

THE DAILY EXAMINER.

JUNE 20, 1891.

Judge Peters.

JUDGE PETERS passed peacefully away at about nine o'clock this forenoon. He had been subject to serious attacks of illness for several years past.

James Horsfield Peters was, if we mistake not, born at Miramichi, in New Brunswick, the son of Thomas Peters, Esquire. He was educated in his native Province and in Europe, and came to Prince Edward Island in 1838.

Judge Peters was ever a reserved man, preferring the society of his family and closest friends. By these he was warmly beloved.

Personal.

Grippe is very prevalent in Crapaud. We regret to learn that Mrs. O. B. Wadman and her daughter are both laid up on account of it.

Miss Winifred Y. Scammon, daughter of Gen. E. Parker Scammon, formerly United States Consul in this Island, was married in New York a few days ago, by Archbishop Corrigan, assisted by the Rev. Father Macdonald, to Auguste Duret Blanchet, jr.

Major McLeod, Captain Bertram and Lieut. Darke, of Hunter River, intend starting next Monday for a trip to Calgary and other principal points in the Northwest, and expect to be absent about one month.

Religious Services.

St. Peter's Church.—Services to-morrow: Celebration of the Holy Communion, 8 a.m.; Matins and Litany, 10.15; Choral Celebration of Holy Communion and Sermon, 11 a.m.; Evensong and Sermon, 7 p.m.

Don't forget the Railway Gospel Meeting to-morrow afternoon at 4 o'clock, in McLeod's Hall. Strangers always welcome. Lessor: Galatians 5, "Stand Fast."

Methodist Brick Church.—Preaching 11 a.m. and 7 p.m.; Sunday School, 2.30 p.m. Service, morning and evening conducted by the pastor, Rev. J. Read.

Zion Church.—Services to-morrow will be conducted in the morning at 11, by Rev. D. Sutherland, pastor, and in the evening at 7 by Rev. J. A. Gordon. Morning prayer meeting at 10.15. Sabbath School and Bible classes will meet at 2.20 p.m.

Baptist Church.—Preaching at 11 a.m. and 7 p.m., Rev. J. A. Gordon in the morning, and Rev. D. Sutherland in the evening. The ordinance of Baptism will be administered at the close of the morning service. Sabbath School and pastor's Bible class at 2.30. Strangers always welcome.

Kensington Hall, Edward Street.—Sunday School and Bible Class at 2.30. In the evening at 7 o'clock, Evangelist Sutcliffe will give an address—Subject "Rough on Travellers." Miss Daisy Lewis will sing a solo. Strangers shown to seats and provided with hymn books.

Local Notices.

Pineapples selling off cheap to-night at Beer & Goff's. You can save at least ten per cent. by buying your boots at the Dominion Boot & Shoe Store.

The best bargains in ladies' dress goods—20 to J. B. Macdonald's. Ladies' dolmans—Have still a few left. Call and get one at J. B. Macdonald's.

Don't forget to call at the Dominion Boot and Shoe Store if you want to buy your boots and shoes cheap. 18 4i

One case of cypress knitting yarn just received at Perkins & Sterns'. 18 3i eod

Will sell at a bargain 30 unmade costumes, all new and fashionable.—Perkins & Sterns'. 18 3i eod

A good story is told of the Duke of Wellington in church. An old lady in humble circumstances chanced to be next the Duke both in a kneeling attitude, and arising from her position, recognizing the Duke, attempts in an apologetic manner to vacate the seat. The Duke very graciously forces her to be seated by him, remarking "we are all alike here." This reminds us of how alike people are in their fancies of flowers. The pansy, for instance, is a universal favorite with all, and we can say with the Duke of Wellington, "we are all alike here"—especially with such beautiful delicate colored ones as Gay & Son are selling in the Market and at home. See their ad. of flowers and vegetable plants. 14 d 4i 2aw w 2i

TURNIPS.—The rush for turnip seeds is to Geo. Carter & Co's. The varieties most in demand are the Hazzard's Improved and Carter's Prize Winner. 14 d 4i 2aw w 2i

Proposed Railway Tunnel

Under the Northumberland Straits,

Between New Brunswick and Prince Edward Island.

Report of Sir Douglass F. X. Member of Council of the Institution of Civil Engineers, and Corresponding Member of the American Society of Civil Engineers.

To the Hon. George E. Foster, Minister of Finance for the Dominion of Canada, Ottawa.

Sir: In accordance with instructions received by me on the 17th September, 1890, through the Hon. Senator G. W. Howland, I detailed Mr. Alfred Palmer, a civil engineer upon my staff, to make a preliminary inspection of the proposed site for the railway tunnel under the Northumberland Straits, to connect the railway systems of New Brunswick, and of the Dominion generally, with that of Prince Edward Island.

He was accompanied by the Hon. G. W. Howland and by Mr. Francis Bain, whom I understand to be a local geologist of repute. Mr. Palmer reports that, having reference to the opinion of Mr. Bain as to the strata under the bed of the sea on the line of the tunnel, the proposed location, under the narrowest portion of the Straits between Money Point in New Brunswick, and Carleton Point in Prince Edward Island, is well selected, from both a constructive and a traffic point of view.

The greatest depth of water is shown as being 96 feet at high water, with a rise of tides of 6 feet at springs, and 3 feet at neaps, and the speed of the current is not exceeding 3 knots, with two hours of slack water each tide.

The distance from shore to shore is given as about 13,200 lineal yards, or say from shaft to shaft 13,500 lineal yards, exclusive of the land approaches on either side, of which about 2,000 lineal yards would be in tunnel.

Mr. Palmer further reports that the shores upon either coast are well adapted for railway approaches, varying from 15 to 35 feet in height above high water mark, with a mean altitude of 25 feet, the soil being of a red, clayey nature. It appears also that the higher land on the Prince Edward Island shore falls away towards the interior, which will, therefore, shorten the approaches on that side.

Mr. Palmer considers that about 5 1/2 miles of railway, including some 2,000 lineal yards of tunnel as before mentioned will be necessary beyond the shafts to connect the tunnel with the respective systems of railway which, however, are of a different gauge, viz: 4 feet 8 1/2 inches in New Brunswick, and the Dominion generally, and 3 feet 6 inches in Prince Edward Island.

Brick clay free from lime is said to exist at several points in Prince Edward Island, and a sample brick of good quality has been forwarded to me, together with a report by Mr. Bain thereon, dated the 9th December, 1890, of which a copy is annexed thereto. (Appendix A.)

Coal of good quality from Picton, and timber, could be delivered at the shafts at moderate prices.

I assume that any materials or machinery required to be imported for the works, would be admitted free of duty.

I am informed that ordinary labor is worth about 4s, and skilled labor about 6s per day.

The ruling gradient on the main lines of New Brunswick is given as 1 in 81, or 65 feet per mile, and that in Prince Edward Island as 1 in 58 or 90 feet per mile. From the approximate cross section of the Straits, accompanying Mr. Bain's report, hereinafter referred to, it appears that no difficulty would be encountered on the question of gradients, as the levels of the tunnel could be so arranged as approximately shown on the cross section (Appendix F), as to give a sufficient thickness of solid strata between the extrados or crown of the tunnel and the bed of the straits, without involving any steeper incline than 1 in 100, or 52-8 feet per mile, whilst the approach tunnel can be laid out with a ruling gradient of 1 in 66 or 80 feet per mile, both tunnels draining into one pumping shaft as shown.

It could be convenient, but not essential, for constructive purposes, that the tunnel alignment should be a straight line from shaft to shaft.

Upon the all-important question of stratification on the proposed alignment, Mr. Palmer quotes the following opinion, given to him verbally by Mr. Francis Bain on the occasion of his visit:—

"In his belief a bed of red clay shale varying in thickness from 50 to 80 feet extends right across the Straits of Northumberland. It lies almost horizontally upon a carboniferous or grey sandstone base, and is said to contain small occasional lenticular masses of fine red sandstone."

Mr. Palmer adds, as the result of his own investigation:— "The geological outcrop on either shore, in which the strata are distinctly visible, the formation of the surrounding country, the stratification seen in neighboring wells, combined with the opinion of Mr. Bain, the geologist, who is a native of the Island, and has a knowledge of its entire formation, prove that the most favorable and impervious stratum does exist for sub-aqueous tunneling."

Accompanying Mr. Bain's report upon the brick clay came a cross section of the straits plotted to a distorted scale (Appendix B.) together with samples of shale and sandstone, as found in the neighborhood. Having communicated through the Hon. George W. Howland, my desire for further and more distinct information, I received the reports by Mr. Bain, dated respectively the 18th of December, 1890, and the 14th March, 1891, of which copies are annexed (Appendices C and D), together with a cross section of the Straits to a natural scale (Appendix E).

In this report Mr. Bain remarks:—"The great shale beds are persistent and uniform, but the small arenaceous or calcareous deposits, which occur in them, are local, lenticular and discontinuous, and

not likely to form leads from water. These shale are impermeable to water. The carboniferous base of sandstone will possibly form a dangerous source of water, and it should be avoided, but, as already remarked, it does not break up under the bed of the straits here.

"It is my duty to state that, though convinced of the accuracy of what I now present, a more minute and detailed geological investigation should be made before active engineering operations are begun."

I have also before me a copy of a letter, addressed on January 9th 1891, to the Hon. G. W. Howland by Sir William Dawson of McGill University, Montreal, which runs as follows:—

"I beg to say that I have read and examined the report and section prepared by Mr. Bain with reference to the proposed tunnel from Carleton Head to Cape Jourdain, which you were kind enough to show me, and that, from my knowledge of the geological structure of the locality, I have no hesitation in stating that I believe the report and section fairly represent the character of the beds to be penetrated by the proposed tunnel, and that these will not present any serious difficulty, the ground being in fact as favorable as could be desired for such a work."

It is evident from the cross sections supplied by Mr. Bain, that it is possible to locate the tunnel entirely above the carboniferous sandstone strata, and care should be taken not to tap these strata either by shafts or borings in the immediate neighborhood of the intended work.

So far as I can judge from the small specimen of the shale in my possession, I agree that it is likely to be impermeable to water, and to form a favorable material for tunneling operations. The cross section, however, shows that owing to the slight inclination of the beds, the tunnel cannot be made to pass entirely through this stratum, but must necessarily cross at an oblique angle and therefore for some distance through certain sandstone beds, which are shown thereon, and which I understand to be red sandstone similar to samples in my possession.

Judging from subaqueous work carried on under my supervision in sandstone of a somewhat similar character, I should expect a certain amount of percolation, but not large feeders of water from this rock. It is of course, impossible to speak with certainty upon this point, but I am strengthened in this opinion by the conformable nature of the strata in the neighborhood, which I understand from Mr. Palmer to be remarkably free from faults showing that the beds as mentioned by Mr. Bain, have not been exposed to strain.

Owing to the great depth, at which the tunnel in some portions of its length, will lie below the level of high water, viz: 156 feet to the underside of the invert, it would be impossible for men to work under the full hydrostatic pressure, which would amount to about 68 pounds per square inch, whereas 40 pounds per square inch can only be endured at considerable risk and for a short time. Whilst, therefore, a reduced pressure might be found useful at certain points to check the flow during construction, it would be necessary to make provision for pumping such feeders as might be met with, reduced as before mentioned and limited also by exposing at one time as short a length of ground as possible.

Since I reported upon this subject to the Hon. (now Chief Justice) Sullivan on the 7th April, 1886, much progress has been made in the driving of subaqueous tunnels in water-bearing strata by means of shields similar to that introduced by Mr. J. H. Greathead, Mem. Inst. C. E. for the Straits under the river Thames in this city, afterwards adopted for the "Sarnia" tunnel, on the Grand Trunk Railway, and now working with some modifications of details in the tunnel under the river Hudson in New York, and in the "Vyrmyr" tunnel under the river Mersey. By means of such a shield, suitably designed in wrought iron or steel, work can be carried on with much greater safety to the men employed, and without the use of temporary timbers, which, whether left in permanently or withdrawn, constantly prove a source of weakness to the permanent work.

In very soft and wet strata, and when compressed air has been employed, it has been found desirable to adopt, for the permanent tunnel, a cylinder of cast iron with suitable flanges, such cylinder being sometimes lined wholly or partially with brickwork for protection purposes.

In homogeneous and dry strata, such as the shale referred to by Mr. Bain, I have a strong preference for a tunnel, also cylindrical in form, but composed entirely of brickwork in cement (grouted externally when practicable) as being of a much more permanent character than an iron structure, which, however well protected, must be more or less subject to corroding influences.

In the present instance there would be the great advantage in the brickwork tunnel of using local instead of imported materials, of much reduced cost, and of more easily providing refuges for the plate-layers.

I should propose, therefore to carry out the work, from a shaft at each end, or possibly from a permanent pumping shaft at Carleton Point, and from an open face at Money Point by means of a shield, especially designed for rapid progress in good material, and in conjunction with brickwork, but so arranged that whereas in the sandstone beds, feeders may be met with, an iron casing may be readily introduced to keep back the water, and so reduce the permanent pumping. In my estimate I allow for a considerable length (one-quarter of the whole distance between the shafts) of such casing.

The shield can also be so arranged as to permit of a small test heading being kept in advance of the main work, which, I have found, in similar work under my charge, to be of great advantage.

The highest speed as yet attained with a shield in connection with a cast iron tunnel is, I believe, from 3 1/2 to 4 yards per day, as an average at each face, but, through the strata shown to exist under the Northumberland Straits, I anticipate no serious difficulty in attaining an average speed of about five yards per working day, or say 300 days per annum at each face, which, after allowing for shaft-sinking, brick-making and other preparations, would enable the tunnel to be completed within 5 1/2 or 6 years from the commencement of the work.

Locomotive pumps of special designs would be necessary to clear the face of the work on the descending gradient at the New Brunswick end of any water which may percolate through the shield during

construction, and permanent provision would have to be made at the pumping shaft for dealing with any water arising during construction in the work driven from the Prince Edward Island end, as well as permanently with the leakage arising throughout the tunnel.

Compressed air plant would be required at each shaft for the purpose of ventilation during construction, and also for establishing pressure at the working faces if required.

Owing to the great length of the sub-aqueous tunnel, viz: 13,500 lineal yards (or rather over 7 1/2 miles) from shaft to shaft, and to reduce as far as possible the enhanced cost and delays consequent upon such long leads as will be necessary, a well laid line of way should follow up the work as closely as possible, upon which pumps, lighting plant, excavation materials and workmen may be rapidly conveyed.

If the permanent tunnel be of normal size, then, by adopting a narrow gauge and proportionately small rolling stock for this temporary purpose, passing places and sidings can be introduced.

The motive and pumping power, and the lighting of the tunnel during construction can be provided for by at once installing electrical plant, to be permanently used as hereinafter proposed.

The important question of the size of the tunnel is one which must be decided by two considerations, viz., that of first cost and that of the comparative facilities for the interchange of traffic between the mainland and Prince Edward Island.

The preliminary expenses, and the cost of shafts, brickyards, pumping plant, compressed air, electrical and ventilating machinery, would not be very materially affected by the size of the main work, and these items, together with the cost of engineering, and an allowance for contingencies, are included in the following approximate estimates for the different sizes of tunnel—which, however, are exclusive of land, interest during construction, and rolling stock, and also exclusive of the cost of the necessary alterations and additions to the railway systems on either side of the straits, which, I am informed, do not come within the scope of my present instructions. I have, however, included the necessary length of land tunnel in Prince Edward Island, leaving only the ordinary above-ground extensions to be dealt with separately.

If it were a question of passenger traffic only, this might probably be quite satisfactorily met by the construction of a tunnel having an internal diameter of 11 feet (slightly larger in diameter than the electric subway in London, which is carrying a heavy passenger traffic) and operated with special rolling stock, which could however be so designed as to run over the existing railways of the St. 6 gauge in the Island, so that passengers would only have one change of carriage at the New Brunswick end of the tunnel, a matter of no great importance. Such a tunnel would also accommodate freight cars of special design suitable for all classes of ordinary traffic. A cross section of such a tunnel showing rolling stock is given in Appendix G.

I am informed that the transhipment of potatoes, eggs and fresh fish is objectionable, especially in winter. Exposure to frost could however be avoided by running the main line and tunnel cars alongside one another in a freight shed at Money Point, properly warmed for the purpose. By suitable arrangements of which I have had experience elsewhere, the delay and inconvenience of transhipment can be reduced to a minimum. Against this slight inconvenience must be set the largely enhanced expenditure, not only upon the full sized tunnel, but also upon rolling stock of the 4 ft 8 1/2 gauge, if the Island traffic is to run through to its destination without change of cars, and such through working would also in all probability involve much empty running in the absence of return freight.

Such a tunnel construction as shown in Appendix G in the dry portions of the work, of brickwork in cement, averaging 1 ft. 6 in thickness (the bricks being of local manufacture) and where feeders occur, with cast iron casing 1 1/2 in thickness with 6 flanges laid with permanent way having steel rails weighing 50 pounds to the lineal yard, estimated to cost subject as hereinafter mentioned, £66 10 0 nearly, per lineal yard or say £287,500 from shaft to shaft, or with the land tunnel and contingencies a total sum of £1,975,200—(at 85 to the pound) \$5,376,000.

Should it be decided that the tunnel must be of sufficient dimensions for an ordinary railway of the 4-8 1/2 gauge, and that the railways of the Island shall be altered to that gauge, a tunnel of sixteen feet in diameter would appear to just accommodate passenger and freight cars of the normal Canadian and American type, but not drawing room and sleeping cars, nor some of the cars reported to me as running upon the Intercolonial Railway. This size does not allow of a very satisfactory permanent way, nor does it provide proper space for the plate-layers.

Such a tunnel constructed in the shale, of brickwork in cement, 1-10 1/2 in thickness and where feeders occur with cast iron casing 1 1/2 inch thickness with 9 inch flanges, and laid with permanent way having steel rails weighing 70 pounds to the lineal yard, I estimate to cost, subject as hereinafter mentioned \$122-10-0 nearly, per lineal yard, or say £1,552,500 from shaft to shaft, or with the land tunnel and contingencies a total sum of £1,971,300—\$9,859,000.

I am of opinion to properly accommodate the Canadian and American rolling stock, generally (exclusive of the special cars on the Intercolonial Railway) the tunnel should have an internal diameter of not less than 18 feet. Such a tunnel constructed as specified for the 16 feet tunnel, estimated to cost subject as hereinafter mentioned £140 sterling per lineal yard, or say £1,890,000 from shaft to shaft, or with land tunnel and contingencies a total sum of £2,252,500—\$11,262,500.

I would recommend, that, before inviting tenders for the chain work, a shaft so placed at Carleton Point, as approximately shown on Appendix F, as to be afterwards available for permanent pumping and ventilating purposes should be sunk well into the red clay shale, which lies above the grey carboniferous sandstone, care being, however taken not to approach closely to such sandstone. This shaft might be either at once lined with local brickwork upon hardwood cribs, or temporarily with timber. If any large feeders were met with, a portion of the shaft might require casing or tubbing. A pumping plant of sufficient power to deal with any ordinary feeder, should be provided before commencing to sink.

Borings similar to those taken at the "Sarnia" tunnel (viz: from a vessel or platform through fine wrought iron pipes, so as to ensure cores of sufficient size and undamaged being brought to the surface) should be made

REDPATH CONCERT COMPANY Lyceum, Monday, 22nd inst.

ONE NIGHT ONLY.

PROGRAMME.

- 1. PIANO.—(a) "Transcendental Grand March".....Gilbert (b) "Concert Polka".....Bartlett. MR. JOHN FRANCIS GILDER.
2. RECITAL—"Amateur Theatricals".....Shakespeare. MR. EDWARD K. HOOD.
3. VIOLIN—"Gipsy Dance".....Sarasate. MISS EDITH E. CHRISTIE.
4. WHISTLING SOLO—"Flor di Margherita".....Arditi. MISS ELLA M. CHAMBERLIN.
5. RECITAL—"The Light Foot Over the Range".....Barton. MR. HOOD.
6. PIANO.—(a) "Andante and Rondo Capriccioso".....Mendelssohn (b) "Plantation Echoes".....Gilder. MR. GILDER.
7. VIOLIN—"Legende".....Wieniawski. MISS CHRISTIE.
8. WHISTLING SOLO—"Selections from 'Erminie'".....Jakobowski. MISS CHAMBERLIN.
9. RECITAL—"A Sure Cure".....Mark Twain. MR. HOOD.

POPULAR PRICES:

Reserved Seats, - - - 35 Cents. Admission, - - - 25 "

Tickets may be procured at the Diamond Bookstore, Hazzard & Moore's, Reddin's Drug Store, Apothecaries' Hall, W. R. Watson's, A. S. Johnson's and F. De C. Davies'.

MONDAY HALF HOLIDAY!

WE, the undersigned Merchants of Charlottetown, hereby agree to close our Stores EVERY MONDAY AFTER-NOON, from ONE o'clock, beginning the first Monday in July until the first Monday in September, both days inclusive.

DRY GOODS. BOOTS & SHOES. JEWELERS.

- James Paton & Co., Stanley Bros., Beer Bros., Prowse Bros., J. B. Macdonald, Perkins & Sterns, Harris & Stewart.
A. E. McEachen, C. B. Warren, J. C. Sprague, Goff Bros., J. B. Macdonald, R. K. Jost (2 stores)
E. W. Taylor, G. G. Jury, E. S. Bonnell, J. A. Cameron, F. S. Mitchell, G. H. Taylor, W. W. Wellner.

Charlottetown, June 20, 1891.

at intervals of, say, not more than 500 yards, right across the straits, and down to the carboniferous bed rock, but this line of borings should be at some distance, say 300 yards from the centre line of the tunnel. This work should be carried out in the presence of an experienced engineer, who should carefully note the samples taken.

With this information obtained, much closer tenders may be expected for the construction of the tunnel, whilst the cost of these temporary works will be comparatively insignificant.

When the work is resolved upon, immediate steps should be taken:

- 1st. To connect the existing railways, either permanently, or by temporary "over-laid routes" to the shafts, with the tunnel works.
2nd. To establish brickyards at the nearest available site, where good clay free from lime is to be found. The quantity of bricks required will vary from 30 to 60 millions, according to the size of the tunnel.
3rd. To erect dwellings, stores, etc., for the staff and workmen.
4th. To put down the permanent pumps and provide the necessary plant for temporary purposes.
5th. To install the necessary electric plant and motors.
6th. To provide and fix the compressed air machinery.

The tunnel, when ready for traffic would require mechanical ventilation, but, by the adoption of a door at one end to be locked, and worked automatically by the signals, the necessary machinery would be reduced to great simplicity, and might consist of a fan of probably 30 feet diameter with the necessary engines and boilers, similar to those erected under my supervision and which have now worked most successfully, and economically for several years on the Mersey Railway at Liverpool.

The traffic through the tunnel could be advantageously conducted either by cable or by electric motors, somewhat similar, in general principle though not in detail, to those now in regular work in London, and about to be introduced by Mr. Greathead and myself in Liverpool.

Arrangements would have to be made for protecting the approaches at either end from snow, and for clearing them of water, which would otherwise find its way to the tunnel. I have been greatly assisted in the preparation of the necessary data for this report, by the Hon. Senator Howland, who has given much time and attention to the matter, and whose local knowledge has enabled me to arrive at a close estimation of the requirements.

I am Sir, Yours faithfully, (Sd) D. DOUGLASS FOX. 28 Victoria Street, Westminster, London, May 5, 1891.

Halifax and P. E. Island.



S.S. FASTNET.

A. H. KELLY, COMMANDER.

WILL sail from Halifax every Monday, at 10 p.m., for Charlottetown, calling at Canso, Arichat, Hawkesbury, Port Hastings and Souris. Returning, will leave Charlottetown every Thursday afternoon, calling at same intermediate ports with the exception of Souris.

For Freight, etc., apply to W. W. CLARKE, Agent.

Charlottetown, June 20, 1891—dy

BOSTON STEAMERS.

EGG SHIPPERS

WILL please note that there will be a WEEKLY BOAT for remainder of the Season, leaving Charlottetown every THURSDAY EVENING, at Six o'clock. CARVELL BROS., Agents.

Charlottetown Athletic Association Classes.

LADIES.—Tuesdays, Thursdays and Fridays, from 11 until 12 o'clock, noon. BOYS.—Every day, from 4.30 until 5.30 p.m. MENS.—Tuesdays, Thursdays and Saturdays, from 6.30 until 7.30 a.m., and Tuesdays, Thursdays, Fridays and Saturdays, from 8.30 until 10 p.m. The Gymnasium will be open daily to members from 6 a.m. until 10.30 p.m. from 10 a.m. until 12, noon, to Ladies only. Boys' tickets not good after 6 p.m. Tickets may be obtained from the Secretary. H. D. JOHNSON, M.D., Secretary C. & A. jn20-tf