CHAPTER XII.

THE NOVA SCOTIA DISTRICT.

Length and Sub-Divisions - General Description - The Cobequid Mountains - Geological Features - Springhill Coal Field - The Iron Mines - Division U, Old Line - Division V, Eastern Extension - Division W, Contract No. 11 - Division X, Contract No. 4 - Division Y, Contract No. 7 - Division Z, Contract No.12.

This District commences at Moncton, and after following 8 miles of the railway between Saint John and Shediac, takes an indirect course, the general bearing of which is nearly south-easterly, to terminate at Truro at the head of Cobequid Bay, in the Bay of Fundy.

It comprises the following divisions:-

Division U.	E. & N. A. Railway,	7¾ miles long.
Division V.	Eastern Extension,	37 miles long.
Division W.	Contract No. 11,	4½ miles long.
Division X.	Contract No. 4,	27 miles long.
Division Y.	Contract No. 7,	24¼ miles long.
Division Z.	Contract No. 12,	24¼ miles long.
Total length,		**124¾ miles.**

It has the most crooked alignment, the greatest extent of curvature, the sharpest curves, the highest bridge, the deepest embankment, the steepest grade, and the second highest summit on the whole railway. It touches tide water at four points, and a considerable summit is found between each two of the points. It has the longest stretches of the most level ground; and it passes through the roughest country, except that at the chief summit on the St. Lawrence District. The character of its soil is accordingly varied, ranging from the highest fertility in the marshes surrounding the heads of bays of the Bay of Fundy, to almost absolute barrenness in the elevated spots. Its rocks range from the granite of the Cobequid mountains, to the coal measures. It was the source of protracted contention in regard to the route; although the location was confined to the narrow limits of an Isthmus between the Gulf of St. Lawrence and the Bay of Fundy.

The Cobequid mountains cross the Nova Scotia District about 25 miles from its southerly end. From Moncton to the Cobequid range, the line crosses three belts of lower carboniferous rocks, and two of the middle coal formation; one of the former being at either extremity, the third being in the middle. The well-known Springhill coal field, is situated on the most southerly of the belts of the middle coal formation.

The flanks of the Cobequids are occupied by rocks partially metamorphosed. On the southerly side the strata consist of quartzites and slates. These are intersected by a large irregular vein composed of carbonates and oxides of iron. This vein extends a long distance on each side of the railway, and is being worked by the Steel Company of Canada. The construction of the Intercolonial line and the Branch to Pictou, places the iron region midway and within easy reach of two all but inexhaustible coal fields. These favourable conditions promise the future establishment of important industries in this quarter.

In the middle of the Cobequid range, a hard reddish granite or gneiss is met. Between the Cobequids and Truro, the railway traverses another trough of carboniferous rocks, but no coal-

seams sufficiently thick for profitable working, have been found.

The first District Engineer, was Mr. W. H. Tremaine, who had had the conduct of the location surveys, and also assisted in the preliminary surveys of 1864. He remained in charge of the works until the close of 1871, when he was succeeded by Mr. Collingwood Schreiber, who remained until their completion.

DIVISION U.

This title has been given to a section, about eight miles long, of the St. John and Shediac Railway, extending northward from Moncton to Painsec, which is common to the two railways. The St. John and Shediac Railway was constructed by the Government of New Brunswick, and is a part of one of the rival schemes of 1845, for connecting Quebec and Halifax. This section was opened for public traffic in 1860, and having been well constructed is in excellent order. The Engineer-in-Chief, was Mr. A. L. Light.

DIVISION Y.

This Section, otherwise known as the "Eastern Extension" of the St. John and Shediac Railway, extends from Painsec to the Provincial Boundary Line.

It was constructed by a Company under contract with New Brunswick, and was finished during the summer of 1871. After completion it was purchased for the Government of the Dominion, by the Intercolonial Railway Commissioners, for the sum of $894,000; being at the rate of $24,000 per mile, for 37¼ miles, its total length. The line departs, to some extent, from a right line drawn between the termini; making a sweep of seven miles in a distance of 20 miles. Besides this general deviation, the line in itself is exceedingly crooked, 13 of the 37 miles being on curves, some of which are very sharp. About the middle of the division there is a sharp 4° curve (Radius 1,432 feet) which sweeps round a semi-circle; it is succeeded by another curve, nearly as sharp, which passes round three-eighths of a circle. These curves are on long maximum grades.

As a great deal of this division is on meadow land, the cuttings and embankments are generally light. There is, however, some heavy work, but as the railway was constructed at a fixed rate per mile, easy construction was more attended to than directness of route. Consequently, even in the most difficult sections of the route, so much curvature has been thrown into the line, that the earthwork on the whole, is comparatively easy. The curves are, as a rule, sharp, and the grades steep.

From Dorchester, the middle of the division, for more than four miles, there is an almost continuous ascending grade, the greatest part of which rises 1 in 100. It is succeeded by a continuous descending grade of 1 in 100, for 2 miles. The remaining grades are easy, the few that rise quickly, have been introduced to reduce the earthwork.

In the meadow lands, or marshes, which would be covered by high tide, "aboideaus" have been built across the embankments to keep back the rising tides. They are square wooden culverts, generally about 3 feet 6 inches wide, each side made of three squared logs, laid transversely to the railway, the top and bottom being of squared logs laid at right angles with the sides. The lower end for six or eight feet, is 4 feet 4 inches square; where the narrow dimensions commence, two half doors are hung horizontally, one at the top and one at the bottom, closing together tightly in the middle, the lower rising with the rising tide. They are made of hard wood,

in pieces bound together by copper bolts. The lower falls on a slip of wood to keep up the outer edge a few inches, and the rush of the incoming tide is sufficient to raise it to a vertical position and close it. Under circumstances where a larger sectional area, is necessary for the drainage discharge, instead of increasing the size of the aboideau, two or more are constructed side by side. In one case, at Aulac, east of Sackville, there are five. These aboideaux have in all cases been found very efficient.

When the railway embankments are subject to the action of the tides, a cheap but efficient protection for the slopes, has been formed, by placing trees and brushwood in layers at right angles to each other, with thin *couches* of ordinary marsh mud***** between them. This protection, even when almost plumb on the face, has fully succeeded.

On this portion of the Railway there are many small pile and trestle bridges. A peculiarity in their construction is the use made of "Ships' Knees" as angle pieces.

A bridge with three spans, each 160 feet wide, crosses the river Tantramar, at Sackville. The superstructure is of iron, on the English lattice principle: the roadway is on the lower chord, the upper horizontal bracing being at a height to admit the passage of trains. The piers were, in the first place, of slight construction. Indeed they may be described as having had no greater dimensions than was barely necessary to carry the superstructure. Consequently, the first winter tried them severely; one pier subjected to a heavy thrust of ice was found not to have strength sufficient fully to resist the strain, and a displacement resulted endangering the whole structure. These piers have since been rebuilt, at a cost many times exceeding the outlay which would have been necessary to build them sufficiently massive in the first place.

Six miles from Painsec, there is an iron girder bridge of 50 feet span; the only one of the Warren pattern between Riviere du Loup and Halifax. The roadway is carried on the top chord.

In general, there is not sufficient ballast on this division, and in many places it is not of good quality. Difficulty was experienced in obtaining suitable material; excepting near Sackville, there was no good gravel to be had on the line. Iron rails are laid 34 miles; the rails have not worn well; the insufficiency and inferior quality of the ballast have doubtless contributed to this result, foe without good and sufficient ballast no road can be maintained in good order.

The Eastern Extension, having been constructed by the Province of New Brunswick, ends at the boundary between that Province and Nova Scotia, in the middle of the river Missiguash; and, as is usual in such cases, only the Western abutment of the bridge over that river was built by New Brunswick.

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DIVISION W.

CONTRACT NO. 11.

This Division begins in the middle of the river Missiguash, and includes the Eastern abutment and the whole superstructure of the bridge.

This superstructure is of wood, a Howe truss, with the roadway on the bottom chord. The span is 100 feet, the width between the trusses 19 feet, and the total height of the truss to the upper horizontal bracing, 21 feet 6 inches. It is the third of the wooden truss bridges on the whole line of the Intercolonial Railway.

Although timber has been employed in spanning the river, the abutments are of substantial masonry, in every way suitable for the support of iron girders; should a spark at any

time from passing trains lead to the destruction of the bridge by fire, and for a time sever railway connection between the two Provinces.

The masonry is built on a pile foundation properly protected by crib-work and rip-rap from the wash of the tide.

There are two aboideaux on this division; one for Gordon's Brook, near the first mile; and the other for the river La Planche, about 2½ miles from the beginning of the division. The first has double, and the second has four-sluiced passages.

There was considerable sinking of embankments over places where the marshes were soft and boggy, but it was anticipated and provided for.

The division is only 4½ miles long. The work was let in November, 1869, to Messrs. Davis, Grant and Sutherland, for $61,713, to be completed by September of the year following. Changes were made in the location and grades, by which the cost of construction was increased by $8,668.24. The work was not finished until 27th November, 1871.

The average quantity of excavation is 37,750 cubic yards per mile, and of masonry 290 cubic yards.

The Resident Engineer in charge was Mr. George H. Henshaw.

DIVISION X.

CONTRACT NO. 4.

This Division, 27 miles long, is the longest division constructed under the Commissioners. It begins one mile east of Amherst, on the "Amherst Ridge," where there is a cutting, one mile long, which contained 60,000 cubic yards. The embankment following was calculated to require 50,000 cubic yards in less than half a mile of its length. On account of its soft marshy bottom, a further quantity of 18,000 cubic yards was provided. The embankment has settled down, spread out at the base, and raised up the adjoining surface; the sinkage still continues, and the embankment requires occasional attention. There is, however, no probability of accident.

The line is much curved, there being forty curves amounting in the aggregate to nearly 13 miles in length, with more than 1,600 degrees of curvature. One curve, almost a mile long, encloses an arc of 127 degrees; and is followed by one, 1,000 yards long, enclosing an arc of 103 degrees. Only a few of the curves are of short radius.

Generally the grades are approximately level. But for 14 miles the separate grades vary from 0.75 in 100 to 1 in 100, three ascending eastwards, divided by level, or easy grades in the same direction; the total height ascended is 206 feet in 5 miles, gaining the highest point on the division, 245 feet above the lowest point. The line then descends continuously for 133 feet in a length of 3¼ miles.

The first cutting, with 60,000 cubic yards, is the heaviest on the division. The cutting at the tenth mile contained 42,000 cubic yards. There are four heavy embankments, the lightest requiring 42,000 cubic yards, the heaviest 65,000 cubic yards. Except on the marshes the embankments are all short; the cuttings are also short.

The quantity of rock in the cuttings, was in the ratio of one to twenty of earth.

A special protection, which has been found efficient, was provided for the railway, where the line runs close to the Maccan river. Piles were closely driven to the level of the ground, by the side of the river, stayed by a second row of piles driven inland, 10 feet apart, the space

between being filled with stone and brushwood.

There are several aboideaux on the line, similar to those described, and many small culverts of masonry.

The Nappan river is crossed by a bridge 100 feet wide, with wrought iron superstructure, having the roadway on the lower chord. The abutments are built on a pile foundation, the outside piles being closely driven, and the foundations protected by masses of heavy riprap. Embankments washed by the tide are protected, according to local practice, by brushwood and small poles, laid in layers with "marsh mud" between them.

A skew bridge of 24 feet span, with iron superstructure, is constructed over a tramway from a coal mine.

A third bridge, of 100 feet span, with iron superstructure, is built over the Little Forks river. The abutments are about 33 feet high, built on rock a few feet below the bed of the stream.

The work was let in 1869, to Messrs. Elliott, Grant and Whitehead, for the sum of $297,000. At the close of that year, when work to the amount of $46,200 had been performed the contractors found their prices were too low; and their contract was annulled. On 25th May, 1870, a new contract was entered into with Messrs. Smith and Pitblado, to finish the work for $438,326, on 1st July, 1871. It was finished one year later.

The length of the division is 27 miles. The average quantity of excavation per mile is 25,800 cubic yards, and of masonry 418 cubic yards.

The Resident Engineer to the close of 1871, was Mr. Geo. H. Henshaw: at the latter date the District Engineer assumed charge and Mr. J. R. Smith acted as assistant.

At the Springhill station, a branch has been constructed to the Springhill coal mines. It is short, with sharp curves and steep grades, and with numerous changes in both. The ballast is bad, in many places being sandy clay. The Branch is not a part of the Intercolonial Railway, but is worked by the Springhill Coal Company.

DIVISION Y.

CONTRACT No. 7.

This Section is heavy, having upwards of a million cubic yards of earth excavation, and forty thousand cubic yards of rock. Nearly all the heavy work is on the last six miles. There are several deep rocky ravines, the embankments over three of which have respectively a height on the centre line of 70 feet, 96 feet, and 105 feet. One cutting, chiefly rock, has a depth of 52 feet in the centre line; as these works are on the steep sides of hills, so the extreme heights and depths are greater.

The division for three-fourths of its length is on ordinary rolling land; but for the remaining distance it lies on steep rocky side-hill, by which it ascends from the valley of the river Wallace, to a high summit at Folly Lake, the highest point on the railway between Metapedia and Halifax. The height of this summit is 607 feet above the sea, and the height of the lowest point, at River Philip, near the west end of the division, is 83 feet, so that the total ascent is 524 feet. On the whole length there are eleven miles of steep grades varying from 0.80 in 100 to 1 in 100, 1½ miles descending, and 9½ miles ascending, towards Truro.

The curves are numerous and some are sharp; one, a 4° curve, 1,433 feet radius, is nearly 2,100 feet long; and another, a 3° 20' curve, radius 1,619 feet, is over 1,800 feet long. The total length of curves is above 10 miles, and the total curvature amounts to 1025°. The tangents are all

short except in one instance, where the length is 5 miles.

On this division seven tunnels are introduced, in place of long heavy culverts, in the ravines passed over; three of 9 feet diameter, four of 7 feet. The three former are respectively 300, 355, and 370 feet long. These seven tunnels are cut through solid rock; and require no lining, except in the case of one, which, for a length of 211 feet in the middle, required the protection of stone masonry 18 inches thick, with a water-way of 6 feet. There are, moreover, several tunnels 4 feet wide by 5 feet high, to take the place of bog culverts for ordinary surface drainage. These tunnels are constructed on a steep side-hill and answer the purpose well. The small tunnels, at the upper end, have a wide perpendicular well, cut into the rock, from the bottom of which the incline commences, parallel to side-hill. Choking by floods and injury to the road-bed are thus avoided. A depth of at least 6 feet of solid rock has been maintained over the smaller, and of 12 feet over the larger passages so the conduits themselves are imperishable.

There are three bridges on the division, one over the river Philip with three spans each 100 feet wide. The two others have spans of 50 feet and 60 feet, over branches of the Wallace river. There is nothing peculiar in their construction. The extreme height of the bridge over the river Philip is 60 feet.

The work was let in 1869 to Messrs. H. J. Sutton & Company, for $413,955. After executing work to the extent of $53,731, in 1869, the contractors gave up their contract, as their prices were too low. The remainder of their work was let in May, 1870, for $557,750, to Messrs. James Simpson & Company, the work to be completed on 1st July, 1871; but it was not completed until the summer of 1872.

The total length of the division is 24¼ miles. The average quantity of excavation is about 45,260 cubic yards, and of masonry 342 cubic yards, per mile. There are besides 576 lineal feet of cast iron pipe culverts, and 1,803 lineal feet of tunnels.

The Resident Engineer from the commencement of the work until the close of 1871 was Mr. Tom S. Rubidge, who had been employed in the Exploratory surveys of 1864. Mr. P. S. Archibald, his assistant remained until the rails were laid, and had charge of the track laying and ballasting.

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DIVISION Z.

CONTRACT NO. 12

The first seven miles of this division have many curves, the line winding round headlands of the River Folly valley; the remainder of the division has long tangents with some long flat curves.

As the Railway falls from Folly Lake, 600 feet above the level of the sea, to Truro, only a few feet above the sea level, many of the grades are extreme, the greatest difference of level being 578 feet. One continuous grade, more than two miles long, descends at the rate of 1.20 in 100. There is an aggregate length of 5½ miles on grades descending at rates varying between 0.80 and 0.94 in 100. There are in all 10½ miles of heavy grades on the Section.

Several tunnels take the place of culverts under deep embankments; with one exception, in compact conglomerate rock, all required to be lined, the other six being built in soft red sandstone, or rather a hardened sandy clay.

The most important of the several iron bridges, is that over the river Folly, with six spans of 100 feet, 82 feet in height from the bed of the river, a striking structure built of durable

sandstone of various colours. The foundations are on rock. It spans the eastern portion of the valley at this place. A long narrow ridge, about 50 feet high, divides the valley of the Folly from that of a smaller stream. This second valley, 80 feet deep, is crossed by a solid embankment; the stream being diverted through a tunnel into the Folly.

There are three low bridges, each with two spans of 100 feet; another bridge, over the Salmon river at Truro, has three spans of 100 feet.

The work was let by contract in 1869, to Messrs. Sumner and Somers, for $597,600, to be completed on 1st July, 1871. But on July 1st, 1872, although $551,000 had been paid to the contractors, the work being much behindhand, the Government undertook its completion by days' labour. $105,000 in excess of the original contract sum has been expended.

The total length of the division is 24½ miles; the average quantity of excavation about 43,700 cubic yards per mile, and of masonry 462 cubic yards. There are 1,251 lineal feet of tunnels.

The Resident Engineer was Mr. Wm. Hazen, who had been on the location surveys of 1869. He was in charge until the close of 1871, after which the District Engineer took charge.

At Londonderry station, about 7 miles from the commencement of the division, a branch 3 miles in length, runs to the Londonderry Iron mines. It was constructed by the Mining Company.

At Truro, the Railway joins the line constructed from Halifax to Pictou by the Government of Nova Scotia, before the union of the Provinces.

***** The local term for the rich plastic substance thrown up by the tides of the Bay of Fundy.

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