horse tramroad along Macquarie-street to the Docks, as shown on the plan. This would pass close to the present Commissariat Magazine, which might be advantageously converted into warehouses for wool, grain, and other produce brought down by the Railway and awaiting shipment.

Leaving the Passenger Station the Line follows the road bounding the Government Domain to a point on the north-east of Mr. Chapman's house, where it enters a tunnel, 457 yards long, emerging on Mr. Solomon's property. Thence it proceeds through Mr. Roope's orchard, crossing the Risdon Road in front of that gentleman's house, and passing about four chains to the north-east of Mr. Marsh's premises. It crosses the New Town Creek about two chains south-west of the Bone Mills, and skirts the boundary of the Racecourse; from this it follows the general direction of the Main Road as far as the seventh milestone, where it passes under the road, and then runs along the western side of it for a distance of three-quarters of a mile, at an average distance from it of about three chains, when it re-crosses the road on the level and follows the eastern side as far as Mr. Brent's pier at Austin's Ferry. From here the Line runs between the Main Road and high-water mark of the River Derwent until it reaches the Bridgewater Causeway, along the western side of which we propose to carry the Railway to the extremity of the

earthwork portion, from which it will continue in a straight line, by means of a timber structure to be provided, to a point on the north bank of the river, about two chains westward of the Bridgewater Hotel. Distance from Hobart Town 12½ miles.

From Bridgewater the Line, following the undulations of the country in a northerly direction, crosses the embankment of the old Main Road at the Horse-shoe Gully, and passes about four chains in rear of the *Crooked Billet* public-house; then crossing the Main Road and running in a north-easterly direction it reaches the River Jordan, which it spans about half a mile south of the Main Road, and enters the Brighton Township,—16½ miles from Hobart Town.

The Line crosses the Brighton and Richmond Road near the Roman Catholic Cemetery, and, passing between Mr. Elliott's house and the Strathallern Creek, follows the course of the latter for a distance of four miles. It then curves to the west towards Mr. Broadribb's house, which it passes about four chains to the south-east, and follows the direction of the Brighton and Enfield Road, leaving Mr. Jarvis's homestead about four chains to the right, and then curves to the northward, round the base of the mountain known as Gunning's Sugar-loaf; crossing the Native Hut Creek at a point about a quarter of a mile to the westward of the Jerusalem and Richmond Road, the latter is crossed in front of Mr. Griffith's house, and then for a distance of about six miles the Line runs between the road and the Coal River, leaving the house of Mr. Ibbott, senr., on the left, and re-crossing the road close to the homestead of Mr. Ibbott, junr., whence it follows the left-hand side of the road for about a mile, and then again crosses it, curving a little to the northward, and following the spurs of the hills into the Jerusalem Valley, where it crosses the Richmond Road, for the fourth time, near Brain's Mill. From here it runs into the Township of Jerusalem, passing about one chain to the right of the Roman Catholic Chapel. Distance, 37½ miles from Hobart Town.

Leaving Jerusalem the Line takes a northerly direction, and passing two chains to the right of Mr. Corrigan's house, crosses the Wallaby Creek about a quarter of a mile above Mr. Salmon's house at the Jericho road bridge. From this it traverses the spurs and gullies of Flat-topped Hill, ascending at a gradient of 1 in 50, and curving round the end, contours up the eastern side of it where it reaches an altitude of 1450 feet above high-water mark at Hobart Town. The greater portion of this elevation occurs very suddenly. Between Brain's Mill and the point here described—a distance of five miles in a straight line—there is a rise of nearly 900 feet. The length of the Railway as surveyed between the same points will be about nine miles, which will admit of a gradient of 1 in 50. To accomplish this it has been necessary to introduce a "zig-zag" in ascending Flat-topped Hill, by which about a mile and a half is added to the length of the Line equivalent to an elevation of 150 feet on a gradient of 1 in 50.

The Line then runs through Hunter's Swamp, and passes on the western side of Mr. Stokell's homestead on the borders of Lake Tiberias, and following the eastern boundary of the lake in a northerly direction, proceeds through Stewart's Flat, up the Broad Valley, and passing about ten chains to the east of Mr. Littlechild's house, crosses the York Rivulet three chains to the east of the Oatlands and Swanport road bridge; it then touches the western corner of Gulliver's Lagoon, and thence runs into York Plains, following the same direction for about five miles, when it curves to the west and runs through the "Tin Dish Farm;" a mile and a half beyond this it crosses the Antill Ponds Creek to the right of Mrs. Barwick's house, and reaches the Main Road about a quarter of a mile on the Hobart Town side of the Half-way House at Antill Ponds.

Crossing to the western side of the road, which it follows very closely, the Line passes in front of Mr. Thomas Harrison's mansion, and thence in rear of Mr. William Harrison's to Antill Ponds Village, where it re-crosses the Main Road, and runs behind Mr. Page's stables into Tunbridge,—74 miles from Hobart Town.

At a distance of two chains from its junction with the Blackman River the York Rivulet is again crossed, and the Line then runs down the Blackman Valley for about a mile, when it crosses Grimes's Lagoon (now drained), and then turns to the northward, having Mona Vale House about half a mile on the left. The Macquarie River is crossed about half a mile, up its course, from the junction of the Blackman River with it, and the Line then follows the eastern side of the Macquarie Valley, passing in front of Mr. Thomas Pairamore's house, and running from thence close along the western boundary of the road from Ross to the Eastern Marshes, for about two miles, where it enters the township of Ross,—84½ miles from Hobart Town.

From Ross to Campbell Town the Line runs on the right of the Main Road, at an average distance from it of about twelve chains; and entering Campbell Town crosses the Elizabeth River about thirteen chains to the eastward of the Main Road bridge. Distance from Hobart Town 91¾ miles.

The general direction of the Main Road is then followed for about five miles, when the Line crosses from the eastern side to the western near Wanstead, and thence takes a westerly direction

for a distance of ten miles towards Mr. Robert Taylor's house at Valleyfield, which it passes about ten chains to the eastward, and then turning north passes through Stuarton Lagoon, keeping along the spurs of the Hummocky Hills until it reaches Fairfield, the property of Mr. Joseph Archer, where it runs about eight chains to the westward of Fairfield House; and continuing the same direction crosses the Lake River three and a half miles due south of Woolmers: from here it skirts round the western boundary of the Longford township, and joins the Launceston and Western Railway about one mile from the Longford Station, 127 miles 10 chains 39 links from Hobart Town, and 18 miles 48 chains 38 links from Launceston on the Western Line.

2. *Lines of Country examined.*

As the difficult portion of the country over which any line must pass lies between Brighton and Oatlands, we first devoted our attention to the study of that section. After a preliminary examination, we determined to make a more careful survey of the Jordan and Coal River Valleys.

The various routes which we have examined and abandoned are shown by fine dotted lines on the general map of the Colony attached to the book of plans.

We first examined the Line up the Jordan River, from Brighton, which runs in a westerly and north-westerly direction between Brighton and Elderslie. The Line here would follow the right side of the river, and is a practicable line, although the works would be by no means light. About two miles north of Elderslie it must pass through a rugged gorge about four miles long. The works on this portion would be of a very heavy nature; the sides of the hills are very steep, and the material very loose. In several instances the spurs of the hills are so sharp, that it would be necessary to tunnel for a total distance of about thirty chains, and to cross the river by bridges four times. Leaving this gorge, the Line would pass in front of Mr. Pitt's house; thence through the Hunting Ground to a second gorge, in passing through which it would be necessary to cross the Jordan twice, and require a tunnel of about six chains in length. Debouching from this gorge there would be a sandstone cutting about fifty feet deep. The Line would then again cross the Jordan, and run along the base of Mount Vernon, following the western side of the river for a distance of three and a half miles, where it must again cross, and enter a tunnel twenty-five chains long, which would have to be driven through very hard rock. From this point it would follow the east side of the river, running along the sides of the hills, and crossing several steep valleys to the Black Marsh, on Mr. John Bisdee's property, along which section there would be several deep cuttings and high embankments, with other heavy works.

From this part of the Jordan Valley three Lines have been examined, with a view to crossing into the Jericho Valley.

The first leaving the Jordan Valley at a point about a mile and a half north of Apsley, and running generally in an easterly direction to Spring Hill. It would pass under that hill about twenty chains south of the summit of the Main Road. On this route workable gradients can be obtained, but they entail a tunnel ten chains in length on leaving the valley of the Jordan, and another fifteen chains long through Spring Hill.

A second Line out of the valley of the Jordan would leave the river at the Black Marsh, and would run up a valley bearing from east to south-east, and pass under Spring Hill to the westward of the saddle over which the Main Road is constructed. This valley is very steep and tortuous, requiring the use of bad gradients and sharp curves, with a tunnel about twenty chains in length through Spring Hill.

The third Line would run northerly in the valley of the Jordan to a point about three quarters of a mile west of the Bothwell Bridge over the Jordan. From thence to the Jericho Valley it would follow the general direction of the Jericho and Bothwell track, passing close to Mr. A. Bisdee's house. Between the Black Marsh and the point referred to west of the Bothwell Bridge would be the most expensive part of this Line, involving as it does a tunnel about fifteen chains in length. The gradients and curves would be on the whole satisfactory, and we consider it to be the only feasible route into the Jericho Valley.

These three Lines would arrive at the same point in the last-named valley, and then follow the route described by the late Mr. Sprent (in his Report dated the 18th February, 1856), passing over Lemon Hill into Oatlands, and thence through St. Peter's Pass to Antill Ponds.

From the foregoing observations it will be understood that a Line by the Jordan Valley route between Broad Marsh and Antill Ponds would be very expensive. A considerable length of it would have to be constructed on very sideling ground, and, as the material of which the hill-sides are composed is in some places of a very loose nature, the probable effect of excavating through it for works of the Railway would be to put large masses of material in motion,—thus filling up the river bed, or involving very heavy expenditure in works to check this tendency.

Next in order followed the examination of the country north of Ross, to the east and west of the Hobart Town and Launceston high road, where there is no difficulty in taking a cheap and satisfactory line, by three routes, to a junction with the Launceston and Western Railway: first near Evandale, secondly at Perth, and thirdly at Longford.

These lines are equally easy to construct, and the study of them involved the examination of five routes, which are shown on the general plan by five dotted lines.

The line to Perth is the shortest. That to Evandale would cause a slight increase of length as regards the Main Line, but would be shorter in the total distance from Hobart Town to Launceston. To make the junction at Longford would add about six miles to the total length of the Main Line between Hobart Town and Longford; but, nevertheless, in the absence of any instructions as to the route to be followed in the preparation of the Parliamentary Plans, we decided to adopt Longford as the junction, as presenting most advantages, among which are the following:— A more direct communication will be opened up between the north-west districts and Hobart Town and the intermediate country, and there is likely to be considerable produce traffic between these districts.

Longford is also a very suitable position for the working of the two lines, as it will be the principal intermediate Station of the Launceston and Western Railway, and is well suited in many respects for working the double traffic and for the central depôt, and for locomotive and carriage repairs; the Line being there level, the foundations good for buildings and machine-shops, the ground well raised above the level of floods, and an abundant supply of good water easily obtainable from the South Esk River for the use of the engines and workshops. All these points are of considerable importance.

From Ross southwards the valley of the Macquarie was examined. It is evident that serious floods occur here at times, and that a breadth of country from three quarters of a mile to a mile in width is sometimes under water. It is, therefore, necessary to keep the Line above the level of the country liable to be so affected.

A Line on the west side of this valley would cross the river close to the present road bridge at Ross, and run thence along the side of the hill, passing close to Horton College. On this Line there would be several bad gradients where it passes over the summit to the west of Mona Tower; and some of the curves, especially one near Mr. Kermode's entrance gate, would be very sharp. An examination of the eastern side of this valley showed that a more favourable line could be found along that route, crossing the Macquarie about half a mile up its course from its junction with the Blackman River. The difficulties on this route commence near the Half-way House at Antill Ponds. From this point the examination extended through St. Peter's Pass and for a considerable distance to the east and west with a view to finding a Line to Oatlands; and we arrived at the conclusion that no such Line is obtainable within a moderate cost, either in primary construction or subsequent working expenses.

On going eastwards into the York Plains a good Line was obtained for a considerable distance; and pursuing the investigation of the country between the Eastern Marshes and the Main Road, and thence down the valley of the Coal River to Enfield, we were led to the conviction that the best engineering line was to be found to the eastward of the Main Road. The one finally adopted and surveyed, after trying several, is elsewhere described, and is shown on the general map by a full black line.

From the York Plains it is *possible* to take a line into Oatlands, which would nearly coincide with the track leading from Mr. James Lord's to the township; but it would be costly to make, and expensive to maintain. The line adopted is three miles and a half east of Oatlands.

The next point of importance remaining to be determined was the crossing of the Derwent. A Line to Risdon was first examined, which has the great advantage of being eight miles shorter than any other. There would, however, be about a mile of tunnelling; and the crossing of the river at this point presents, in view of the expense, a practically insuperable difficulty, there being a depth of water in the centre of 102 feet. Another Line was tried, from Brighton to Austin's Ferry, on which there would be some heavy works, but not of so formidable a nature as to induce us to abandon that Line, if the river could be satisfactorily crossed. The water at this point is not very deep (only 20 feet), but the depth of soft mud is unknown. The bottom was tested in three places with boring-rods, which were pushed down by two men without trouble to a depth of 50 feet, and boring for 30 feet more showed no material strong enough to support piles. A bridge at this point would exceed 2100 feet in length.

These considerations decided us to go to Bridgewater, with a view to using the existing Causeway for the transit of the Line. From the information we have been able to obtain, we have reason to believe that this plan is quite feasible. We learn that there is about 15 feet of

mud at this point, and below it a stratum of clay sufficiently strong to allow of the construction of a bridge to the westward of the present timber structure; and we believe that, by using the earthwork portion of the Causeway in connection with this, a safe and economical crossing can be constructed, still leaving room for ordinary vehicles.

Following the Line shown on our plans, the works from Bridgewater into Hobart Town would be comparatively light, with the exception of a tunnel about 20 chains long opposite Mr. Chapman's house, and would be little, if any, more expensive than a line through the Government House grounds, which would necessitate either a tunnel or a deep cutting close to Government House, and a heavy cutting at Macquarie Point. The latter Line would pass through a great deal of valuable private property, and trespass upon the Government Domain and the Public Gardens, which are all avoided by the Line selected.

B.—*Estimate of the Cost of Construction.*

We estimate the cost of constructing the Main Line Railway as surveyed by us will be eight hundred and fifty thousand pounds sterling (£850,000). This includes everything necessary to open the Line for traffic in a satisfactory manner, but does not include land compensation, which we have not attempted to estimate. The demands of owners of land on the Western Line have been—with a few notable exceptions—so much at variance with all reasonable calculations, that we have thought it better to separate that item from our estimate of works.* The estimate is for a single line of railway with a gauge of 5 feet 3 inches between the rails, and provides for eleven stations. At the principal stations we propose to build the platforms on sidings, by which arrangement, with the aid of slight additions to the existing Telegraph, we consider the Line can be worked with perfect safety and regularity. The station buildings to be chiefly of timber and iron.

C.—*Observations on the Gauge, and general character of the Road.*

Much discussion has arisen during the last few months as to the character of Railway best suited to this case, and the mythical "Fell and Fairlie system" has found many advocates. One candidate for a seat in Parliament lately addressed his constituents on the subject of Railway Construction, and declared himself favourable to the construction of the Main Line provided it were done on this system, but he would oppose any Line projected upon the same extravagant principle as that of the Launceston and Western Railway.

One of the greatest evils under which these young communities labour is the tendency on the part of some public men, even amongst those who aspire to rank as statesmen, to form and express strong opinions on subjects with the facts of which they have taken no trouble to make themselves acquainted. If this gentleman had sought information from any person who is conversant with the history of Railways and their designers, he might have learned two important facts; first, that the so-called Fell and Fairlie system has no existence; and secondly, that the Launceston and Western Railway will be the cheapest substantial Line ever constructed,—due consideration being given to the difficult character of a portion of the country traversed, and the high cost of labour in these Colonies.

Mr. Fell and Mr. Fairlie each advocates a particular invention intended to overcome difficulties of a *special* nature; but there is no connection whatever between the two systems, or between the two gentlemen named, and neither system is suited for general application. Mr. Fell is the engineer of the Railway *over* Mont Cenis intended to work the traffic temporarily pending the completion of the tunnel *through* the mountain. This system consists of a Railway with a third or middle rail, and an engine so constructed that it does not depend for its tractive power wholly upon the friction of the ordinary vertical driving-wheels, whose adhesion is solely due to the superincumbent weight of the engine, but has in addition horizontal wheels which grasp the central rail on both sides, and, in fact, haul the engine up otherwise impracticable gradients, as a sailor in a boat would haul himself ashore, hand over hand, by a line fasted on shore. This plan we believe is likely to prove to be an important advance in the solution of working hitherto impracticable gradients, such as 1 in 12, which the declivities of Mont Cenis involve; but as both the road and the engine are most complicated and expensive forms of machinery, they should be dispensed with whenever it is possible to do so, in favour of the more simple and well-tested modes of construction at present in use.

Mr. Fairlie's system consists simply in the design of a peculiar form of engine, having one long boiler which rests at the ends upon two short engines to which it is attached by king-bolts on the same principle as the ordinary road waggon, by which means it is expected to be able to travel round curves of unusually short radius. Two engines on this principle (but not constructed we believe by Mr. Fairlie) were purchased by the Queensland Government; and they have totally failed in the attempt to work them round curves of five chains radius, and have been abandoned as useless, while much lighter engines, of the ordinary form, work the traffic satisfactorily.

* The quantity of land required would average about 8 acres to the mile.

In summarising these remarks we may state that both the systems under review are still merely in their infancy, that they must be—under their best state of development—only applicable to cases of an extraordinary character, and that there is nothing in the line of country over which the Main Railway must pass to justify our recommending the Government to experiment in unproved systems.

The plan of permanent way and engines which we have adopted for the Launceston and Western Railway we believe, on the whole, to be most suitable for the Main Line; but as the traffic on the latter will probably be light for some time to come, and the greater portion of the gradients and curves are good, we propose to use a lighter rail (60 lbs. to the yard) over the easy parts, and confine the heavier rail (70 lbs.) to the midland section, where the gradients and curves are worse, and will require more powerful engines to work over them. The engines which have been ordered for the Western Line possess all the latest improvements, including an adjustment of the framing of the leading wheels, which enables them to pass easily round bad curves without serious injury to the wheels or rails.

We here insert a copy of a letter which we have received from Mr. G. W. Hemans, of London, an eminent member of the Institution of Civil Engineers, which deals fully with the "Fell and Fairlie system:"—

(Copy.) 1, *Westminster Chambers, Victoria-street, London, S.W.,*
21st April, 1869.

MY DEAR SIRS,

YOUR letter of the 27th February is just to hand, and I am happy to answer your enquiries relative to various schemes which have been afloat here for the improvement of rolling-stock, and of economy in the construction of railways.

I am glad to hear there is a probability of the construction of the principal line of railway which your Island seems to require,—that is the one from Launceston to Hobart Town.

First, as to the gauge.—Having already selected, for reasons which I think were good, the gauge of 5 ft. 3 in. for the Launceston and Western Railway, I cannot conceive it possible that any other gauge could be adopted from Longford to Hobart Town without the greatest inconvenience. I have often and carefully considered the question of the 3 ft. 6 in. gauge, which I know has been adopted in Queensland, and my ultimate conclusion is that, except in particular cases,—such as the Isle of Man, for instance, where mineral lines were projected into the mountains in connection with the Main Line from Douglas to Peel, and in which case I recommended it with a view to economy,—it is not generally preferable.

There is no connection whatever between the middle rail or Fell's system and what is called the Fairlie system, which latter applies only to improvements in rolling-stock. I am not at all a convert to the Fell system except in extreme cases of mountain lines where nothing else appears feasible. The idea of applying, for the purpose of making cheap surface lines, this system in an ordinary country I should consider radically bad. The locomotive on the Fell system will always be a very complicated machine, difficult to work and keep in order. The Fairlie system, which has for its chief object the diminution of the dead weight of trains, and of the crushing load on the driving-wheels of locomotives, has enough prospective advantage to induce the fullest trial to be given to it. I do not consider that the Fairlie engine has as yet had anything like sufficient trial to enable me to pronounce with confidence on its absolute superiority to the engines now in use; but I have so far good expectations of it, that I have, along with several other engineers, subscribed a considerable sum of money to enable further trials to be made of it.

There is no Fairlie engine running at present in this country, but we have one just ready, and most favourable reports were made by several engineers some time ago, including Captain Tyler, the Government Engineer, on the performances of one that was tried in South Wales, and which broke down from gross neglect of the contractor, who afterwards became a bankrupt. I am informed that the two Fairlie engines which were sent to Queensland were not designed by Mr. Fairlie, and were built without a water division in the fire-box, without which the two boilers cannot work properly at the same time.

The small company of Engineers with whom I am associated are also constructing a steam bogie carriage for trial, of which I send you two or three engravings. You shall know the result of these trials, which I hope will prove the applicability of this system to the economical working of branch railways. Upon the whole I may state that the present condition of railway invention does not, in my opinion, justify the departure from established rules of railway construction in a line like that proposed from Longford to Hobart Town. You need not be afraid of gradients of 1 in 50, or curves of 10 chains radius, which can easily be grappled with; but you should not go out of your way to attempt to make a surface line with gradients and curves much steeper and sharper than these. If the experiments we have in hand should be perfectly successful, they will bear their fruit upon a better class railway as well as on an inferior line. When you come to construct branches into poor districts, the lighter railway system with the steam bogie carriage may turn out to be the best thing.

* * * * * * * *

I am, &c.,

(Signed) G. W. HEMANS.

Messrs. DOYNE, MAJOR, *and* WILLETT, *Melbourne.*

We have also to call attention to the Report of Messrs. Brereton & Lewis to the Victorian Government, which we append; both of these documents, it will be seen, fully bear out our opinions.

A small gauge Railway similar to that of Queensland has been spoken of. However suitable that Railway may be to the special case for which it was designed, we consider it would not be at

all suitable for the Main Line of Tasmania. The peculiar character of the country over which the Queensland line had to be constructed enforced the free use of curves of five chains radius; and as these could not be worked by any Engines at present in use upon broad gauge lines, the smaller gauge was adopted. When small gauge Railways have to be worked by locomotive engines, it is a mistake to suppose that there is any great economy in the use of them. The reduction of the gauge, like the bogie applied to engines, admits of the use of sharper curves, which enable the Engineer to follow more closely the natural contour of the country, and by that means reduces the cost of earthworks and bridges. The engines being necessarily light, somewhat lighter rails can be used; but experience has shown that all the saving that can be effected in construction by the use of these narrow Locomotive Railways, except in special cases, does not compensate for the great additional cost of working and maintenance, due to the inferior character of all the appliances; the cramped space into which must be crowded the machinery of the locomotives; and the reduced power of the latter requiring a large number to be constantly in use, entailing increased expenditure in fuel and repairs, and the employment of a larger number of men,—a serious consideration where wages are so high.

The difference between the constructional cost of a first-class Line, and of one on the smaller gauge, would not amount to £100,000; but the increased annual cost of working and maintenance would represent a capital very greatly exceeding that sum, while the better class of railway and rolling-stock can be worked with a degree of satisfaction and safety not to be obtained by the other.

A great deal of misapprehension prevails on the subject of the cost of construction of the Launceston and Western Railway, which it is desirable to mention here, as arguments based upon false premises are freely used to prove that a similar principle of permanent way should not be adopted for the Main Line. The original estimate was £400,000, and now that all the contracts have been let, and consequently very close estimates upon reliable data can be made, there is no reason to suppose that the Railway will cost more when completed in a thoroughly satisfactory manner, except in the item of land compensation, for which the Engineer is in no way responsible. Dividing that Line into two sections, which the character of the country naturally points to,—namely, (1), from Launceston to the Longford Station about 18 miles, and (2) from thence to Deloraine 27 miles,—we find the cost of the first, including everything, will be about £13,000 a mile, while that of the latter will be about £6000 a mile. This great difference is due to the very heavy earthworks on the first section, and the necessity of crossing the Longford Valley at a level which will keep the Line above the influence of the floods, and leave abundant water-way. The average cost per mile for the whole Line will be about £8800; and the use of the inferior gauge would not have effected a total saving of more than £500 to £1000 a mile on the average.

As the gauge of the Western Railway is now a settled question, and its working must dovetail into that of the Main Line, there is an additional and a very strong reason for adopting the same gauge—5 feet 3 inches. In England the break of gauge between the 7 feet and the 4 feet 8½ inches has proved to be so great an evil, necessitating the transfer of passengers and goods wherever the gauges meet, or the expensive and complicated contrivance of a third rail to enable both classes of rolling-stock to pass over the same Line, that, although the latter is by no means the approved gauge in the present day,—being too narrow for the working parts of the engine,—the absolute necessity of having a uniformity of gauge on all Main Lines that are, or may become connected, is universally accepted, and the broad gauge is being gradually removed, and replaced by the others, which is the ruling gauge of the Country.

The experience of England on all these points has led to the adoption of an intermediate gauge, by which the excessive weight of rolling-stock, and the consequent increased wear and tear, on the 7 feet gauge is avoided, while more space for the working parts of the engine is given than the 4 feet 8½ inch gauge affords. These intermediate gauges are 5 feet 3 inches and 5 feet 6 inches. They are almost universally used in Countries which are not already committed by extensive Railways to another gauge. Ireland, India, Victoria, and New Zealand have adopted one or other of them,—not as a matter of necessity to avoid break of gauge, but as that which experience has proved to be, on the whole, the best. When Mr. Whitton, the present Engineer-in-Chief of the New South Wales Government, took charge of the Railways in that Colony, he found that several miles had been made with the 4 feet 8½ inch gauge, and he recommended that they should be altered to 5 feet 3 inches as a better gauge, and to avoid the break with the Victorian gauge when the two Lines should meet. Financial considerations, however, decided his Government not to adopt the suggestion, and the inconvenience will be duly felt when the now rapidly converging Lines are joined.

A review of all the considerations here set forth induces us to advise strongly that the gauge of the Main Line shall be 5 feet 3 inches; the weight of the rails 60 lbs. a yard for the lighter sections, and 70 lbs. for the heavier; and the character of the rolling-stock generally similar to that of the Western Railway,—subject, of course, to any improvements which may be satisfactorily established in the meantime.

D.—*General Observations.*

The cost at which the Line can be constructed will be affected by the mode of letting the contracts. The country over which it will pass naturally divides it into three Sections, which should be let in separate contracts.

(1.) From Hobart Town northwards to Brighton.
(2.) From Longford southwards to (say) Campbell Town.
(3.) The Midland District between Brighton and Campbell Town.

To execute the works simultaneously over the whole length of the Line would cause a very large increase of expenditure upon the carriage of materials to the Midland Section; and would place such difficulties in the way of the Contractors, as to render it doubtful whether there would be any ultimate saving of time in the completion of the entire work.

With the two end Sections open for traffic, the mid-Section would practically have a port at each end of it, from which supplies could be quickly and economically obtained for the purposes of the Contractors in the first instance, and afterwards for the delivery of the permanent rails and rolling-stock. From the scarcity of suitable timber in the vicinity of the Line through the Midland Section, it would be cheaper to draw supplies from Hobart Town and the Northern Districts by means of the end Sections; these would also secure all the traffic entering Hobart Town at one end, and Launceston at the other, and would thus at once become sources of revenue; while the carriage of the mails by coach would be reduced to the intermediate stage from Brighton to Campbell Town,—about 60 miles.

To make the Sections proposed from Hobart Town to Brighton, and from Longford to Campbell Town, we consider that ample funds would be provided by raising £350,000 of the total amount required. Our estimate of the final cost of the Railway is based upon the assumption that this principle of carrying out the works will be adopted.

With regard to the Midland Section it may be thought desirable to leave the exact route for the present an open question. Having carefully ascertained the best engineering line in all respects, we deem it our duty to recommend that one for the Main Line of the country, both with a view to present economy, and to facilities for connecting branch Lines which may be projected hereafter; but we are aware that a strong feeling exists in favour of a route by the Jordan Valley. We have shown that such a Line is *practicable*, but will be much more expensive than the one we have selected. Of this there can be no doubt, and we may roughly state the extra cost at not less than £100,000. Nevertheless the question may be thought worthy of further consideration, and the mode of construction we recommend will afford ample time to arrive at a mature decision. We might here suggest, as an alternative, a Branch Line from Bridgewater by New Norfolk to the Hamilton and Bothwell districts. As a rule branch lines have proved in the old countries to be unremunerative, and to constitute suckers instead of feeders to the profits of the main lines; but this is often due to the principles upon which they are constructed and worked; with the same weight of rails, and the same heavy and expensive rolling-stock as is used on the main lines. Fortunately the progress of engineering science is such as to promise that branch lines may ere long be constructed and worked at a cost proportionate to their traffic by the use of improved appliances.

We have not attempted to enter upon the question of the revenue likely to be derived from the traffic on this Line; first, because the Government has made special arrangements for that purpose; and secondly, because we do not believe that the existing traffic of the country would, in its present depressed condition, give any true indication of the future results: nor do we think that the desirability or otherwise of entering upon this work should be decided solely upon such narrow considerations. To us the question presents itself in a broader light. Will the construction of this Railway, directly and *indirectly*, confer such benefits upon the country as to justify the country in taking the responsibility of incurring a debt for the purpose? Will it tend to settle population in districts which are now cut off from markets by the difficulties of transit? Will it aid in promoting the unity of the Colony by developing closer commercial relations between the different districts; improving the waning energy of the inhabitants; introducing fresh blood and capital; and by providing means of free communication between man and man, help to efface those feelings of petty jealousy and rancour which always flourish in locally isolated communities, and destroy the vitality of the whole nation?

Will Tasmania so united and strengthened be able to bear the increased burden of debt?

We think all these questions may be safely answered in the affirmative.

We have the honor to be,
Sir,
Your most obedient Servants,
DOYNE, MAJOR, & WILLETT.

The Honorable the Colonial Secretary,
Hobart Town.

APPENDIX.

EXTRACTS from Victorian Parliamentary Paper of the Correspondence in relation to the recent Construction and Working of Railways in England and elsewhere.

(Copy.)

LETTER from MESSRS. BRERETON *and* LEWIS *to the Honorable* MR. VERDON.

SIR, *Westminster, 30th December*, 1868.

Victorian Railways.

IN accordance with your request that we should report to you upon the several questions raised in the letter of the Honorable the Commissioner of Railways and Roads, of 13th October last (No. 523), we beg to submit the following observations:—

Construction and Working of Railways.

The first seven questions of the Honorable Commissioner relate to Fell's and Fairlie's systems and to the Mont Cenis Railway, on which the former has been adopted.

We beg to refer you for information upon Mr. Fairlie's views to the pamphlets he has published, and for particulars of the Fell system and the Mont Cenis Railway to the report of Captain Tyler to the Board of Trade, and to the copy of a letter from Mr. Longridge, the managing director of the Mont Cenis railway company, enclosed herewith.

However, it may be more convenient if we had some particulars of these systems, and the experience gained respecting them, in the order suggested by the enquiries of the letter, especially as we have had the advantage of communicating with some of the persons best informed on the matters, but who are unwilling, in the present incomplete state of both systems, to commit themselves to definitive opinions.

1. Is the mode of construction adopted in the case of the Mont Cenis line by Mr. Fell or that advocated by Mr. Fairlie applicable to main trunk lines of railway having a heavy goods traffic, or only to lines of light traffic, or branch lines?

Neither Mr. Fell nor Mr. Fairlie's systems consist in any alteration of the principle of construction of railways as ordinarily adopted.

They both aim at the application of increased power of locomotive engines for carrying heavy traffic over steep gradients, and the systems may therefore be considered as generally more applicable for working lines, with heavy traffic, than for lines of light traffic or "branch lines." Both, however, have been applied to railways of very narrow gauge, viz.—3 feet 7½ inches, and 3 feet 6 inches, respectively, and having very sharp curves. Still narrower gauges, however, are being worked by ordinary locomotive engines.

Fairlie's Engine.

Mr. Fairlie's engine requires no addition to the ordinary mode of laying the permanent way, working as it does, like other locomotives, by the adhesion of its driving-wheels to the bearing rails; but to obtain increased weight, and consequently tractive power, without excessive load upon the driving-wheels and permanent way, the number of the wheels has been increased by the adoption of a duplex engine of two distinct carriages or frames, each containing four or six driving-wheels, coupled together, worked by separate pairs of cylinders, supplied with steam by jointed steam-pipes from a long double boiler built in a single piece.

The boiler is carried towards its ends by two "Bogie," or movable pins, one upon the centre of each carriage, which admits of free horizontal motion, after the manner of an ordinary timber carriage. Each set of wheels is, therefore, capable of adapting itself to the curvature of the rails it runs upon. Each of the two divisions of the double boiler has its set of tubes, smoke-box, steam-pipes, &c., the chimneys being at the ends, and the fire boxes at the centre, where the two are attached together. The foot-plates and the fuel are at the sides, from whence also the firing is done,—the engineman and fireman usually standing on opposite sides of the boiler,—and they are considered capable of firing for the double boilers and otherwise of attending to the engines.

These engines have been tried upon the Neath and Brecon Railway in South Wales, with a gauge of 4 feet 8½ inches, gradients of 1 in 50, and curves from 8 to 40 chains radius. The line is intended for a heavy mineral traffic. They have also been tried upon the Queensland Railways of 3 feet 6 inch gauge, with gradients of 1 in 45, and curves of 5 chains radius. None of them are now in use, except that we believe a small one is occasionally employed for shunting on the Neath and Brecon. The larger one tried on this line is now in Mr. George England's yard, at Hatcham. Their failure is said to have arisen from defects in detail of construction, and deficiency in generation of steam.

Mr. Fairlie has also a project for coupling the wheels of passenger carriages, and converting them into driving-wheels, by applying steam cylinders supplied from the boiler of a single engine, somewhat after the manner of Mr. Sturrock's application to the engine tenders on the Great Northern Railway, by flexible steam-pipes, which, however, is not now generally worked on that line, and the whole scheme requires further development before it can be recommended.

Fell's Engine.

Mr. Fell's engine requires the addition of a third or central rail, laid between the ordinary permanent rails, gripped by pairs of horizontal driving-wheels with vertical crank axles pressed together against the surfaces of the rail to obtain adhesion, in addition to that derived from the weight of the engine on the ordinary coupled driving-wheels. This enables comparatively light engines, with short-wheel base, to carry heavy loads up steeper inclines, and round sharper curves than ordinary locomotives, and to surmount inclinations such as the latter are incapable of overcoming. The central rail is only laid, and horizontal wheels only used, where the gradients are steeper than 1 in 25. Efficient break-power is also obtained, when descending, by clips upon the vehicles pressed against the central rail. This contributes also to safety in travelling round the very sharp curves the system admits of, by checking the tendency of the wheel-flanges to leave the rails.

The railway over the Alps at Mont Cenis, where the Fell central rail and engines are in use, is about 48 miles in length, with gradients averaging 1 in 25, the steepest being 1 in 12, and is principally laid along the public road, ascending and descending the mountain side with an elevation of about 3000 feet, and passing some very sharp curves of 130 feet, or 2 chains radius. The gauge of the railway has been constructed only 3 feet 7½ inches; this is complained of as too confined for advantageously getting in the details of the engine. The engines are in daily use, but have required many alterations of the working parts.

2. Would it be advisable to adopt either Mr. Fell's or Mr. Fairlie's mode of construction on a main trunk line in a country where a line with gradients of 1 in 50, and curves not exceeding 40 chains radius, and of thoroughly substantial construction, can be obtained at a cost, exclusive of stations and rolling-stock, of £7300 per mile of line (single), or including these, of £9300 per mile?

It could not be considered advisable to adopt these complicated modes of construction for the cases given. The ordinary powerful engines in general use are capable of conducting the traffic, and an additional engine can always be coupled on for exceptionally heavy loads; as on such curves as 40 chains radius, length of coupled wheel base is not a material inconvenience, and although engines on both Mr. Fell's and Mr. Fairlie's principles have been experimented upon for several years, defects in construction still require to be remedied; but for surmounting gradients of excessive steepness the former may be considered the most promising system yet adopted.

The Mont Cenis Railway of Mr. Fell, although with gradients of 1 in 12, and curves of 130 feet radius, and with a gauge of only 3 feet 7½ inches, and almost entirely along the public road, has cost £9000 per mile, or about as much as that suggested in the question of the Honorable Commissioner.

3. Assuming a certain amount of traffic to be worked, will it be worked cheaper on railways constructed as proposed by Mr. Fell or Mr. Fairlie, or on a line such as is above described, and what would be the proportion of working expenses to receipts in each case?

Mr. Fell's engine weighing 16 to 18 tons, all available for adhesion on the driving-wheels, will have, when in proper order, about double that amount of additional adhesion by the grip of the horizontal wheels upon the centre rail, or 32 to 36 tons, which is equivalent to the same weight of useful load of train beyond what ordinary engines of 16 to 18 tons weight could carry up inclines. Some economy in working would doubtless result from this; but, on the other hand, the engine will be complicated and costly in construction, and the additional or centre rail will add about one-half to the cost of the permanent way.

The economy in working by Mr. Fairlie's system consists in the saving of an engine-man and stoker, who would be required were an additional independent engine employed.

4. What has been the total cost per mile of the Mont Cenis line complete, including engineering, stations, and rolling-stock?

The total cost of the Mont Cenis Railway, which is about 48 miles long, has been £430,000, or about £9000 per mile, including all expenses. The narrow gauge, the sharp curves, and the use of the public road for about 43 miles, have tended to keep down the cost: on the other hand, the galleries and covered ways, which have been required to protect the railway from snow and avalanches, have tended to increase the cost as compared with railways in more usual districts.

5. What is the extreme gross load, exclusive of engine, that is taken over Mont Cenis by Fell's railway, and what the corresponding useful load?

The gross load of train, exclusive of engine, has been 35 tons, and the net useful load 24 tons, taken up gradients of 1 in 12. The weight of the engine has been from 16 to 18 tons.

6. What is the extreme gross load, exclusive of engine, that Mr. Fairlie calculates on being able to carry with gradients of 1 in 12, and what the corresponding useful load?

Mr. Fairlie's engines have not been constructed to surmount gradients so steep as 1 in 12. The engines for the Queensland railways of 3 ft. 6 in. gauge weighed 30 tons, and were designed to take 90 tons of gross load, exclusive of their own weight, up gradients of 1 in 45. The engine for the Neath and Brecon Railway, of 4 ft. 8½ in. gauge, weighed 44 tons, and took a gross load of 302 tons, exclusive of its own weight, up gradients of 1 in 50 and 1 in 57.

7. What average speed is expected to be obtained on Fell's and Fairlie's systems?

Mr. Fell, in the Mont Cenis line, under the conditions before explained, attains an average speed of from 12 to 14 miles per hour, but upon the gradients of 1 in 12, of about 8 miles per hour. Mr. Fairlie, on the Neath and Brecon, with gradients of 1 in 50, 1 in 57, and 1 in 66, attained an average speed of 14⅓ per hour.

8. How do English railway companies carry out the repairs of the permanent way of their lines—by contract, or by employing their own labourers?

Originally the maintenance of railways was frequently let by contract, but we believe the practice has been almost entirely abandoned, and all the chief companies now employ their own labourers.

9. How do English railway companies carry out the repairs of their engines and rolling stock, generally? Do they contract for their repairs, or are they made by mechanics and others employed directly by the company?

There have been several cases where parties have contracted with companies for the supply of locomotive power, and have then found and repaired their own engines. This was once done on the London and North-western, and the most recent case we are aware of was the South Devon and Cornwall railways. But the plan has been almost everywhere given up, and the companies have become owners of their rolling-stock and engines, and repair them by their own mechanics. There is, however, a large quantity of rolling-stock running on English railways, the property of private freighters or rolling-stock companies, and this is kept in repair, sometimes by the owners, and sometimes by the lessees.

10. Do railway companies contract for the repair or building of engines and carriages, and place their workshops and machinery in the hands of the contractors, to be used by them in carrying out the work they contract to do; or do they put the work out to mechanics and others employed directly by the companies and working in their shops under the system of piece-work?

English railway companies mostly obtain their locomotives from engine-builders, who work to specification, but some, and notably the London and North-western, build extensively themselves; but almost invariably companies do their own repairs at their own workshops by their own men, generally by day-work, but occasionally by small systems of piece-work.

11. If they place their workshops and machinery in the hands of contractors, what guarantees are taken that the machinery, &c., are properly cared for, and how is the work done by the contractors supervised?

In the case of the contractors on the South Devon and Cornwall lines, which were the most recent, and about which great pains were taken, the contractors were required to insure the workshops and machinery at agreed sums, and covenanted to return them at a certain period in good order, fair wear and tear excepted, and the whole working of the contract was placed under the supervision of the company's engineer.

12. The weight unloaded of a waggon of each class used on the best managed English main line of railway, and the weight of the useful load that a waggon of each class is capable of carrying?

The great variety of stock in use on most of the English railways does not permit of an average being struck that would serve as a safe reply to this question; but the following table of the stock in use on the Great Northern and Great Western railways will give the information sought:—

Waggons.	G. N. R.		G. W. R.	
	Empty Weight.	*Load.*	*Empty Weight.*	*Load.*
	tons. cwt.	tons.	tons. cwt.	tons.
Covered Goods	5 0	3 to 8	4 18	8
Low-sided Trucks.....	4 0	5 to 8	4 7	8
Open Goods or Mineral	4 12	9		

13. The same information as to passenger carriages, with the number of passengers that a carriage of each class will carry.

Carriages.		G. N. R.			G. W. R.		
Class.	*Compartments.*	*Number of Passengers.*	*Weight of Passengers.*	*Weight of Carriages.*	*Number of Passengers.*	*Weight of Passengers.*	*Weight of Carriages.*
			cwt.	tons. cwt.		cwt.	tons. cwt.
First	Three	18	21	6 0	18	21	7 3
First	Four	24	28	9 3	—	—	—
Second	Four	40	43	8 0	32	35	7 6
Second	Four small	40	45	6 10	—	—	—
Third	Five	50	55	8 2	40	44	7 5
Third	Five small	50	55	6 10	—	—	—

Referring to the enquiries respecting Mr. Page's mode of construction, I beg to refer you to the enclosed printed memorandum, headed "Tram-Railway Association."

The project advocated by Mr. Page is for a patent description of tramway for laying down upon public coach roads; the trams to be of iron, stone, or timber, upon which a locomotive engine with very broad wheels is to run, and the roughness of the tram is relied on for securing sufficient adhesion of the wheels to overcome steep inclinations. The carriage wheels are to run on narrow plates or rails upon the inner edges of the trams. The engine will not have flanges to its wheels, but is kept upon the track by vertical or diagonal guide-wheels bearing against the inner edges of the trams.

Many tramways of various kinds have been laid upon public highways, and worked by horses or otherwise, and locomotive or traction engines have been applied for working upon public roads, but none resembling what is now proposed by Mr. Page.

Experiments with models have been made, from which it is said great adhesion of the wheels has been obtained up very steep inclines.

Not having been able to obtain all the information we desire, we must ask leave to postpone any remarks on Baldwyn's chilled wheels, which, although extensively used in America, have not yet found much favour in this country.

We have the honor to be,
Your obedient Servants,
(Signed) R. P. BRERETON.
W. B. LEWIS.

18, *Duke-street, Westminster, S.W.*,
30*th September*, 1868.

Victorian Railways.

Dear Sir,

By this mail Mr. Verdon forwards a copy of a report we have addressed to him at his request, on certain questions asked by the Honorable the Commissioner of Railways, chiefly relating to the Fell and Fairlie systems of working railways, and to this I beg to refer you, although doubtless you are already informed on the subjects treated of.

Perhaps I may safely add that, where ordinary circumstances have to be dealt with—and such I should deem to be the case in a country admitting of 40-chain curves and gradients of 1 in 50—experience does not warrant a departure from the ordinary mode of proceeding; but should you have to deal with extraordinary difficulties, and be driven to steep inclines and sharp curves, then Fell's system may be looked upon hopefully—perhaps the best hitherto suggested. But the opening of the railway over the Mont Cenis for practical traffic has, as is common with new systems, discovered many defects in the construction and working of the engines, which, however, the promoters are remedying, and they are sanguine of being able to accomplish great improvements.

I am, dear Sir,
Yours very truly,
R. P. BRERETON.

Thomas Higinbotham, *Esquire.*

(Copy.)

REPLY of MESSRS. BRERETON *and* LEWIS.

8, *Victoria Chambers, Westminster, S.W.,*
27th January, 1869.

SIR,

WE have the honor to acknowledge the receipt of your minute of the 25th instant, asking for a "report upon the present modes of railway construction and management, for the information of the Honorable the Commissioner of Railways and Roads."

Of course it will be impossible for us to prepare a reply to so comprehensive an enquiry in time for the outgoing mail, but we trust that our report of last month will have afforded useful information upon some of the questions with regard to railway construction and management now occupying public attention; and, in continuation and in anticipation of a more detailed reply to your minute, we beg to forward the following documents, which we think will be found of interest, and especially to bear on the questions put by the Honorable the Commissioner; viz.—

1. Letter from Mr. Sturrock on the subject of Fairlie's engines.
2. Paper read before the Institution of Civil Engineers by Captain Tyler, R.E., on railway gradients and curves, with discussion thereon.
3. Paper read before the Institution of Civil Engineers by Mr. Rochussen on the maintenance of the rolling stock of the Cologne, Minden, and other Prussian railways.
4. Tables appended to report of George Berkley, Esq., C.E., to the Directors of the Great Indian Peninsular Railway Company, showing a comparison of the carriages and waggons in use on English and Indian railways.
5. Report of G. B. Bruce, Esq., C.E., to the Directors of the Great Southern of India Railway Company on the rolling-stock in use upon that line, with a comparison of the same with rolling-stock on Prussian and other railways.
6. Report of the Directors of the Oude and Rohilkund Railway Company to the Shareholders at the 12th half-yearly meeting.

Referring to these papers, we would remark, that Mr. Sturrock's opinion, from the responsible position he long held with the Great Northern Railway Company, and from the efforts he has made to advance beyond present practice and to accomplish some of the objects sought by Mr. Fairlie, is entitled *per se* to considerable weight; and, while concurring fully with his statement that "Fairlie's engine is as yet quite an experiment," and his advice that "it would be unwise for a distant colony to yet embark in such engines," we venture further to express our belief that this would be acquiesced in by nearly all the locomotive superintendents of our principal railways. We may add to Mr. Sturrock's letter that we are not aware of Fairlie's engines being in successful use in any country. In our opinion, the principle involves contrivances not well suited to the usage to which locomotives in ordinary traffic are unavoidably exposed.

In the paper of Captain Tyler and the discussion which followed will be found, amongst others, the opinions and the grounds for the same of those who are most sanguine of successfully working steep gradients; but we think it will be apparent that the extreme view to be taken is that, while the difficulties of working steep gradients possibly will be so much reduced as to render railways practicable in places hitherto considered inaccessible by them, yet it would not be justifiable to adopt them where they can be avoided at reasonable cost. Where, therefore, railways may be constructed at the cost named by the Honorable Commissioner, viz., £9000 per mile, and worked by engines of ordinary construction, with the prospect of a fair return for such an outlay, we have no hesitation in expressing our strong conviction that it would be an unwise policy for the colony to be permanently burdened with lines that must be uncertain and expensive in working.

Mr. Rochussen's paper contains some valuable tables, but calls for no special comments.

Passing on to the other documents, we may observe that an impression became prevalent in the minds of the public interested in Indian railways, and at last in the Indian Government itself, that the rolling-stock on those lines was inferior to that in use in England, and not suited to the special traffic, and the consulting engineers of the various companies were requested to investigate and report upon the subject. We have had the advantage of perusing reports made by Mr. Hawkshaw, Mr. George Berkley, and Mr. G. B. Bruce, the tenor of all being alike, recommending slight improvements which the experience gained in conducting the special traffic suggested, but not advising radical changes as beneficial. Mr. Berkley appended to his report some elaborate tables giving a comparison between the stock in various English and Indian railways, and, having kindly placed these at our disposal, we beg to hand you a copy for the information of the Honorable Commissioner. Mr. Bruce also prepared a somewhat similar table, but embracing also statistics relating to Prussian rolling-stock: the whole of his report, although directed to the special circumstances of the railway with which he is associated, is so full of interesting information, that we send a complete copy, without, however, endorsing his remarks.

From the tables appended to these reports, and the information possessed in Victoria, a comparison may be drawn between the Victorian, the English, the Prussian, and the Indian rolling-stock.

The Oude and Rohilkund Railway Company adopted a much lighter system of railway than that in ordinary use, in one case with a gauge of 4 feet, and in another with a gauge of 5 feet 6 inches, corresponding with that of the main line system they run in connection with. The latter has not been successful; and in this case, where an extremely light permanent way has been adopted on a line of similar gauge to, and in connection and capable of being continuously worked with a railway of ordinary construction, the experiment has not been encouraging, although tested only with a "light traffic."

Our object in forwarding these papers is to afford general information; and we think that they will tend to show that, in the matters to which they refer, recent progress has chiefly consisted in improvement and in the perfecting of what has long been known, rather than in radical change where no novel circumstances have had to be dealt with.

We beg to call your attention to the second report of the Railways (Ireland) Commission, which contains an elaborate report on the history and management of the Belgian State and other railways, and which could not fail to be of interest to the Honorable Commissioner.

We have the honor to be, Sir,
Your most obedient servants,

R. P. BRERETON.
W. B. LEWIS.

G. F. VERDON, *Esq., C.B., Agent-General for Victoria.*

(Copy.)

LETTER of MR. STURROCK *to* MR. LEWIS.

20th January, 1869.

MY DEAR SIR,

IN reply to your enquiry, I beg to inform you that Fairlie's engine is, as yet, quite an experiment. Not one, that I know of, is at work in this country. That built for the Cambrian railways is laid up, and could not be put to work for less than several hundreds of pounds. However correct the principle "of all the weight being used for adhesion," (and I believe such should be done on gradients of 1·50), I feel sure that Fairlie's present engine will require much modification to enable it to solve the problem. It would be very unwise for a distant colony to yet embark in such engines, as, if unsuccessful in their original shape, they cannot be altered, but must simply be thrown into the scrap heap.

Yours very truly,

(Signed) ARCHD. STURROCK.

W. B. LEWIS, *Esq.*

JAMES BARNARD,
GOVERNMENT PRINTER, TASMANIA.