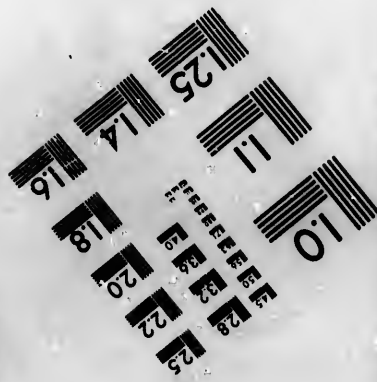
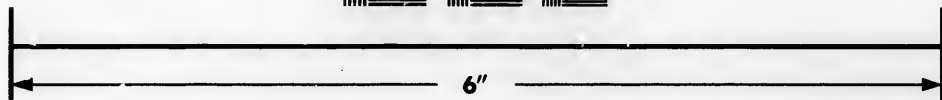
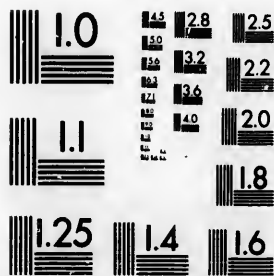


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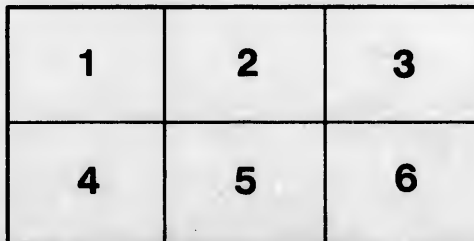
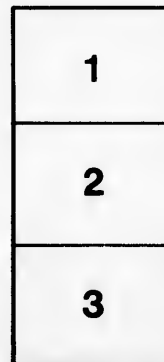
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Halifax and Windsor Railroad.

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**REPORTS,**

**PLAN AND ESTIMATES.**

**Published by Order of the Government.**

HALIFAX, NOVA-SCOTIA.

1849.

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## Report, &c.

### Hon. Mr. Howe's Letter to the Lieut. Governor.

**MAY IT PLEASE YOUR EXCELLENCY,—**

In May last your Excellency did me the honor to appoint me, in conjunction with the late Solicitor General, the present Judge Desbarres, a Commissioner to carry into effect the Resolution passed during the last Session of the Legislature, by which provision was made for a survey to ascertain the most practicable line for a Railway between Halifax and Windsor.

Having, as early as the year 1835, brought the importance of establishing communication by rail between the capital of Nova Scotia and the fertile regions lying around the Basin of Mines to the notice of my countrymen, and having ever since looked confidently forward to the gradual approach of the period when the accumulation of capital, and the increase of population, would render the enterprise practicable and remunerative, I cheerfully entered upon the performance of the duties with which I was charged. Though the elevation of Mr. Desbarres to the Bench, and his retirement from the Government, deprived me, in the autumn, of that gentleman's further assistance, it is due to him that I should acknowledge, that, in all the more important steps taken under this commission, I have been materially aided by his counsel and zealous co-operation.

Having opened a communication with Mr. Fraser (the mover of the Resolution) and other gentlemen at Windsor, who take a deep interest in the project, and whose friendly co-operation I am bound to record, it was determined to entrust the Exploration to Mr. George Wightman, whose able Report, Plans, and Estimates, I have now the honor to present for your Excellency's information.

Mr. Wightman is a native of the Province, and has been long favorably known to the public as a skillful and scientific Civil Engineer. Many of our best Highroads run upon lines discovered and traced out by this gentleman, who was for several years employed under Major Yuill, on the survey of the St. Andrews Railway, and the Military Road to Quebec,—and subsequently under Captain Pipon, Major Robinson, and Captain Henderson, in the survey of a Trunk Line for a Railway from the Atlantic to the St. Lawrence.

The range of the Ardoise, presenting, from its elevation, the most formidable obstacles on the proposed route, Mr. Wightman was instructed to ascertain, in the first instance, whether these could be overcome, because, if they could not, further expense would be unnecessary. He left Halifax on the 19th May, with a party of five, and spent eighteen days in examining this difficult region, and exploring several routes, chiefly to the eastward of the one finally selected. The partial Report marked A. with the accompanying Plan, was sent in on the 10th of June, and show the work performed up to that time, and the general conclusions at which the Engineer had arrived.

He was then instructed to return, and, adhering to the line he might adopt, to complete his survey from the Tide level at the St. Croix to the head of Bedford Basin. This portion of the work was the most tedious and difficult and occupied the party until the 4th September, when Mr. Wightman again returned to town, exhibited his working plans, and reported generally.

His attention was then directed to that portion of the line lying between the head of the Basin and Halifax, which, from the depth of the Coves, and the broken and elevated nature of the upland ridge, which runs around the shore, it has always been feared would be most difficult and expensive. It proved less so than was apprehended. By the 24th October, the line was complete to the Three-mile House; and then a series of Surveys of the Peninsula were necessary, to determine the very delicate and important question as to the mode of approaching the City. The shore route, outside of the Campbell Road, was finally adopted, and though the terminus, as marked upon the plan, is advanced no further than Richmond, I am happy to report that no serious obstacle exists to establishing it in the centre of the city.

On the 9th of November, Mr. Wightman repaired to Windsor, and the Survey from the tide level in the Meander to the Town of Windsor, occupied him until the 25th of November.

On his return to Town, such of the Party as were no longer required were paid off, and Mr. W. devoted himself to completing his

Plans, and preparing his summer's work for the review of such other Engineer as he was informed would probably be employed for that purpose.

The selection of such a person required care and discrimination. It was indispensable that an Engineer, not only competent to report upon the line, but able, from experience in the construction and working of Railways, to check the estimates, and determine accurately the cost of the work, should be engaged. An American Engineer, whose experience was derived from the alignment and formation of Railways through countries like our own, was for many reasons to be preferred. Having obtained an introduction to John B. Jervis, Esq. the Chief Engineer of the Hudson River Railway, a gentleman of the highest standing in his profession, I explained to him what was required, and asked his aid in making the selection. For the promptitude and discrimination with which that gentleman responded to the requisition thus made upon him by an entire stranger, I am bound to feel truly grateful. The gentleman I was advised to select was E. J. Chesbrough, Esquire, of whom Mr. Jervis, in reporting on his qualifications, was pleased to say that he was not only a person of experience, but "worthy of all confidence." I have appended to this Report (B) a letter from Mr. Chesbrough, written at my request, and several extracts from Public documents, by which it will appear that from 1828 to the present time, that gentleman has been variously and almost constantly employed, under or in connection with the most experienced Engineers of the United States, in the survey or execution of some of the most important public works of that country.

Mr. Chesbrough arrived here on the 13th January, and proceeded at once, with Mr. Wightman, to traverse and inspect the line. On the 25th of January he reported generally, and, as his engagements in the States were pressing, and as it was very desirable, before Mr. Wightman's report was finally made up, that that gentleman should carefully inspect the lines of Railroad running through Massachusetts, Mr. Chesbrough recommended that he should proceed with his plans and estimates to his office in Boston.

Though some increase of expense would be incurred by adopting this suggestion, the advantages to be derived from it were obvious, and Mr. Wightman was instructed to proceed to Boston in the steamer of the 9th of February. He returned on the 23d of February, and on the 10th March handed me the general report and plan marked C. which I have now the honor to submit for your Excellency's inspection.

Mr. Chesbrough's Report marked D. is also submitted. Though dated earlier than the general report, it is based upon the working plans and estimates laid before him by Mr. Wightman, and carefully reviewed.

These documents, will, it is confidently anticipated, interest your Excellency, and convey to the Legislature and to the Province at large, the most encouraging and gratifying information.

The results, as exhibited in these Reports, may be thus summed up. A Railroad can be made between Halifax and Windsor, with practicable grades and curvatures, suited to the speedy conveyance of passengers and freight for £330,000, allowing for a rise in the price of labour.—for £300,000, should prices not rise above the ordinary rates of the country.

Mr. Chesbrough states that a gross annual income of £30,000, or about £82 per day throughout the year, will cover working expenses, and pay five per cent on the capital expended. Mr. Wightman estimates the probable income, almost immediately on the completion of the work, at £31,865.

Should the work be undertaken by a private Company, and these calculations be accurate, the enterprise would not only be free from risk, but immediately remunerative. But, should the Legislature step in, and, mindful of the rights of the public over this great Highway through our country, determine to construct it, by an issue of scrip redeemable in twenty years, not only may the interest upon the capital be reduced to 3½ or 4 per cent, but the profits which cannot fail to accrue from the rapid increase of travel, and growth of population, which Railroads everywhere induce, may be steadily applied to the extension of this fine chain of communication, carrying it link by link through Falmouth, Horton, Cornwallis, Aylesford, Wilmot and Granville, until the whole of that fertile valley, encircled by the North Mountain, and rapidly filling up with population and industry, becomes a suburb of the capital, and until the commercial emporium of the Sister Province of New Brunswick is brought into such close connexion with Halifax, that passengers can go thither and return in a single day.

An account of the Expenditure incurred under this Commission, marked E. is annexed, and although the sum placed at the disposal of your Excellency has been exceeded by a moderate amount, I trust that the discretion exercised in this respect will not be disapproved, and that the information collected throughout the year, and now condensed into a moderate compass, accessible to, and easily comprehended by, all who take an interest in the subject, will be regarded, by your Excellency and by the Legislature, as worth the outlay it has cost.

I have the honor to be,  
Your Excellency's obedient  
Humble servant,  
JOSEPH HOWE.

His Excellency SIR JOHN HARVEY,  
&c. &c. &c.

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## Mr. Wightman's General Report.

SIR—

Having been appointed to explore the country in order to ascertain the most practicable route for a Railroad from Halifax to Windsor, and to make a preliminary survey thereof, I beg leave to lay before you, for the information of His Excellency the Lieutenant Governor, the following Report:

The general formation of the country between Halifax and Windsor is too well known to require a very minute description. It is composed of a range of ground from seven to eight hundred feet in height opposite Windsor, and falling off gradually eastwardly to the Shubenacadie Lakes.

The first object was to examine the country with reference to finding the lowest pass through the highlands, and the most favorable position for the road. The result of this examination was to determine on the vallies of the Sackville and Meander Rivers for the line of the Road.

This pass is lower by eighty feet than any pass westwardly of it, while it admits of a much greater distance in the descent to the tide water of the Bay of Fundy, and consequently of a much less perpendicular descent per mile.

Besides this, on the southern side of the highlands, the valley of the Sackville River, which commences in the same depression as the head of the Meander, affords a direct opening to Bedford Basin; whereas the openings of the country, from the western pass, lead either through Lake Pigot to the Meander, or to Margaret's Bay:—the ground in the direction of Halifax being occupied with barren and rocky ridges running across the course required for the line.

Another reason for the preference given to this line is, that by crossing the main road leading from Newport, Rawdon and Douglas towards Halifax, it will attract more of the business of these Townships, both in freight and passengers, than if it went direct from Windsor; besides the land on the direct route is too barren to afford any compensation for the loss of this business. And lastly, the valley of the Meander abounds in Plaister and Lime Stone, the freight of which will, in all probability, afford considerable revenue to the Road.

Eastwardly of the Meander, the next practicable opening is the valley of the River Hebert. This valley forms a passage through the highlands, about one hundred and twenty feet lower than the pass by the Meander, but is very circuitous, and runs into difficult and broken ground between the head of the River Hebert and Sackville. Indeed the natural opening of the country by this route joins the proposed Quebec line at the head of the Shubenacadie Grand Lake.

Taking the vallies of the Meander and the Sackville Rivers as the proper route, and com-

mencing at Windsor, the line will run nearly on the track of the present road to the bend at foot of "Prospect Hill," where it continues directly through the ridge at Mr. Jenkins' to the shore of the River St. Croix, which it follows to Tongo's Ferry, about  $3\frac{1}{4}$  miles from Windsor.

Thence it continues directly onwards, over the "Winkworth" Marsh, crosses the St. Croix, passes a few rods to the Southward of the mansion of James Allison, Esq. at Mantua, crosses the Hebert at the edge of the highland, and passing across the marshes of Messrs. Chambers at Newport, enters the valley of the Meander about half a mile easterly of the house of Mr. John Chambers. In all this distance (6 miles) it may be carried on a dead level.

From this place to Parker's Mills, six miles further, the valley of the Meander is twenty to forty rods broad, and bounded by abrupt hills. The line can be carried on ascents of 15 to 37 feet per mile, except about half a mile immediately below the mills, where it will be necessary to increase the grade to 58 feet per mile, for the purpose of getting above the mill dam.

From Parker's Mills to Canovan's Point,  $4\frac{3}{4}$  miles, the valley assumes the character of a deep mountain ravine, and will require careful management and some rather heavy work. The grades vary from 45 to 60 feet per mile—the latter being a mile and three quarters in length, at the head of the deep valley. This is the steepest ascent on the northern side of the Ardois, and will govern the weight of the loads passing towards Halifax. It is desirable that this grade be reduced, and it is possible that a line might be carried along the sides of the hills on the western side of the valley, so as to make a uniform grade over the whole section, and the practicability of such a grade should be tested before locating the line. It would probably, however, add more to the expense than the benefit would repay. The equalized grade would be about 50 feet per mile, and the addition of useful power about ten per cent.

From Canovan's Point to Dymock's Mill, one mile and a quarter, the valley is open, and the grades averaging about 28 feet per mile. Dymock's Mill is virtually on the top of the Mountain, the rise thence to the highest ground being too trifling to require particular notice; above this place also the appearance of a valley is no longer seen, and the stream, now an insignificant brook, flows between banks but a few feet higher than its bed.

From Dymock's Mill it is one mile and three quarters to Cockscomb Lake, a sheet of water one mile and three quarters in length. The line follows its western side, and will require some heavy embankments in coves of the lake.

The eastern side, besides being out of the alignment, is impracticable.

From Cockscomb Lake to the summit of

ground, it is for half a mile a rocky ridge, dividing the waters of the Meander from those of the Sackville River. A cut of 12 feet in this ridge will reduce the rise from the Lake to 18 feet per mile. This point is twenty-one miles and three quarters from Windsor, and 464 feet above high tide water in Bedford Basin.

Immediately on the south side of this ridge, the Sackville River takes its rise in an extensive range of flat, boggy ground; at about 2 miles it begins to assume the appearance of a valley, but broad, and admitting of curvatures of three to six thousand feet radius, and grades varying between the level and thirty feet per mile to Lewis' Mill, about a mile westwardly of the "half way house," on the Windsor Road. This section, seven miles, is the easiest on the route.

At Lewis' Mill commences a great fall of the valley, near three miles to McCabe's Lake, the first mile and a quarter at 59 feet per mile, and the remainder varying from ten to forty-five feet per mile: the curvatures easy; then we have two miles and a quarter along McCabe's and Webber's Lakes level, with the exception of about a quarter of a mile between the Lakes, which descends at 40 feet per mile.

At Webber's Lake commences a rapid descent towards Sackville, averaging 76 feet per mile, for two miles and a quarter. This section will require some heavy works, and will be the most expensive in the line.

It is very desirable that this grade be reduced to the same descent as the maximum on the northern side of the mountain—60 feet per mile. There is a probability that this may be done by carrying a line along the eastern side of the valley, crossing the stream at the thirty-seven mile mark upon a high viaduct, and coming out to the present line about half a mile above Sackville bridge. No surveys have been made with reference to this object, but this ground ought to be carefully examined.

From the foot of this grade to Sackville, the bottom of the valley is open, and offers no obstacle to be particularly noticed.

From Sackville to Halifax the line follows the edge of Bedford Basin, cutting occasionally across the small coves. This section has not been found so expensive as it was anticipated. The formation of the coast is such as to admit of a line nearly along the margin of the water, at curvatures which are not greater than are considered admissible on most of the American Roads.

**GRADES.**—With respect to the grades of this road, a glance at the section will show that it cannot be compared with roads in more level countries. It has been found, however, that steepness of grade has not affected the cost of transportation to so great a degree as was formerly supposed. It is the mere running expense of the locomotive only that is increased by the increase of grade, and this bears but a small proportion to the whole.

By adapting the weight of engine to the gradients, nearly the whole increase of expense will be in increased quantity of fuel. This, in the Massachusetts roads, ranges between one fourth and one fifth of the whole working expense.

It appears from a careful perusal of the various reports, that the cost of transportation is governed more by other circumstances than by the mere state of the gradients. That this is the case will appear from the following statement of the cost per ton per mile for transportation of freight extracted from the first Annual Report of the Baltimore and Ohio Rail Road:

Name of Road	Steepest Grades.	Cost pr. Ton per mi <sup>ts</sup> .	Fass'grs. pr. mile.
		Cents	Cents.
Boston and Lowell.	10 feet	1.538	1.450
Boston and Providence.	per mile		
Boston and Worcester.	37½ "	2.181	1.529
Eastern Railroad.	30 "	1.728	1.284
Western Railroad.	40 "	2.644	.833
Georgia Railroad.	83 "	1.334	1.419
Baltimore and Ohio.	60 "	1.670	2.050
		1.652	.922

Here we see that the cost on the Western Railroad, with its heavy grades, and which surmounts a ridge of country nearly 1450 feet high, is less than on the Boston and Lowell, which is nearly level. I am not in possession of sufficient data to be able to point out fully the reason of this—neither would this be a proper place to go into an investigation of the subject, but the fact that freight is carried on the Western at the above rates, on grades of 78 feet, may satisfy us that such grades are not very exceptionable. No. 1 is a section of the Western Road, and of the Halifax and Windsor Road on the same scale with the heights and grades marked upon them, and by which a comparison may be instituted.

**Curvatures.** The curves on this line are numerous, but not so abrupt as, from the nature of the country, was to be apprehended. The shortest curvature is at Canovan's Point, the radius 800 feet, and passenger trains will have to slacken speed in passing over it, but as it is nearly on a level, this can be easily done.—There are several curves from one thousand to fifteen hundred feet radius, but they are all of them on a level, except one of fifteen hundred feet near Dymock's Mill. The curves on the steep grades have radii of three to six thousand feet, and will admit of rapid motion upon them, nearly as well as a straight line. That such curves as occur in the Halifax and Windsor route are not impracticable will appear from this, that out of about twenty roads in

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Massachusetts, eleven have curves whose radii are occasionally from five to eleven hundred feet, although such small radii are considered objectionable, except near stopping places, where the speed would not be great.

On the Halifax and Windsor route, although the table of curvatures exhibit a great length of curved route, all the larger curves may be considered as virtually straight lines. On the Boston and Worcester Railroad, there is a curve of about 2200 feet radius, which is passed daily by trains running between twenty and thirty miles an hour with perfect safety, and without slackening speed.

*Mode of performing the Work.* As respects the ultimate completion, this question is easily answered: there is no doubt that it should be governed by the same rules as govern road-making of any other kind—making due allowance for difference of use. If we put a few inches of gravel or broken stones upon the ground, it will answer very well for common carriages, but if we want a road to bear the action of carriages of 20 tons weight, moving at great velocity, we must have a road of strength proportionate to the stress. Another subject to be attended to in these northern latitudes, is the liability to heave with the frost. In the first American roads those matters were not sufficiently attended to: experience, however, has shown that a perfect foundation is absolutely necessary, but the most proper time for establishing this must depend upon the command which may be had of materials in any given locality. The more common plan, after establishing a good drainage, is to dig out a trench of a proper width for a roadway, and fill up with stone or gravel, which should go below the heaving action of the frost. This foundation requires a good deal of attention to keep the supports of the rails at a proper height: whether the expense exceed or fall short of the interest of the sum required for a more permanent structure, is uncertain; it must depend mainly on the means of obtaining the proper materials in any locality.

The Romans, in their road-making, built a rock of concrete and flags in alternate layers, and their roads have proved indestructible. Possibly the expense may be too great for imitation, but the line from Halifax to Windsor offers a fair field for the experiment, the materials are immediately on the spot. The estimates, however, are predicated upon the usual plan, leaving the consideration of the more perfect plan to some future time.

*Superstructure.*—This includes the rails and their immediate supports. The whole history of Railroads, so far as this subject is concerned, is to be considered in some measure as a series of experiments.

On the first English Roads, Iron rails were fastened upon square stone blocks imbedded in gravel; on some of the more modern roads longitudinal timbers have been substituted. On the American roads a great variety of

plans have been tried and abandoned, but that which is generally acted upon at the north, is the use of the II rail, about 56 pounds per yard laid upon cross pieces of timber imbedded in the surface of the road at from 2½ to 3 feet from centre to centre. This keeps the road effectually in gauge, although the cross sleepers require, as already observed, frequent re-adjustment in height.

The first rails, upon the II. plan were about 40 pounds per yard, but were found too light, and were replaced with the rails of 56 to 60 lbs. On all the roads in Massachusetts, eighteen in number, the returns of which were made to the Legislature in 1847, thirteen had rails of 56 pounds per yard, and the remaining five ranged from 54 to 64, except the 'Western,' on a part of which they ranged as high as 70 lbs. We may therefore take 56 lbs. as the weight that has been generally settled upon in Massachusetts, after an experience of 15 years. I have not been able to learn whether they have tried the continuous bearings similar to the Great Western and other roads of the kind in England. It would be proper before determining upon any definite plan for Nova Scotia, to ascertain the effect of both descriptions of roads.

*Weight of Engine.*—Closely connected with the weight of rail is the weight of engine, or rather they are correlatives, the weight of engine being that which governs the weight of rail. On the earlier roads the engines were light, generally about eight tons—never exceeding ten tons. These engines answered pretty well under ordinary circumstances, but occasionally contingencies arose in which the want of greater power was much felt. Gradually the engines have been enlarged, until at the present day they range ordinarily from 12 to 23 tons. The advantages of heavy engines are said to be—

1st. That while they cost no more for train-hands, they take, under ordinary circumstances, heavier loads, and in emergencies, such as snow, frost, &c. on the rails, are still equal to the business required.

2d. That the fuel required to draw a light load with a heavy engine is but a little greater than that required to draw the same load with a light engine—the difference being only that required to move the extra weight of the engine and tender.

3d. That the parts of a heavy engine being more massive, and being but seldom drawn upon to their full strength, are not so liable to get out of order, and therefore they cost less for repairs.

4th. That with light engines going fully loaded, whenever any emergency happens, the only remedy is to put on more engines, the hands of which must be kept in pay whether there is work for them or not; whereas, with heavy engines going ordinarily lightly loaded, there is always a surplus power immediately at command by merely applying a little fuel.

The disadvantages are that the first cost is somewhat greater, and they require heavier rails. The question is merely one of economy, and it has been settled by an experience of fifteen years in favor of heavy engines.

#### CONDUCTING OF THE WORK.

I would recommend that the work be divided into yearly sections. The first section may extend from Beddoes road to Sackville—fifteen and a half miles. It is estimated at forty-one thousand pounds for grading, and thirty-one thousand pounds for superstructure—making seventy-two thousand pounds in the whole. This will require for grading about one hundred and sixty-four thousand days' work of men and horses, and, allowing two hundred and seventy working days in a year, the number of men and horses required will be about six hundred—say five hundred and fifty men and fifty horses, or, which is equivalent, one hundred and sixty men throughout the year, and twelve hundred men for four months in winter. It will also require about one hundred and seventy men during the summer, to lay the superstructure. This section may be finished in November, 1850, and would be immediately used for bringing ship timber and various kinds of lumber and timber to Sackville, and would also be useful in the transportation of materials for the remainder of the road.

The next section might run from Beddoes Road to Newport Road, sixteen and a half miles. The estimate for grading is about sixty thousand pounds, to which add thirty-three thousand pounds for superstructure, gives ninety-three thousand pounds. The grading will require two hundred and fifty thousand days work, which, at the same proportion for their winter and summer labour will require two hundred and forty men throughout the year, and eighteen hundred men extra in the four winter month, with a proportionate number of horses—also, about one hundred and eighty men in the summer, for laying the superstructure, which would be completed in Autumn of 1851. This would let in ship timber and lumber from both sides of the Ardoise Hill, and probably lime, plaister, hay, and farm produce from Newport and Rawdon.

The third section may reach from Newport road to Windsor, and from Sackville to Halifax. The grading and bridging will come to about fifty thousand pounds, which at the same calculation as above, will require two hundred thousand days work of men and horses; but as this work will be in exposed situations, we may suppose it pretty evenly spread over the year. This section, including the superstructure, will require about eight hundred men and a proportionate number of horses. In the Spring of 1852 the part from Newport road to the St. Croix may be finished.

By following this course there would be six months for preliminaries and surveys, and three years for building the road. This is as short a time as the work can possibly be done

in without great injury to other interests, and most probably to that of stockholders themselves.

In the building of all the American Rail Roads which I have been able to get an account of a considerable time has been consumed.

For the Boston and Lowell Rail Road the Act of incorporation was passed in June, 1830. The construction commenced in 1831, and the Road was opened in the Spring of 1836, making altogether between five and six years. The length of the road twenty-five miles.

The Boston and Providence Rail Road received its charter in June, 1831, and the surveys were commenced in July of the same year. In December, 1832 the work was commenced. In June, 1834, twelve miles were opened, and in June, 1835, the road was opened throughout—making four years in the whole. The length of the road is forty-seven miles.

For the Boston and Worcester Rail Road, the first surveys were made in the summer of 1831. In April, 1833, the grading was going on in several places and nine miles opened; and the whole was opened about the end of 1835, being about four years and a half. The length of the road forty-four and a half miles.

The Western Rail Road is a continuation of the Boston and Worcester Rail Road to Albany, about one hundred and fifty-six miles. It was intended to draw a part of the trade of the West through Boston: had a loan of four millions of dollars from the State and one million from the corporation of Albany, and was besides pushed forward by the wealthy capitalists of Boston. There was therefore no want of funds. The Company for constructing this road was formed in 1835, in 1839 it had been carried to Connecticut river—about fifty-four miles—and it was finished in the Autumn of 1842, about seven years from the commencement of the surveys.

The Boston and Maine Railroad, seventy three miles, was eight years. The Eastern, forty-one miles, five years. And the Nashua and Lowell, fourteen miles, four years in building. The time required for constructing these roads shows that three years is the very least that ought to be applied in the construction of the Halifax and Windsor road. Indeed, it is probable that four or even five years will prove more in accordance with the supply of labour that can be spared from other avocations. By taking a considerable time in the construction of the road, it can be easily done by the means already existing in the country, and without abstracting the labour from other interests. There is a large body of labouring men out of employment from the middle of October to the middle of April each year. At the very least, one third of the men and horses in the agricultural districts, might, during three months, be employed on roads, without diminishing the ne-

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ecessary labour upon the farms; and there is no doubt that a large portion of this class of persons would readily accept of employment on the Railroad; and probably a considerable quantity of the stock might be disposed of in this way. There is another reason in favor of winter work that does not usually apply to Railroads. On this road there is about one hundred and sixty thousand cubic yards of rock excavation at an estimated cost of upwards of sixty thousand pounds. Common labourers are not efficient at this kind of work, but the plaister quarry men are good miners, and in winter are mostly out of employment. In the County of Hants is a large body of men who either follow the business of quarrying plaister at present, or have been accustomed to it at some former time. If this rock cutting is confined to the summer, it must be done at such a price as will induce these men to leave their quarries and farms, or at an expense equally great by labourers unaccustomed to the work. Whereas, in winter the price would come nearly to the level of that of other work. That this work can be done in the dead seasons of the year, is certain—experiments have been made in this Province on a small scale, which prove it. In such reports as I have been able to procure, respecting the Massachusetts roads, there is no intimation of the work being stopped by the winter. Just now, large quantities of earth are being removed into Boston, for filling up low ground; and in Vermont, a colder country than Nova Scotia, there were a great number of men employed upon Railroads last winter, and I believe they are at work this winter—though of this I have no positive information.

This may serve partly to explain the fact of the rapid increase of railroads in Massachusetts. That State, containing about eight hundred thousand inhabitants, had from 1830 to 1848, expended in the construction of railroads, about thirty five millions of dollars, and this immense amount of labour has been paid for without foreign assistance, and without neglecting any other interests. But great as it is in the aggregate, when spread over 18 years, and divided among the population it appears a very light burden. Massachusetts is as poor, if not a poorer territory than Nova Scotia, but by judicious combination the inhabitants have done more than those of any other State in the Union. That they have derived great benefits from their railroads, may be inferred from the fact that these works are steadily upon the increase. In 1846 the State Legislature chartered eighteen; in 1847, sixteen; and in 1848, nineteen railroads and branches, with an aggregate capital of fourteen millions and a half of dollars, and this in addition to eight hundred and eighty miles of railroad already made. When this is compared with the tardy rate at which railroads advanced from 1830 to 1840, it shows not only an increased confidence in the value of them but in the available resources of the country.

## SUMMARY OF CURVES AND STRAIGHT LINES

Number of Curves	Length of Curve of same Deflection in miles.	Radii in Feet.	Deflection in Degrees.	Total Deflection in Degrees.
1	.3375	800	127.63	
1	.2687	1,000	81.38	
1	.2375	1,250	57.45	
7	2.2187	1,500	441.7	
2	.8250	1,600	156.	
5	2.4375	2,000	368.7	
9	3.6562	2,500	431.	
8	5.6814	3,000	573.5	
5	2.3187	3,500	200.	
4	2.6937	4,000	203.74	
3	1.3375	4,500	90.	
5	2.9875	5,000	180.75	
14	6.0250	5,500	331.33	
3	.7750	6,000	29.	3281.65
68	31.7999	Curved Line.		
	14.9875	Straight Line.		
	46.7874	Total.		

## TABLE OF GRADES.

Dis- tance.	Inclina- tion per mile.	Ascent.	Descent.	Total As- cent and Descent.
Miles.	Feet.	Feet.	Feet.	Feet.
17.825	Level.			
3.195	0 to 10	3.00	18.30	21.30
4.337	10 to 15	39.17	15.95	55.12
3.575	15 to 20	23.95	43.55	67.50
3.600	20 to 30	82.50	62.60	145.10
2.975	30 to 40	53.45	52.28	105.73
1.980	40 to 50	66.26	19.40	85.66
5.200	50 to 61	210.92	90.93	301.85
2.100	61 to 85	—	164.25	164.25
46.787		479.25	467.26	946.51

## ESTIMATE

## ROAD BED.

Embankment, 1,047,500 yards, at an average of 1s. 3 <sup>1</sup> / <sub>2</sub> d.	£67,581	2
Rock Ex'vation, 140,000 yards, average 7s,	61,195	0
Dry Masonry, for Bridges and Culverts, 28,800 yards,	10,566	16
Protection Walls, Dry Masonry, 15,000 yds.	3,390	0
Superstructure of B'dgs. over roads and small rivers,	4,942	5
Catch Drains,	254	17
	£147,930	
St. Croix and River Herbert Bridges,	48,000	0
Draw Bridges at Winkworth Creek and Nine Mile House,	900	0

Cob-work in Coxcomb Lake,	4,000	0
Alteration of main road in various places,	600	0
Fencing,	3,380	0

**SUPERSTRUCTURE.**

Iron Rails, 88 tons, (55lb per yard) delivered in Halifax @ £13 15,	£1,210	0
600 est. iron chairs (15lb)	60	0
10,000 spikes, ½lb ea. 3d.	62	10
Freight of iron to the Road,	120	0
2,100 kyanized Sleepers of Spruce or Hemlock @ 1s. 3d.	131	5
Ballasting the Track @ 20s. per rod,	320	0
Laying, say,	56	5
For one mile	2,000	0
For 50 miles, including tumouts,		100,000

*Estimate for Road Furniture furnished by Mr. Chesbrough.*

**ENGINES AND CARS.**

8 Locomotives @ £1,875,	£15,000
8 First Class Passenger Cars, @ £500	4,000
2 Second do. do. @ £312 10s.	625
48 Freight Cars @ £168 15s.	8,100
20 Gravel do. @ £66 15s.	1,325
4 Snow ploughs, @ £125	500
5 Hand Cars, with tools for road repairs @ £90,	450

30,000

**DEPÔTS AND OTHER FIXTURES.**

1 Passenger House at Halifax,	£ 750
1 Freight do. do.	1,250
1 Car do. do.	375
1 Engine do., including Repair shop and tools,	1,125
2 Wood Sheds, do.	125
1 Turn Table, do.	375
2 Trucks, do.	250

4,250

Same as above at Windsor, except Repair Shop,	
3 Passenger and Freight houses at way stations,	£1,500
3 Wood Sheds at do.	250
1 Tank and Boiler at Middle Station,	300
4 Small intermediate stations,	325

3,625

£40,250

**SUMMARY.**

Grading,	£147,930
Bridges, &c.	16,880
Superstructure,	100,000
Road Furniture,	40,250
Land Damages, suppose	5,000
Engineering, Management, and Contingencies	20,000

16,880

Total, £330,060

The above estimate is made upon the supposition of a rise of labourers' wages to the amount of nearly twenty per cent. Whether any such rise will take place, will depend much upon the manner in which the work shall be conducted. If the price of labour should remain as it is at present the estimate may be reduced on this account by about £30,000.

The Bridges are calculated to be of the best timber, kyanized and secured from the weather. They may be built equally strong in the common way for two thirds of the estimate, but would be more exposed to accidents from fire, and not half so durable. There is also an objection to frequent renewals on a railroad, on account of the interruption to the business.

The St. Croix and river Hebert Bridges are calculated for stone piers and abutments, with superstructures protected from the weather. They may be built with wooden abutments, and strong rough superstructures, for about two thirds of this estimate.

The Bridge and Road masonry may be omitted to the amount of one half the estimate, and wood substituted. The masonry may be built up before the decay of the wood—say within ten years. This would not interfere with the working of the road.

Several of the high embankments may have bridges or trestle work of timber substituted, and be filled with earth at leisure. The objection to this is the exposure to fire, and the inconvenience in case of an accident, which would render it necessary to take a car out of the train.

The amount of these savings would be :  
 On the small bridges, &c.....£1700  
 St. Croix and River Hebert } 3000  
 Bridges, }  
 Masonry .....5000  
 Embankments.....7300

£17,000

These reductions are to be considered merely as a temporary expedient to get the road in working condition under a temporary want of funds. On the earlier American roads the practice of making temporary work was carried to a great length, but it was found inconvenient, as well as expensive, in the end, and the more common feeling at present is, if possible, to make a permanent structure at the first.

The measurements upon which the estimate is founded are of course to be taken only as

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an approximation to the truth, but the calculations are so made that on the final location of the line I do not think the quantities estimated upon need be exceeded, except in the case of the alteration of line proposed in the Sackville valley, which, if adopted, would require a new survey.

**SOURCES OF INCOME.**

**PRESENT TRAVEL AND TRAFFIC.**

By Mr. Sentell's returns of traffic and travelling, taken at the Nine mile house, the number of passengers going into Halifax were, for nine and a half months,

In Carriages .....	11,072
Horsemen .....	469
In Coaches .....	2,245
Foot passengers.....	1,337
With waggons.....	4,328

The first item of the above probably includes the small market waggons, one-fifth of which may be considered as from the Eastern roads. The second, third, and fourth items may be considered as nearly all belonging to the Western road. The last may be considered as superseded by the freighting department of the railroad.

We have then for passages :

First item, four-fifths of 11,072.....	8,872
Second.....	469
Third.....	2,245
Fourth.....	1,377
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	12,963

Add the proportion for 2½ months, 3,411

Same out of Do. Do. 16,374

32,748

By the same returns the freight was, from Halifax :

	TONS.
Merchandise .....	1258
Flour .....	550
Fish .....	30
Luggage .....	16
Miscellaneous.....	100
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	1,954

Towards Halifax :

Hay .....	1438
Meat .....	1031
Apples, Potatoes, Vegetables, Oats, Barrels, Timber, &c. }	1000 3469
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	5423

Add the proportion for 2½ months, 1427

Gives for the year, 6350

The heavy Eastern freights pass nearly all by Dartmouth—a reduction of five hundred tons will probably be quite sufficient to make for that part of the traffic, leaving for Western freight 6350 tons.

The returns of Cattle give 3128 oxen and cows, and 7468 sheep in the nine and a half months, from the first of June to the middle of February. The number of cattle during the remaining two and a half months cannot be taken proportional to the time, probably five hundred will be a fair allowance, making 3628. Suppose the cattle from the eastward be nearly or about one-half of the whole number, we may, without much danger of error, allow for the Western road 2000 head. The number of sheep will be augmented very little in the Spring months, and making due allowance for those driven from the Eastward, we may suppose the number coming from the Westward about 4000.

Summing up these items, we get :

32,748 passengers, @ 5s.	£8,187 0
6,850 tons freight, @ 15s.	5,137 10
2,000 cattle, @ 5s.	500 0
4,000 sheep, @ 9d.	150 0
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	£13,974 10

This is the amount derivable from the present traffic. It remains now to examine into the probable income that will be created by the road itself.

*Way Travelling.* This is a head of income very difficult to judge of. It must always depend on the amount of population along the line. In nearly every instance on railroads in the Northern States, it has greatly exceeded the anticipations of the projectors. In the official reports of the Massachusetts's Railroad Directors to the Legislature, the numbers of the way passengers are not separately given, but by dividing the number of passengers carried one mile by the length of the road, we get the equivalent number of through passages, which compared with the number of passengers actually carried, gives a tolerable idea of the way travelling. In 1847, the actual number carried compared with the number of passages that the aggregate miles travelled were equal to, were on the following roads :

	Actual Passengers.	Equivalent through Passages.
Boston and Maine,	728,307	172,600
Boston & Providence,	487,478	175,525
Boston & Worcester,	598,305	321,793
Western,	388,111	114,530
Connecticut River,	237,215	65,554
Eastern,	892,896	33,570
Fall River,	173,134	77,000
Fitchburg,	494,035	160,000
N. Bedford & Taunton,	97,936	81,380

As the average distance of the way passages is not given, they cannot be separated from the through passages on the above roads but it may fairly be inferred that they amount to a very large proportion of the whole number. We cannot compare some of these roads with the Halifax and Windsor, because of dissimilarity of circumstances ; but there are others that can be so compared. The New

Bedford and Taunton, for instance, is only twenty miles in length, running through a sparsely settled country, and there the way travelling is about two-sevenths of the whole. The Boston and Worcester is forty miles in length, and runs through a country indifferently settled. It is the thoroughfare for business travellers from the west, and making due allowance for this class, who are always through passengers, and comparing the remainder, at least three fourths of the local passages must be way travel.

But perhaps as good a way as any to examine this question is to compare the number of passages and the money paid for them with the whole population. In 1847, the population of the State was about 830,000, and the number of passages on all the railroads five million two hundred and fifty five thousand six hundred and ninety, giving an average of six and one-third passages for each individual. In the same year the money paid for passages amounted to two million seven hundred and twenty thousand one hundred and thirty six dollars, being an average of three dollars and twenty eight cents for each individual.

No doubt a small part of this travel, is by business people from other States, but on the other hand there are large portions of the State without the benefit of railroads.

It is evident from the fifty new railroads and branches which have been chartered in the last three years, that the people in the State do not think themselves as yet fully accommodated.

Mr. Jervis, Chief Engineer of the Hudson River Railroad in his report of June last, after giving the statistics of the Massachusetts roads says—"It may be enquired what is the cause of this extraordinary amount of travelling. Probably the active habits of intercourse among these people. But what has caused this habit? It does not appear to have existed to any considerable degree prior to the construction of these railroads. When the Worcester, Lowell, and Providence Railroads, (three of those in the table) were projected or in course of construction, the friends and promoters of those roads, after carefully investigating the subject of travelling at that time, and after making allowance for the probable increase that would be realized by opening these new facilities for the public accommodation, estimated the annual number of passengers that would be carried on the three roads, at one hundred and forty-one thousand four hundred and forty, which is less than one-eleventh of the number actually carried the past year. The actual number carried before the Railroads were constructed, could not have been more than one-twentieth of the number in the table. The travelling habit has therefore been substantially created by the facilities Railroads have afforded."

"In 1839, a committee of the Massachusetts Legislature having the subject of Railroads under consideration, remark—"On every railway yet opened the actual transportation has

far exceeded the recorded estimates formed on that existing in any period previous to their construction, and has been constantly increasing."

That Mr. Jervis is right in his opinion that the travelling habit has been created by the Railroads, will appear by appendix A, which shows that the increase of travelling has been immeasurably beyond the increase of population; but even on the roads which have been a considerable time in use, and on which it might be supposed the travelling had become uniform, there is still an increase. By comparing the number of passages in 1846 and 1847, the increase of the following roads was as under:—

Name of Road.	Time in use up to 1846.	Increase per cent.
Boston and Lowell,	10 years.	21
Boston and Providence,	12 "	2½
Boston and Worcester,	12 "	27
Western,	6 "	46
Eastern,	7 "	13½
New Bedford and Taunton,	7 "	4
Nashua and Lowell,	7 "	17½
Boston and Maine,	4 "	58
Old Colony,	1 "	83

Here it may be remarked that the "Boston and Providence" and "New Bedford and Taunton" are nearly stationary. The first depends, in a measure, upon the New York travelling, a part of which has been drawn off by a rival line, and the second appears to have attained its full amount of business; but when we come to the "Worcester," we observe, in the twelfth year of its existence, an increase of twenty-seven per cent. The Western road is the avenue of communication between Boston and the West, and crosses a good deal of barren mountainous country. It might be supposed that the business travel upon that road would increase but little after the third or fourth year, and yet, in the seventh year of its existence, the number of passages increase no less than forty six per cent. Similar observations will apply to the Eastern, and Boston and Maine roads. These are rival lines, running from Boston towards Maine, and taking, in their way, a number of small towns and villages. The former of these, in its eighth year, has increased thirteen and a half per cent, and the latter, in its fifth year, fifty-eight per cent.\*

\* Since the above was written the Annual Report for 1849 has come to hand, by which it appears that the ratio of increase in 1848 was, for the

	Per Cent.
Boston and Lowell Road.....	8½
Boston and Providence.....	16½
Boston and Worcester.....	35
Western.....	4½
Eastern.....	14
Nashua and Lowell.....	13
Boston and Maine.....	45
Old Colony.....	41

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Nothing can show more plainly than these examples the gradual formation of new social habits among the 'people' by the influence of Railroads. It is not difficult to account for this ; when the roads are rough, and with the common conveyances, people do not ordinarily move to any considerable distance without some imperious necessity, and the social intercourse of family with family is confined within narrow limits. But give them a Railroad by which, at a trivial expense, they can travel at a rapid rate, in a moving palace, protected from the weather, and warmed in winter, and it may be easily conceived that the circle of friendly intercourse will increase in proportion to the means of gratification. One evidence of this is the great number of females that travel on the American roads. Of the influence of Railroads in creating travelling, we have an example at Pictou. The distance from the Albion mines to New Glasgow is less than three miles, and yet almost every coal train carries a greater or less number of passengers. Nobody seems to think of walking, who can get along with the train. It is not improbable that the passages in these trains bear quite as great a ratio to the population as in any part of New England.

In applying the foregoing facts and reasonings to the Halifax and Windsor line, there is one circumstance that it would be unfair to omit noticing. The population is principally concentrated at or near the extremities of the line, the intermediate country not admitting of a dense population; still a very considerable amount of way travelling may be expected.—Sackville will undoubtedly grow into a respectable village; the valley of the Sackville River, contains a strip of very good land, throughout nearly the whole length that will speedily be filled up with inhabitants; and the Ardoise Hill contains a great deal of good land, that would soon be occupied. All these people would depend immediately upon the road, not only for their intercourses with the capital and with Windsor, but with each other. When we go to the northward of Ardoise Hill, we find a considerable population, which, in all probability would under the influence of a Railroad, be trebled in density in a few years.—The valley of the Meander would become thickly settled, and villages would also grow up at Newport Road, and probably at Mantua. Taking the population at Windsor and Falmouth, at two thousand, and the population East of the St. Croix, at two thousand more, and allowing them to contribute at the same rate per head as in Massachusetts, the income from the way passengers, in this quarter, would be three thousand pounds per year. But it is not to be supposed that the road if carried to Windsor, will stop there. It is only twenty-five miles further to Cornwallis, and its course would be through the midst of a wealthy population of eminently social habits, and the intercourse that would grow up between the settlements in Hants and Kings, may be expected to be very great. There

would be at least ten thousand people within the immediate influence of the Railroad.

We may form some opinion as to the amount of this intercourse, from the following account of passages over the Avon Bridge, at Windsor, in the year ending December 1st, 1845, which is taken from the toll keeper's return :

22,865 persons,
6,008 single horse conveyances,
679 two " "
477 three " "
346 four " "
1,198 head of cattle,
401 sheep and calves.

It is proper to remark that there is another Bridge about five miles further up the River, which is not subject to toll, and over which there is a large amount of travel. The first two items of the above return manifestly consists mainly of the intercourse between the townships on either side of the Avon River, and by supposing it to increase in the ratio which has been usual in Massachusetts, four to ten fold, it would of itself make a very fair item of income. Were a Railroad made from Windsor to Kentville, it is probable that the local business and travel would support it.

This, though not bearing immediately and fully upon the question of traffic and travelling on the Halifax and Windsor road, seems yet a fair subject of collateral enquiry, on account of its prospective effects upon the income of this road. There would be then a direct intercourse by Rail between the capital and the most fertile and wealthy townships of the interior, and the increase of travel to and from the capital, and which would contribute to the income of the latter road, would undoubtedly be very great. The further increase of travel that may be calculated upon with considerable confidence, is as follows :—The first effect of a Railroad would be to create ship-building establishments at Sackville, as well as a village of wealthy persons, who would retire from the City. Suppose one hundred and fifty families drawn to Sackville and the valley of Sackville River—from various causes their passages and freightage will be probably one thousand pounds. For the inhabitants along the Basin, and at Hammond Plains, we may put down one hundred pounds. Passengers from the city for pleasure, will constitute a large item. Great numbers of persons now make excursions to Sackville at seven shillings and six pence to ten shillings a piece. If the cost was reduced to one third of the sum, and the comfort at the same time increased by the accommodation of a Railroad train, there is reason to believe, that travelling of this description would increase ten fold. Besides, near two hundred persons go weekly to Sackville in the Steamer, during the Summer, the whole of which would go by the road. If we put this item at five thousand pounds, it will not be likely to prove an over estimate—it will only average about five shillings apiece on all the inhabitants of the city, whereas the statistics of the Massachusetts roads, show that

the payments of people for railroad travelling, is above three dollars a piece for the average of the whole state. At this rate, the proportion of Halifax would be fifteen thousand pounds. There is another source for travelling that we have yet to consider. The North side of Minas Basin, comprising Londonderry and Parrsboro', with the settlement on the Mucan River and Amherst, have but little intercourse with Halifax, on account of distance and other difficulties. If by a proper establishment of water craft, by steam or otherwise, these people could be accommodated with passages to Halifax from the shore of the Basin, at a low rate, a large intercourse might soon be established. From Amherst to Parrsboro', the distance is thirty-nine miles over a good level road, and this road running along the valley of the Macan, passes through a flourishing settlement nearly its whole length. The distance from Parrsboro' to Windsor is thirty miles, about three hours for an ordinary steamer—thence to Halifax by rail two hours and a half. If this distance can be run over for two or two and a half dollars, a considerable accession of travelling and business may be anticipated. Income from this source is uncertain, but suppose to begin with, £200.

Summing up these, we get :

For passages between Ardoise Hill and Newport on the one side, and Windsor and Falmouth on the other,	£3,000
Sackville and the vale of Sackville River, and along the Basin,	1,100
Pleasure Travelling from the City,	5,000
From the North side of Basin of Minas,	200
	£9,300

There remains yet to be considered the probable income from sources of traffic not open by the present mode of conveyance.

A glance at a map will show that a railroad between Halifax and Windsor is, as it were, a canal to unite the Bay of Fundy with the Atlantic—admitting of as cheap a transit, and open in all seasons of the year. Whatever additional traffic may be thereby created, will go to swell the income of the road. These additional sources may be nearly as follows :—

**Potatoes.**—The freight of potatoes from the Basin of Minas to Halifax, is six-pence per bushel, and the insurance and deterioration on board the vessel, not less than one shilling more; making the expense to Halifax one shilling and six-pence per bushel. Were the Railroad completed, a class of small traders would spring up, who would bring them to Windsor in large boats, and put them upon the road for about two-pence per bushel, and three-pence more would pay freight to Halifax, making with other charges about eight-pence.—This would bring all the roots, apples, &c., from Hants and Kings, and part of Colchester by the Railroad, and would give those counties nearly a monopoly of the supply. If we estimate the supply of root crops, apples, &c., at one hundred and twenty thousand bushels,

the weight at forty bushels per ton, will be four thousand tons, which at ten shillings, = £2,000.

**Cider.**—The freight and insurance by sea from Cornwallis and Horton, is about three shillings per barrel. Allowing eight barrels to the ton, and nine-pence per barrel for freight in boats to Windsor, the freight thence to Halifax would be one shilling and seven-pence, making in the whole two shillings and four-pence per barrel. This would bring all the articles of this nature upon the road, suppose one thousand barrels, equal to one hundred and twenty-five tons, = £78.

**Fish.**—All around the Basin of Minas may be caught large quantities of the Digby Herrings. They were currently sold in the summer of 1846 in Londonderry for 1s per bushel. A few are now smoked and exported, but were a cheap communication opened with Halifax this business would doubtless become considerable. It is impossible to estimate the amount of income from it to the Road; but suppose, for fish and other returns—travelling in connexion therewith, &c., about £100. Besides this, the Shad from the Basin of Minas being a fish much prized, would probably, a large portion of them, be brought to Halifax. Also, a great quantity of fresh fish of other kinds would be carried from Halifax to the country. Freight from these sources, say £100.

**Ship Building at Sackville.**—There is a great quantity of good Ship Timber on the Ardoise Mountain, and on the range of country between the Windsor and Beaver Bank roads, which could be brought to the road and worked up at Sackville, where there is an excellent site for a ship yard immediately along side of the Railroad. The freight upon the timber will amount to about five shillings per ton of shipping. Suppose two thousand tons to be built annually, it will give for freight £500.

**Lumbering in Hants and Colchester.**—A considerable part of the lumber that is taken to St. John's from both sides of the Basin of Minas, will be brought to Halifax. The freight of deals to St. John is about two pounds per thousand; by the boat to Windsor, and thence by rail to Halifax about two pounds ten shillings; but Halifax is the best market and nearer to England, which would give it a preponderance. A considerable quantity would be required for loading new ships. Suppose five hundred thousand of deals at thirty-five shillings, £875. Besides this it is not unlikely that Halifax may be established as the general shipping port for the deals made around the Basin of Minas. The freight to Halifax will cost ten shillings per thousand more than to St. John's, but the freight and insurance from Halifax to England would probably be fifteen shillings less, leaving a small preponderance in favour of the Halifax trade. This trade is too uncertain to calculate much upon at present—but suppose £500.

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*Cord Wood.*—The smaller hard wood trees and the tops of those used for ship timber, would be converted into cord wood for the Halifax market; suppose one thousand cords at eight shillings per cord, £400.

*Wharf Logs and Timber* from various points on the line between Ardoise Hill and Sackville, not easily estimated, suppose £200.

*Boards, Scantling, Staves, Hoops, &c. &c.*, from the borders of Minas Basin, say £300.

Also a considerable share, if not the whole, of the traffic between Truro, Onslow, Parrsboro, and even Amherst, with Halifax, will be carried on by water across the Basin to Windsor, and thence to Halifax by the Road. By means of Boats upon the Basin, this can be done more cheaply than by the Eastern road. The freight by land from Truro to Halifax is about two shillings and sixpence per cwt, and from Halifax to Truro about the same, or two pounds ten shillings per ton each way. From the townships northerly of Truro it is greater. The freight by the Railroad and boat may be set down at twenty shillings.—This saving would determine the greater part of this freight by Windsor. The amount of this cannot be ascertained; suppose, with return freights three thousand tons, at fifteen shillings per ton, £2,250.

There is a large quantity of goods sent by sea to Cornwallis, Horton, &c. in return vessels. The trade in potatoes, &c. being done by the road, the goods would be returned by the same; suppose four hundred tons, £300.

*Trade of New Brunswick.*—It is probable that a considerable quantity of dry goods and fine cutlery, for the New Brunswick market, would come to Halifax by the Mail Steamer, and be passed on to New Brunswick by Windsor. The quantity is uncertain, suppose for freight, £100.

*Lime.*—The valley of the Meander, abounds in limestone of excellent quality, also, materials for casks, water-power for making them with, and wood for burning the lime. It is probable that the greater part of the Supply of Halifax, will be derived from this source—suppose fifteen hundred hogsheads at five shillings per hogshead, £375.

*Brick.*—Along the valley of the Meander, and in the vicinity, there is abundance of materials. They can be made at a price that will bear freight to Halifax—suppose one hundred thousand at twelve and six-pence per thousand, £62 10s.

*Plaster of Paris.*—The plaster on the Meander is of the best quality, and brings the highest prices in the American market. At present vessels returning to the United States, often have to purchase ballast at one shilling and nine-pence to two shillings per ton, and it probably costs them six-pence additional to get rid of it at the next port. Plaster at present prices can be put into Cars on the Rail-

road, at two shillings per ton, and allowing six shillings and six-pence per ton for freight, it can be shipped in Halifax for eight shillings and six-pence per ton. At this price, vessels bound to New York, or to the southward of that port, may be expected to make up full cargoes with plaster—suppose one thousand tons shipped in this way, £250.

*Calcined Plaster.*—For making calcined plaster, the line of railroad offers greater facilities than any other situation in the Province. Water-power for grinding the plaster, and making casks, and fuel for calcination is abundant. It is probable there might be a considerable export of it to the West Indies, and elsewhere—freight say, £100.

*Flag Stones.*—On the Parrsboro Shore there are to be obtained flag stones among the best in the Province. They are a fine grained sand stone, work freely, and stand the weather. They can be quarried and brought by the return plaster vessels to Windsor for seven shillings and sixpence per ton, and seven shillings and sixpence more would bring them to Halifax. At this price they would be put to a great variety of uses. Freight, say £100.

One advantage derived to the road from a traffic in plaster, lime stone, &c. will be, that when the ordinary freight of country produce is slack, they will keep up the employment, and the profit may consequently be smaller than upon market produce.

Collecting these several items, we have :

For freight of Potatoes, &c.	£2,000 0
“ “ Cider,	78 0
“ “ Fish,	200 0
“ “ Ship Building,	500 0
“ “ Deals,	1,375 0
“ “ Cord Wood,	400 0
“ “ Wharf Logs, &c.	200 0
“ “ Boards, Scantling, &c.	300 0
“ “ Traffic with Cobequid Bay,	2,250 0
“ “ Return Goods to Cornwallis,	300 0
“ “ Goods to N. Brunswick,	100 0
“ “ Lime,	375 0
“ “ Brick,	62 10
“ “ Plaster of Paris,	250 0
“ “ Calcined Plaster,	100 0
“ “ Flag Stones,	100 0

	8,590 10
Add to this, Way Passages,	9,300 0
Income under Sentell's Returns,	13,974 10

£31,865 0

All of which is respectfully submitted, by,

Sir,  
Your most obedient servant,  
GEORGE WIGHTMAN.

To the Honorable JOSEPH HOWE,  
Provincial Secretary, &c. &c.  
HALIFAX, March 10th, 1849.

## Mr. Chesbrough's Report.

WEST NEWTON, MASS.,  
February 20th, 1849.

SIR,—

After having examined the line surveyed for the proposed Halifax and Windsor Railroad, and the plans and estimates of the same, as furnished by Mr. Wightman, who made the survey. I feel prepared to make the following Report :

In my opinion, the survey made is sufficient to give a satisfactory knowledge of the general character of the route, and to afford a basis for an approximate estimate of the probable cost of the work. It is not, of course, so satisfactory as a definite location would have been ; but this could not have been made for the amount appropriated for the survey.

The ground selected for the line, and the plan proposed as it regards grades and curves, appear to me to have been judiciously chosen, with very few exceptions. The most important of these is the steep grades between the 34th and 37th miles from Windsor.

Here, I think, by incurring a reasonable additional expense, and selecting rather different ground for the line, a maximum grade of not more than 60 feet per mile, instead of 80 feet, might be obtained. A slight improvement might perhaps be made in a similar manner, between the 10th and 17th miles from Windsor, and result in diminishing the maximum ascent, going Eastward, to 53 feet per mile, instead of 60. This might prove to be a matter of considerable importance, as the heavy transportation will probably be in that direction. These changes are partially, if not altogether, recommended by Mr. Wightman.

The estimates of cost of the different items which make up the whole work, are, so far as I can see, quite liberal. At a few places, upon further investigation, the estimates may be found too low ; but, should this prove to be the case, which is quite likely at the crossing of Cockscomb Lake, and over the bogs on Sackville River, the opportunities of altering the line are so good, that the estimates need not be exceeded.

The probable net income to be derived from your road after its completion,—the all-important subject so far as a remunerating investment of capital in it is concerned, depends upon three elements : 1st. The cost of constructing the road, and furnishing its equipments. 2nd. The amount of travel and freight that will pass over it ; or in other words, the gross amount to be derived from passengers and merchandize. 3rd. The cost of working the road to accommodate this amount of business.

The cost of construction, as will be seen by reference to Mr. Wightman's estimates, will not, I think, exceed £337,500, and should the present low prices of iron rails and labor continue, will in all probability not be more than £300,000 ; but to guard against disappoint-

ment in the final result of the enterprise, it would not be safe to assume it at less than the higher sum.

The gross revenue to be derived from the business of the road, must depend upon the travelling and business statistics of the population likely to make use of it. My own knowledge of these is so exceedingly limited, that it could be of no value to you whatever. I have, however, for your satisfaction and guidance in making up, or adopting an estimate of the probable gross amount of income, annexed to this paper several tabular statements. No. 1, and No. 1 continued, show as far as it has been in my power, with a good deal of effort to collect them, the cost of construction, progressive increase of business, original estimates of these items, length, &c. &c. of the principal roads that have been for any length of time in operation in New England, and of a few in other parts of the United States. These statements show that the universal tendency of Rail Roads in this country, is to increase the travel and transportation of the merchandize of the districts through which they pass. This increase, however, does not always follow the same rate on different roads ; nor does it usually continue long at the same rate on any given road.

In Massachusetts it has generally been found that the travel along any line of Railroad, was in a short time after its completion, treble that of the original estimate, when that estimate was based upon actual and carefully ascertained statistics. This is owing to the much greater comfort, and economy of time and expense of railway travelling. Sometimes, however, capitalists have been disappointed, by embracing in their estimates too wide a region on each side of the road, and then presuming upon a liberal increase.

Railroads not only tend to increase the amount of travel and business of the districts through which they pass, but they increase also the value of the property along them, and at their termini. As an illustration, see Tabular Statement, page 98, Boston Census of 1846, showing the increase in the valuation of property in the City of Boston. Could I obtain similar statistics of Worcester, Springfield, Fitchburg, and other towns in Massachusetts, they would show similar results. You will perceive from a glance at these statements, that the original estimate of the cost of construction of several of the Railroads in this country has fallen far below the actual cost. This has not been owing so much to under estimates of particular items, as to unforeseen contingencies ; such as changes of plan rendered necessary to accommodate an unexpected amount of business ; and improvements found necessary, as the views of projectors and engineers, became more enlightened.

There is not now the same necessity, nor the same excuse for such wide discrepancies,

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unless equally wide departures from the present rules which govern the operations of railroads should hereafter be found necessary. Besides, when railroads were first introduced into this country, the views of even the best engineers on this subject, were exceedingly crude, and now afford considerable amusement to look back to. You will also perceive that the cost of construction increases on the same road from year to year, after its first completion and opening for use. This has been owing to causes already mentioned, and to the building of Branches, the lengths of which are mentioned in the statements.

With regard to the cost of working the road, it will depend very much on the amount of business to be done, and the amount of accommodation given to that business; that is, whether you run one or more passenger trains a day each way over the road. Thinking it might be satisfactory as a matter of reference, I have appended to this, the Tabular statement No. 2., showing various items in relation to the cost of working, and rates of charges on several of the most important Railroads in the United States.

It will be seen from this statement, that the cost of different items, varies very much on different roads. This is owing not so much to a difference in judicious management, as to a difference of circumstances. For instance, the Boston and Lowell Railroad Company, expended for each mile run of its engines in 1846=103.4 cents, while the Western Railroad Company expended but 72 cents. But while the Lowell Railroad is only 25½ miles long, the company is obliged to maintain expensive depot establishments at each terminus, and incur almost as heavy general expenses, as the Western Railroad Company, whose road is 156 miles long.

The cost of operating the Connecticut River Railroad, affords perhaps a more satisfactory comparison, for the proposed Halifax and Windsor Railroad, than any other that I know of; although, the analogy even here is not complete.

By referring to Tabular Statements No. 3., it will be seen that the cost per train per mile, run in 1848 on this road, was 53.3 cents. The average cost per train per mile, on all the Massachusetts Railroads in 1847, was about 71 cts. per mile.

No doubt one passenger train a day, each way, could carry all the persons who might wish to travel between Halifax and Windsor, but they would be far better accommodated by two trains a day, and this would tend greatly to increase the amount of travel; at least, such has been the effect to a remarkable and unexpected degree, wherever judiciously tried in this country. Supposing then, that you will run two passenger and one freight trains daily, each way over your roads, and that you will not run Sunday trains, the following may be considered a safe estimate of the total cost of working the road, viz.: three trains each way a day, would be 6 trains a day over the whole road. Calling the road 47 miles in length, this would be 282 miles a day,

or for 312 days, the total number of 87,984 miles to be run by the engines in a year: 60 cents per train per mile, would give as the total cost per annum of working the road \$52,790.04, or in round numbers £13,200 currency—60 cents per train per mile run, may be considered large when composed with the Connecticut River Railroad; but that is a new road and has not yet been subject to the deterioration common to older roads; besides, they run a greater number of trains over it without increasing their general expenses, or salaries and miscellaneous expenses of principal officers. On the other hand, it may seem too small when composed with the average of all the roads in Massachusetts; but fuel costs twice as much here as it does in N. Scotia, and labor is 23 per cent dearer here than there.

From the foregoing premises, then, if there should be business enough to yield a gross annual revenue of £30,000, which, after deducting the cost of making the road, (£13,200) would leave a net income of £16,800,—it would afford a return of about 5 per cent on the estimated cost of the road.

For further and more detailed accounts of the doings and expenditures of the most important Railroads in Massachusetts, I would refer you to the reports of the Directors of the different Companies, made to the Legislature of this State,—copies of which reports have been furnished to Mr. Wightman for the years 1840 to 1847, inclusive.

Which is respectfully submitted.

E. S. CHESNROUGH, Civil Engineer.

Hon. JOSEPH HOWE,

Provincial Secretary, Nova Scotia.

Extract from the Appendix of a Report made by Mr. Samuel B. Ruggles, Chairman of the Committee of Ways and Means of the Assembly of the State of New York, submitted to the House on the 12th March, 1838.

"The following Tables, compiled from public documents, are published for the purpose of exhibiting the progressive increase during a series of twenty years, in the official valuation of the taxable property in the City and State of New York respectively. They embrace the periods of ten years each, one immediately preceding, and the other immediately following the completion of the Erie Canal in the year 1825:

I. *Official Valuation of the Real and Personal Property of the City of New York, from 1815 to 1825 inclusive.*

Year.	Real Property.	Personal Property.	Total.
1815	57,000,000	24,636,042	81,636,042
1816	57,308,200	24,766,000	82,074,200
1817	57,799,435	20,996,200	78,895,735
1818	59,827,285	20,426,806	80,254,091
1819	60,500,295	18,612,766	79,113,061
1820	52,084,328	17,446,425	69,530,753
1821	50,619,720	16,665,350	68,285,070
1822	53,330,574	17,958,570	71,289,144
1823	50,184,220	20,756,591	70,940,820
1824	52,019,739	31,055,946	83,075,676
1825	58,425,895	42,734,151	101,160,040



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The expenses of the first six of the above Roads are apportionate between the Passenger and the Freight business, according to the number of miles run with trains of each description.

The Statements for the first four Roads are for the year ending January 31st, 1847.

The Statements for the Western Rail Road are for the 11 months ending December 1st, 1845.

The Statements for the Georgia Rail Road are for the year ending April 1st, 1847.

The Baltimore and Ohio Rail Road is taxed with an expensive horse power establishment, with which the other Roads here, compared with it, are not burdened. Excluding the cost of this establishment, the expense on this Road, per mile run is but 480 per Passenger per mile, and 1.525 per ton per mile.

**TABULAR STATEMENT, No. 3.**

CONNECTICUT RIVER RAIL ROAD.

*Current Expenses for 1848.*

Repairs of Road,	9800 61
“ Bridges,	333 21
“ Buildings,	848 62
“ Engines,	9910 87
“ Snow Plows & Scrapers,	
“ Tools and Machinery,	156 59
“ Passenger Cars,	3241 18
“ Freight do.	3641 08
“ Gravel do.	187 01
“ Hand do.	87 79
Clearing Snow,	341 38
Stationery, Printing & Advertising,	888 54
Damages	951 25
Expenses of	{ Services, 10742 42
Transportation	{ Wood, 13480 50
	{ Oil, 1895 41
	{ Contingent, 491 26
Expenses of Stations,	14697 48
General Expenses,	2856 22
Miscellaneous do.	3833 24

Total, \$78,444 68

Number of miles run, 147,092.  
Total expense per train per mile run \$0.533.

(No. 1.)

WEST NEWTON, MASS.  
20th February, 1849.

DEAR SIR,—

You requested me, while in Nova Scotia, to give some account of my professional history. I commenced engineering when scarcely 15 years of age, in the Spring of 1828, on the Baltimore and Ohio Railroad, and entered the service of the State of Pennsylvania in 1830, as a sub-assistant engineer, on the Alleghany Portage Railroad, under Bt. Lt. Col. S. H. Long, U. S. T. E. In 1831, I joined the corps of Major (then Capt.) Wm. Gibbs McNeil, U. S. T. E., and remained in it for eleven years, during which time I was employed on the Paterson and Hudson River Railroad, in New Jersey, the Boston and Providence and Taunton Branch Railroads, in Mass., the Concord Railroad, in New Hampshire, and the Louisville, Cincinnati and Charleston Railroad, a

great Southern project, only 67 miles of which were ever built. Of this I had the active and entire charge for the last two years, my chief having become the consulting engineer. In 1844, I took charge of the Stoughton Branch, in this State, and completed it. I located afterwards a large portion of the Vermont and Providence Railroad, and the Pantucket Branch of the Boston and Providence Railroad; and have been employed for nearly three years on the Boston Water Works, as Chief Engineer of the Western Division, or Aqueduct Department.

Mr. Wightman has two or three pamphlets, which will give you additional information, if it be desired, on this subject. I also send you five letters, one from the present Governor of this State, and the others from Presidents of Rail Road Companies, and would beg you to return these to me by the first opportunity, after having examined them.

Very respectfully,

Your obedient servant,

(Signed) E. S. CHESBROUGH.  
To the Honorable JOSEPH HOWE,  
Provincial Secretary,  
Nova Scotia.

(No. 2.)

BOSTON, 14th February, 1849.

I have been for several years acquainted with Mr. E. S. Chesbrough. In his profession, as an Engineer, he has a high reputation,

and as a gentleman, he is intelligent, amiable, and courteous; in uprightness and integrity of character, I believe him to be without reproach.

(Signed) GEO. N. BRIGGS.

(No. 3.)

Office of Boston and Providence }  
Railroad Companies. }

BOSTON, June 2nd, 1845.

SIR,—

It gives me great pleasure to say to you that I have noticed your conduct as Resident Engineer of the Stoughton Branch Railroad during its construction—that it has been to my entire satisfaction, and that of all parties interested. This Corporation being largely interested in the Stoughton Branch Railroad has led me to notice your conduct closely.

I hope you may succeed in finding employment on some of the new Railroads about to be constructed—your talents and experience will be found valuable to whoever may employ you.

With great respect, &c.

(Signed) JOS. GRINNELL,  
E. S. CHESBROUGH, Esq. President.

(No. 4.)

CANTON, June 2nd, 1845.

I hereby certify that Mr. E. S. Chesbrough has had the sole charge of the Stoughton Branch Railroad, (as Engineer,) and that he has discharged the duties of said office in a most faithful, efficient and satisfactory manner, and shall ever take much pleasure in re-

TABULAR STATEMENT, No. 2.

commending him as every way capable (as an Engineer) and worthy of all trust.

(Signed) F. W. LINCOLN,  
President S. B. R.

(No. 5.)

Boston, 26th March, 1844.

Sylvester Chesbrough, Esq.

DEAR SIR,—

Your brother Louis has informed me, that you are now unemployed, and would like to take charge of the construction of some Railroad now commencing. From my acquaintance with you, while in my employ, in constructing the T. and B. Railroad, and since, while constructing the Columbia Railroad, I can, with confidence in your ability and integrity, recommend you to the favorable notice of any corporation who may want an Engineer to construct a Railroad

I am respectfully,

Your friend,

(Signed) THOMAS B. WALCH,  
President T. B. R.

(No. 6.)

Office of the L. C. and }  
C. R. Company. }

CHARLESTON, 25th July, 1842.

E. S. Chesbrough, Esq.

DEAR SIR,—

Your relations as Resident Engineer, and those of John McRea and Mr. Wm. Graham, your assistants, having terminated in consequence of the completion of the Railroad as far as Columbia, I cannot permit the separation to take place without expressing to you the high sense entertained of the professional ability of yourself and assistants, and of the zeal and perseverance with which you have discharged the varied responsibilities devolving on you. I beg that you will convey the above testimonial on my part to Mr. McRea and Mr. Graham, and that you will accept for yourself, and in their behalf, the high consideration and regard entertained personally for each of you.

Yours respectfully,

JAMES GADSDEN,  
President L. C. and C. R. R. Company.

(No. 7.)

Extract from the first Monthly Report of the Water Commissioners of the City of Boston, No. 20, pages 4 and 5.

"On the 25th, the Commissioners having held frequent previous consultations on the subject, and having given deliberate consideration to the selection of an Engineer, decided

on dividing the work to be executed into two departments—the first to consist of the Aqueduct leading from Long Pond to a reservoir in Brookline or Brighton; and the second to consist of the line of pipes from that reservoir to the city, with the reservoir and distributing pipes in the city, each to be under the charge of a Chief Engineer, who shall be independent of each other. They also decided on inviting E. Sylvester Chesbrough, Esq., then employed on the Pawtucket Branch Railroad, to take the charge as Chief Engineer of the first of these departments. They subsequently, after conference with Mr. Chesbrough, in reference to the nature of the duties to be performed, and the manner of executing them, completed an arrangement with him, by which he agreed to enter immediately into the service, at a compensation of \$3,000 per annum."

(No. 8.)

Extract from a Pamphlet, entitled "Celebration of the introduction of the Water of Cochituate Lake into the City of Boston, October 25, 1848," (prepared by order of the City Council of Boston,) page 27.

"It remains only for me to perform the grateful duty of acknowledging the obligations which the Water Commissioners are under, for the cordial co-operation of all those who have been associated with them in the prosecution of the enterprise. To the skill, energy and assiduity of the Chief Engineers, Messrs. Whitwell and Chesbrough, and of the Consulting Engineer, Mr. Jervis, we are eminently indebted, for the promptness and success with which the work has been carried forward, and the satisfactory manner in which it has been executed."

(No. 9.)

Extract from "Proceedings of the Louisville, Cincinnati and Charleston Railroad Company, 1838," pages 56 and 57.

"The Senior Resident Engineer, E. S. Chesbrough, has, as heretofore stated, been charged with the general direction of operations in the States of Tennessee and Kentucky, and continued to be so, till those operations were suspended; when his services (always invaluable) were availed of in South Carolina, on that portion of the work in progress of construction. The evidences of intelligence and skill with which the work was constructed by him, under my instructions, and of the great industry with which it was prosecuted, I am satisfied will be apparent on an examination of the Archives of this department, in the office at Lexington."



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Showing the Length, Cost of Construction, and progressive increase of Business, of various American Railroads

		Original Estimate.	1835	1836	1837	1838	1839	1840
BOSTON & LOWELL,	Gross receipts,	\$58,514	\$64,654	\$165,124	\$180,770	\$191,778	\$241,249	\$231,575
	Receipts from passengers,				117,643	111,059	135,037	127,407
	Net Income,	36,000	45,529	89,798	102,261	116,180	149,066	140,176
BOSTON & PORTLAND, (1839-'40 & '41.) BOSTON & MAINE, 1842, &c.	Cost of construction,	600,000	1,312,239	1,505,645	1,508,394	1,575,663	1,698,476	1,729,542
	Gross receipts,						69,001	93,458
	Receipts from passengers,						53,885	71,798
BOSTON & WORCESTER,	Net income,						25,676	30,546
	Cost of construction,	142,500						231,807
	Gross receipts,			120,792	123,331		212,325	267,547
EASTERN,	Receipts from passengers,						112,032	122,496
	Net income,	108,352					126,752	105,423
	Cost of construction,	1,000,000						1,848,085
FALL RIVER,	Gross receipts,	191,300					37,422	125,623
	Receipts from passengers,							113,068
	Net income,	131,300					19,604	72,447
FITCHBURG,	Cost of construction,	1,375,000						1,306,196
	Gross receipts,							
	Receipts from passengers,							
NASHUA & LOWELL,	Net income,	58,982					6,114	55,053
	Cost of construction,							82,639
	Gross receipts,						6,114	35,793
NEW BEDFORD & TAUNTON,	Receipts from passengers,							30,106
	Net income,	38,982						368,704
	Cost of construction,	220,000					279,939	26,437
PROVIDENCE,	Gross receipts,							23,250
	Receipts from passengers,							13,411
	Net income,		106,929	(f) 243,095	(g) 250,883	264,114	313,907	412,188
NORWICH & WORCESTER,	Cost of construction,							(i) 202,601
	Gross receipts,						196,974	184,651
	Receipts from passengers,							59,474
OLD COLONY,	Net income,							116,517
	Cost of construction,							78,872
	Gross receipts,							64,014
TAUNTON BRANCH,	Receipts from passengers,							1,777,472
	Net income,							
	Cost of construction,	732,945						
WESTERN,	Gross receipts,			19,044	46,839	48,737	58,019	75,477
	Receipts from passengers,			16,177	35,160	32,860	40,910	44,900
	Net income,			6,223		13,771	22,839	30,805
BALTIMORE & OHIO,	Cost of construction,				256,752		17,609	112,347
	Gross receipts,							70,820
	Receipts from passengers,							50,276
SOUTH CAROLINA CANAL AND RAILROAD,	Net income,						3,288	
	Cost of construction,		263,368	281,312	301,301	365,224	407,347	432,895
	Gross receipts,							
CENTRAL, (Georgia.)	Receipts from passengers,							
	Net income,			68,575	12,176	93,643	94,847	107,804
	Cost of construction,							
CAMDEN & AMOY,	Gross receipts,		249,754	271,614	280,215	323,281	422,842	383,194
	Receipts from passengers,							
	Net income,						84,946	103,837
CAMPDEN & AMOY,	Cost of construction,							2,378,849
	Gross receipts,							91,401
	Receipts from passengers,							
CAMPDEN & AMOY,	Net income,						685,329	548,174
	Gross receipts,						427,286	282,216
	Number of through passengers,							152,113
CAMPDEN & AMOY,	Cost of construction,						3,220,857	

(a) \$72,758 deducted from net profits of 1843, should have been charged to repairs of previous years, instead of construction. The construction account was credited with depreciation of machinery. (c) Including Woburn Branch. (d) For 11 months to Nov. 30th. (e) Including \$17,421 Interest. (f) Taunton and Dextam Branch. (g) Including all its Branches. (h) Much of this was absorbed by interest.



