DOMINION ATLANTIC RAILWAY DIARY VIII

C. H. RIFF

THE

Railway and Shipping World

With which is Incorporated The Western World. Established 1890.

Devoted to Steam & Electric Railway, Shipping, Express, Telegraph & Telephone Interests.

OLD SERIES, No. 137.
NEW SERIES, No. 55.

TORONTO, CANADA, SEPTEMBER, 1902.

10 CENTS A COPY.
$1.a YEAR.

The Midland Railway Bridge Over the Shubenacadie River, N.S.

By G. E. Thomas, M. E., N.S.E.

In this paper it is intended to point out some of the difficulties encountered and overcome in locating and sinking the caissons. This river may be called an arm of the Bay of Fundy, the tide coming in through Minas basin and up through Cobequid bay, rushes through the narrow passage with a velocity of 10 ft. per second on the neap-tide to 15 ft. per second on the spring-tide. There are two tides in 24 hours, and the peculiarity at this point being, that we have all the flow in 2 hours and 30 minutes, it taking 9 hours and 20 minutes to run out; also, that on the incoming spring-tides we had a rise of 17 ft. of water in 20 minutes.

This is known as the Bay of Fundy bore. I have heard it said of its coming on a level plane of 8 ft. I never saw it over 2 ft., and I think the mistake is made by the undulation caused by the tide striking the sand bars and making quite a wave, but I do not underrate the power of the tide in the Bay of Fundy.

The substructural work on this bridge consisted of 2 abutments, 4 pedestals and 6 river piers, and are located as follows: Starting from the west side of the river with a concrete abutment, 30 ft. from the center of this was one pair of concrete pedestals; the next pair was placed at an equal distance from those; then pier 1 was located just 30 ft. east of those. Pier 2, or the draw pier, was located 42 ft. from center of pier 1, and the other piers were 210.50 ft. from center to center, and the east abutment was the same distance from pier 6.

We started work on the west abutment and found a soft shale rock cropping out; we excavated through this about 12 ft. to a hard rock bottom; on this was placed the concrete, bringing this up to surface of ground, and then placing the mould and building up the work to the proper elevation. The same course was followed with the pedestals.

Pier 1 begins at low water and was built up in the open. We had considerable difficulty in preparing the rock under this pier, as it was very uneven, and we had only one and a half hours in which to work on each tide. We succeeded in making a true and practically level bottom on the hard rock, into which we drilled and put in a number of anchor rods, to which was fastened the first course of crib timbers to the rock, consisting of 12 x 12 in. white hemlock timber. It was slow work, as it had to be very carefully done in order to secure success. After this course was securely fastened, it was much less difficult to care for the courses above, each being drift-bolted to the one below. Hemlock timber was used only up to ordinary low water, and above this point we used what is known in that country as bay shore spruce.

When this crib was built up 3 ft. and calked, we put in the first 2 ft. of concrete. The reason for starting so early on this filling was that we could not put in on the low tide more than this quantity. The time was so short during low water, before there was a return of a very rapid tide water, bringing with it a heavy body of sand and mud, and before this came we had to protect the new made concrete by very carefully covering it with canvas, placing on this large stones and filling in between those with small ones to break the force of the incoming water. We learned several lessons before completing our work. This pier 1 was formed differently from the others, it being rectangular. The purpose of this was to enable a protection to be built against it to keep off the ice, etc., during the winter. This crib was not completed last season, winter coming on before it could be done.

THOMAS McHATTIE,
Master Mechanic, Eastern Division, G.T.R.

The first pneumatic pier to be put in was no. 6, and was the one on the Colchester county or east side; the plans of piers and the profile showing the bed rock, etc., were furnished by the M.R. Co.'s engineer. This profile proved faulty, as the rock did not materialize at the points indicated. Low water was shown at a given elevation, and immediately under the bottom of pier 6 the rock was shown to be too close to enable us to put on a timber roof and have this submerged, as we required at least 6 ft. for a working chamber in a pneumatic caisson.

With the consent of the Chief Engineer I decided to build up the walls of the caisson to 8 ft. high, putting on a roof of two courses of 12 x 12-in. timber, lined with 3-in. spruce plank, and calking the seams, fitting up air and supply shafts, and building up a temporary crib around the sides and ends, and loading this with rock to overcome the uplift of the tide. After reaching the bed rock we removed this temporary roofing, etc., and carried up the concrete continuous to the bridge seat. This involved a large amount of extra work, but we did not consider it safe to put in a timber roof that would be exposed to the climatic changes and subject to rapid decay. However, I found upon reaching the point indicated as rock on the profile, that we had still to go 3 ft. deeper to excavate in order to reach bed rock. This greater depth, if known in advance, would have enabled me to put in a permanent roof on which we would have built up the permanent concrete, thus not only saving labor, but very valuable time. Immediately overlaying the bed rock under this pier we found a hard conglomerate, embedded in which were large boulders, making it a hard material to excavate.

Our next pier was no. 5. This was located 210.50 ft. from the centre of no. 6, and about 500 ft. from shore. The caisson for this pier was built to pass through the class of material indicated on the profile, that is a soft material permitting rapid sinking; but in this we were disappointed, as from start to finish we encountered an entirely different formation to that represented. Not only was the material which we passed through different to that represented, but we had to go about 14 ft. further to find bed rock. This, of course meant a great expenditure of time and money, especially in such a river as the Shubenacadie.

We met with a strange accident in the early stage of sinking this caisson. The tide was due in half an hour and the men were getting ready to come out, as I never allowed them inside the caisson when the tide struck the

The Midland Railway Bridge Over the Shubenacadie River, N.S.

(*Continued from page 293.*)

site. This caisson was out on a sand-bar, and the tide was so low there was absolutely no current at this point at the time; and as there was only 4 ft. of water in the working chamber, there was a very light air pressure. Due, I think, to some carelessness, the two doors of the air lock were allowed to be opened at the same time, and in this way there was a rush of water into the body of the caisson which so frightened some of the men, they made a stampede for the shaft, each trying to get there first. I was informed by some of the older pressure-men, who were not frightened and stood their ground, coming out after all the trouble was over, that if the men had kept cool all would have been well. However, we are not all built on the same lines, and we would all be better men were our first thoughts equal to our second. We lost four men, who were taken out dead. In three minutes from the time the air was lost from the chamber everything was again in working order and the water was out of the working chamber. In fact, it was not realized that four men were injured until they were found in the bottom of the caisson chamber. The accident was thoroughly investigated by the coroner, a competent jury and the friends of the deceased, and all exonerated the contractors. I would say there was not any change made in any of the machinery or appliances after the accident, the men showing implicit confidence in the system by returning to work as soon as the bodies had been shipped to New York, except one who was buried in a little churchyard near the bridge site, and who, I was informed, had been a soldier in Her Majesty's service at Halifax. His fellow-workmen erected a very handsome stone over his grave giving an account of the accident.

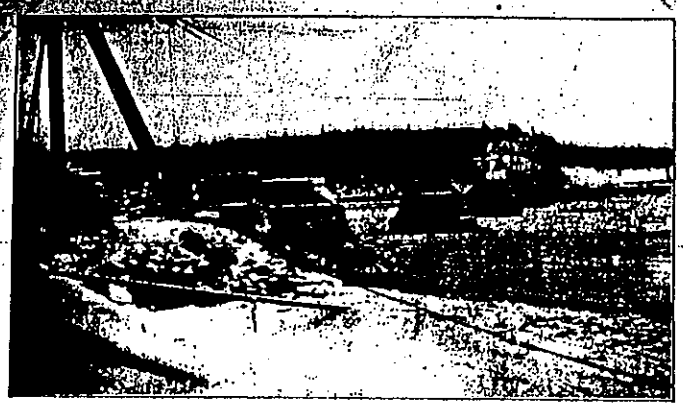


FIGURE 1.—SHUBENACADIE RIVER BRIDGE.

We experienced much difficulty in getting this caisson to the bed rock, having to take it about 14 ft. deeper than indicated, through a very hard tenacious material, which necessitated the use of a large quantity of dynamite. We could not make much impression on it with ordinary picks, and had to resort to drills, steel bars and explosives. However, we finally reached bed rock, and made a first-class concrete pier.

We next went over to pier 2, which is the draw pier and is located about 42 ft. from the centre of pier 1. It will readily be seen that the opening for vessels to pass is small. On pier 2 rests the small jack-knife draw. We experienced great difficulty in getting the rock under this pier level enough to receive our caisson, as at low water there was only 2½ ft. of water at one end and nearly 12½ ft. at the other. This necessitated doing some under-water drilling and blasting before bringing the caisson down. The point of location of this pier was the most difficult to do this work in, as it had to be done at extreme low water, and the lower the water the greater was the concentration of the tide. The incoming tide, in time and force, depended somewhat on the direction and force of the wind in the lower bay that would cause it to vary as much as thirty minutes between some tides. One day it came up so much before it was expected, it washed away our steam drills and tools, swamping the heavy working float that was held by heavy steel wire cables. This float came up after the tide slacked up, but the tools were never seen afterwards. There is no use trying to handle these tides during the strong run. After a hard fight and persistent effort we finally got this rock so levelled up by the use of stone and clay thrown in on the slack tide from our cable bucket, that it was possible to put this caisson in position and get enough weight on top to hold it down. This enabled us to get inside of it and level the rock, taking the caisson down through the temporary filling and making a first-class job. We filled the working chamber and completed this pier up to the coping, none of which was set, however, until the concrete was well settled.

The next pier was no. 3, and with this one we had the least trouble. This is not saying it was easy work, but we had been well drilled into the work with the others by this time, that this one seemed comparatively easy. After the experience I had with the material and location of bed rock in no. 5, I concluded I would alter the form of the cutting edge and strengthen the caissons for piers 3 and 4. This was done by putting on the outside a course of vertical timbers, 12 x 12 ins., letting them extend down about 12 ins. below the other side timbers, and bolting them through into the working chamber; putting in extra through rods, etc., etc. We got no. 3 to bed rock and filled with no more than the to be anticipated amount of trouble. This, however, was the calm before the storm. We started in on no. 4, the last of the caissons, and which was known as the "Z. J. Fowler," named after the Chief Engineer of the Midland Ry. This caisson was launched and taken down to the bridge site in good time and without accident, getting it out into position, and leaving it about 12 ft. above the direct centre line of the bridge. We did this to enable us to put on the first lot of concrete as the flotation of the timber in the caisson was so great, and the time between the tides so short, we could not get weight enough on it in one tide to hold it down. We used two day-light tides to do this work. We put in all the concrete we wanted on the first tide, the caisson riding safely over the night tide. The next morning we located it exactly in position and were anxiously watching it settle. At this time the water was passing freely over the sand-bar directly above us; this seemed to stop instantly and the bar was exposed; this caused the water to strike the west bank of the river, concentrating the full force of the falling tide against the upstream west side of the caisson, which parted the three steel cables and forced the caisson out of position, and in five minutes it was hard aground 8 ft. out of position toward the east. All the moving cables were rigid except the broken ones. These we had to renew and the others to slack up before the tide came again to allow the caisson to rise with the incoming tide. This it did successfully; but before we could get down to renew the broken side cables, the sand-bar had been removed, due to the presence of the caisson above it, causing a very great concentration of tide under the working chamber. This caused the structure to roll over, bottom side up, and I thought, perhaps, the concrete which had been put in would roll out, but in this I was disappointed. You will notice there are times when it does not pay to use an extra quality of concrete. I knew the caisson could be rolled back; but the same conditions would exist, and the momentum of rolling would have to be cared for. I concluded to try, as we might succeed. We put on the purchase and rolled it back, but it kept rolling. At once I decided to remove the caisson to the shore, if possible. All the cables except the inshore upstream one were cast loose and allowed to drag on the bottom, and thus steady the caisson as it flanged to the bank. It did all I anticipated it would, until the mooring gear, which was now on the under side, caught in one of the large anchors, which brought too much strain on the cable and parted it. The caisson then floated up the river on the strong flood tide, and we followed it in our yawl boats and with strong manila lines. We rowed much faster than the caisson drifted, and securing a 1,000-ft. line to a tree on shore, we rowed out to meet the caisson, and in this way navigating it into slack water, then landing it until the returning tide, when, with the assistance of our tug boat, we took it on the early ebb tide to our building yard, there taking out the concrete, using dynamite. We then wrapped four 1⅛ inch steel hawsers around the caissons, two each way, and led these on shore. Putting a heavy purchase on to each, and taking the hauling parts to separate engines, we rolled the caisson back into position. Notwithstanding that this caisson had endured such hard usage, it was but very slightly damaged. We at once made the necessary repairs and prepared to get it into position, which we did with perfect success. We experienced a new difficulty in filling this crib on this caisson. Every pier put in, reducing the opening for water passage in the river, seemed to act like so many wedges, and made the current more violent in the openings. During the spring tides it seemed next to impossible to keep the new concrete from being washed away. This happened several times, and we would lose the result of a day's hard work. We finally abandoned the use of canvas and used woolen blankets. Those seemed to conform more to the concrete, and in this way we managed to get above the tide. We

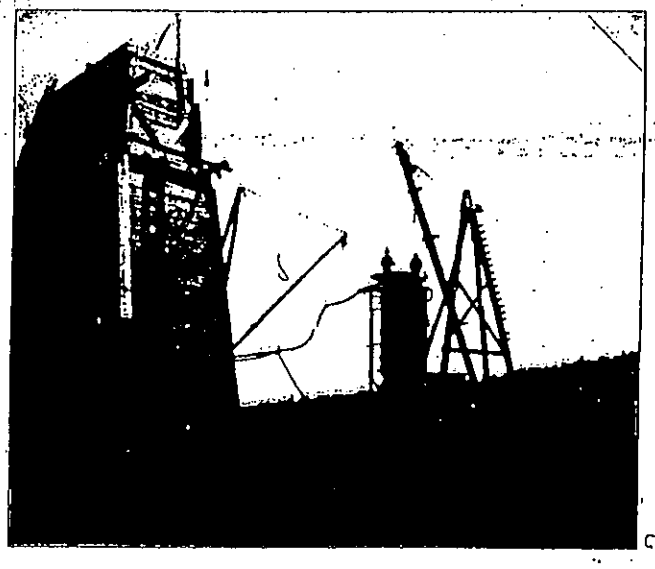


FIGURE 2.—PIER 1, SHUBENACADIE RIVER BRIDGE.

FIGURE 3.—PIER 6, TEMPORARY ROOF REMOVED.

found it was better to keep the concrete close up to our cribbing, thus preventing the scouring action of the water falling over the top of the crib. By watching the changes of the current in the river, I was enabled to so place my direct cables as to hold this caisson that had once got away from me. It certainly was a very trying and anxious time. The men who stood by me through the placing and sinking of those caissons did their full duty, and I assure you it was a very nerve-trying position. The plan adopted by me to locate those caissons was, first, to take the caisson down from the building yard to the mouth of the five-mile river, which was about 300 yards above the centre line of the bridge. In order to do this, we had to start at certain periods on the tide, there being so many changes of the current in this river. The distance from the building yard to the bridge site was only a mile, but there were so many swirls and eddies we had to keep lines on shore the whole distance and check up on the cable at the lower end. Another strange feature of those tides is, that the body of water would be falling and still a very strong current on the surface running up, and at a certain time of each tide, without any notice, the whole river would be running out with apparently irresistible force, and if not prepared for this you would move down stream with it. We were taught more than one lesson this way. There is absolutely not over 30 minutes on the top of high water when you can handle any floating stock at the site of the Shubenacadie bridge. I saw this upon my first visit to the bridge site, and concluded to use a cableway across the river, the distance being about 1,400 ft. I put up two towers. The one on the west side was built on the marsh bank, and was about 85 ft. above low water, while the one on the east side was built on the bluff, and was about the same height above the water, though the tower being on higher ground was shorter in the posts. Those towers were very strongly built. I also took the precaution of putting some wire guys to the heads of the towers. We did this to guard against the wind strain which came up with the flood tide, sometimes with considerable force. We used a 2½-in. diameter cable with the ordinary working steel wire ropes. The main cable was anchored back in the ground, the end on the west side being held in marsh mud. With this we had to be very careful, and to overcome any possible chance of its giving way, we used as an anchor four very large hemlock logs buried in a deep trench, the front of the trench being planked up with 3-in. plank. The main sheave for passing the main cable through was securely lashed to those four logs with ⅝-in. flexible steel wire rope, each part being brought to a proper bearing, and giving each part its share of the load. We loaded the surface of the ground with field stone. This cable never moved or gave me any trouble, and we have handled between tides as high as 116 buckets of concrete, each bucket containing 32 cubic feet.

The machinery never gave me any trouble further than the ordinary wear and tear of machinery driven under such hard work as this was. I cannot speak too highly of the cable system. I would not say this work could not have been done in any other way, but I would not like to try any other way known to me. We had quite a time getting the main cable over, as the ever-present tide came on us when we were about two-thirds way across; but we completed our task without accident. We also experienced great difficulty in getting our supplies for the work. The stone for concrete was quite a problem. We used large quantities of small boulders which had been washed down the river, and we also found a vein of about 5 ft. of quartzite on the river bank, which we quarried when the tide would allow. You see the tide enters into all our arrangements.

The cement selected by the Dominion Government engineer was manufactured in England and shipped to Halifax by steamer, and from Halifax to Stewiacke siding by rail, unloaded again and taken down to the bridge site in small scows, the distance being about 12 miles.

The sand-bars are so numerous and change so often one cannot take up a boat with more than 2 ft. draft, and this has to be handled with sweep oars and only make from three to four trips per week, up on one tide and down on the next, if you are not nipped or caught. You see the tide is omnipresent. The sand for our concrete was another problem for the same reason. We had to go 50 miles to Five Island Point to get a good and acceptable sand; and this we had to get in schooners, as it is sometimes very rough on the bay. The gravel which entered into the concrete largely had to be bonted on the tide from De Bert beach, about 16 miles down the bay; and only small barges could go after this on account of sand-bars. We had a small tug we sent several times, but we generally had complaints from the captain about the risk. Our coal was quite an item, as this had to be brought either from Passboro or over the Intercolonial Ry. to Stewiacke, and then barged down to the bridge site. It was a common occurrence to see the barge with coal or cement pass the site, going down stream, the tide being so strong it could not make a landing. Even the water for the boilers had to be bonted to the site, about 12 miles, in barges, and only one trip could be made with each barge on a tide. We had to stop sinking the caissons on more than one occasion on account of lack of fresh water for the boilers.

We moored the caissons with not less than six steel wire cables on each, those being not shorter than from 600 to 1,000 ft. each, and fastened to either large anchor cribs filled with rock on a sand-bar, or to anchor bolts put into the rock in the river bed. The cables were fastened with clips to those and attached to the caisson by a specially devised mooring gear. After the caisson had been properly weighted with concrete we would put our machinery barge alongside, mooring it in a similar manner. We would take our water barge alongside the machinery barge and pump the water out as rapidly as possible. We lost all of the large load of fresh water on several occasions by the tide breaking in over the water scow. We tried on one occasion to bring coal off on a barge and use it from this barge, but the incoming tide settled this point by standing the barge on end, dumping the coal, then fouling the moorings and breaking the barge into two parts. After this I ran all the coal out by the cable way, which added much more work to our already hard worked cable.

Machinery, derricks and barges were built by us as strong as wood and iron could make them, knowing as I did the rough usage they would have to encounter. In the barges I used hardwood frames and spruce sides, strongly trussing them throughout; they were 80 ft. long and 22 ft. wide, and 7½ ft. deep, with a good flare at each end. The mooring timbers were very strong, of 14-by 14 in. hardwood, and with a very heavy warping chock on each end. All of which

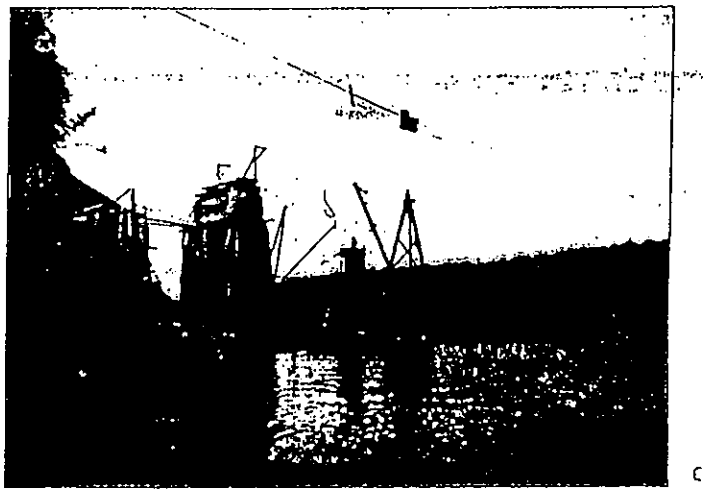


FIGURE 4.—PIER 1 AND WORKING ON PIER 2 FOR DRAW SPAN.

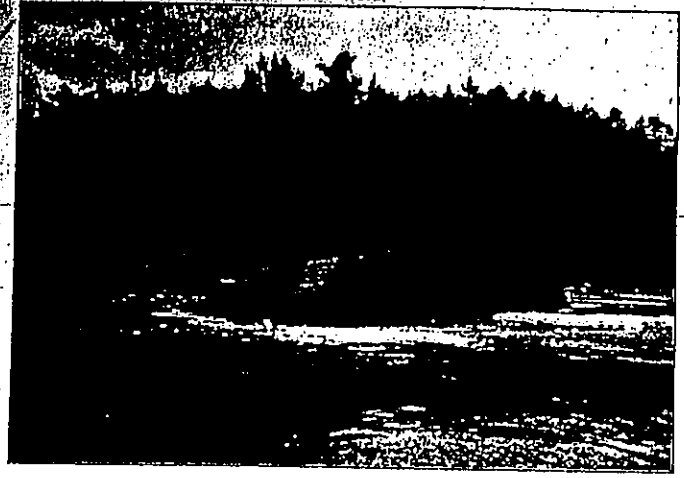


FIGURE 5.—CAISSON FOR PIER 4 BEING ROLLED OVER.

was necessary, as we not only had the racking of the machinery, but the sandbars were so changeable that, generally, at low water, the barges would be on the bottom and very unevenly landed. Our machinery consisted of an ordinary pneumatic plant, viz.: compressors, pumps, boilers, electric lighting machinery, etc. We also had in the hold of the machinery barge a large number of barrels connected with pipe, which we used for water storage, the plant being very compact. Our derrick barge was a duplicate of the machinery barge; it was surmounted with a very strong derrick and carried an 8¼ by 10 in. double winding engine. The coping stones for those piers were quite heavy, four on each pier weighing over 8 tons each. Setting those stones with a long boom was no child's play, with the strong running water that was there. We also had several derricks along the wharf on shore, also at the shipyard where we built the caissons and one up the river at Stewiacke. This work called for more machinery than ordinary work does, due to the time of still water being so limited for loading or unloading supplies.

Our caissons were built of 12 by 12 in. white hemlock and were 62 ft. long, 26 ft. wide, and had 8 ft. of working chamber. The sides were 3 ft. thick, all drift and through bolted, lined on the inside with 3-in. spruce and calked, also braced across and through with 1½-in. rods put in from side to side. A hemlock roof 3 ft. thick was planked over and the seams calked. From this point we started our crib work, this also being calked on the outside. They were built sharp on each end, and each of the ends was faced with hardwood 6 in. thick, which was fastened on with ⅝-in. steel drift bolts; then the nose and shoulders were faced with ⅜-in. steel plates, fastened on with ¾-in. iron rag bolts. The cribbing was 12 by 12 in. bay shore spruce. We did not use any timber ties, but in place used 1¼-in. through rods with turn-buckles. There were four of these put in every third course of timber.

Our concrete was of two classes, viz., hearting and facing; this was mixed on a platform on the west side of the river under the cable way and transferred out to the various piers. In all cases Portland cement was used. We also built into the concrete hook rods made of ¾-in. round iron, which overlapped each other, thus making a continuous bond. These were put in vertically and horizontally. This work was designed by the Chief Engineer of the Midland Ry., Z. I. Fowler, of Ottawa, Ont. He is a very able engineer, and of whom I cannot speak too highly. I found in Nova Scotia a warm-hearted and energetic people, ever ready to extend the hospitality of their homes and hearts to us. The work was done under the supervision of Dr. M. Murphy, the Nova Scotia Government Engineer, whom I found a very able and competent engineer. Mention should also be made of Mr. Douglas, assistant to the Dominion Government Engineer, and J. J. Taylor, resident engineer, Truro, who were concerned in the work and to whom due credit should be accorded.

The foregoing paper was read before the Western Society of Engineers at Chicago, the reading being followed by the discussion given below:

MR. FIRLEY—In describing the foundations for one of the piers Mr. Thomas mentions that there was a hard material that was very difficult to remove. Why was it necessary to remove it?

MR. THOMAS—I will simply say that what has been might occur again, and it was very evident that at some time the river bed was down at bed rock, and at some time in the future the water might go down again to the bed rock. I can never do my work too well, for I realize that human life is concerned in the integrity of the foundations of these piers.

GEN. W. SOOY SMITH—What appears to me most singular, in Mr. Thomas' talk this evening, and what might perhaps invite criticism (which would not be in good taste in the absence of those who designed the work), in the light of American engineering, is the fact that the bridge should have been planned as it was, and that there should have been such a lack of knowledge of the conditions under which these foundations have been built, and even the material itself upon which they were to rest was not well known. The soundings also proved deceptive. It would certainly appear that that, of all situations, was one in which a long span would have been advisable, first, on account of the extreme difficulty of putting in the piers, and, second, because of the obstruction of the piers themselves. Great ingenuity was called for on the part of those conducting this work, as has been made evident to us. The greatest difficulty was imposed upon them, and it seems to me to have been, to some extent, unnecessary, if a thorough knowledge of the work had been obtained in the first place. If a plan of substructure had been made, adapted to the superstructure and adapting itself to the existing conditions, the difficulties would have been very largely reduced, and the final result, it seems to me, very much better.

MR. THOMAS—With regard to the proper soundings being taken, it was what we have all met with and will meet with again, namely, they did not allow the engineer, in the first place, sufficient money to make the necessary examination, and more than that, the man who did make it had evidently never done any of that class of work before, as in place of making "borings" he made "drivings." He drove a rod down; he said he could not turn his pipe down. I made some surveys for the Roberts-Corbin syndicate when I was in the employ of Sooy Smith & Co. It is not generally known, but I made all the borings and all the surveys in New York harbour, from Cortlandt street to Ft. Tompkins, and up the Kill von Kull for the proposed tunneling, etc., which is to be done under New York city. I went down over 200 ft. to rock, using only a 1¼-in. pipe. I went down 104 ft. through boulders and very hard material, and there is no use telling me a man cannot put a pipe down where he wants to, if he understands his business.

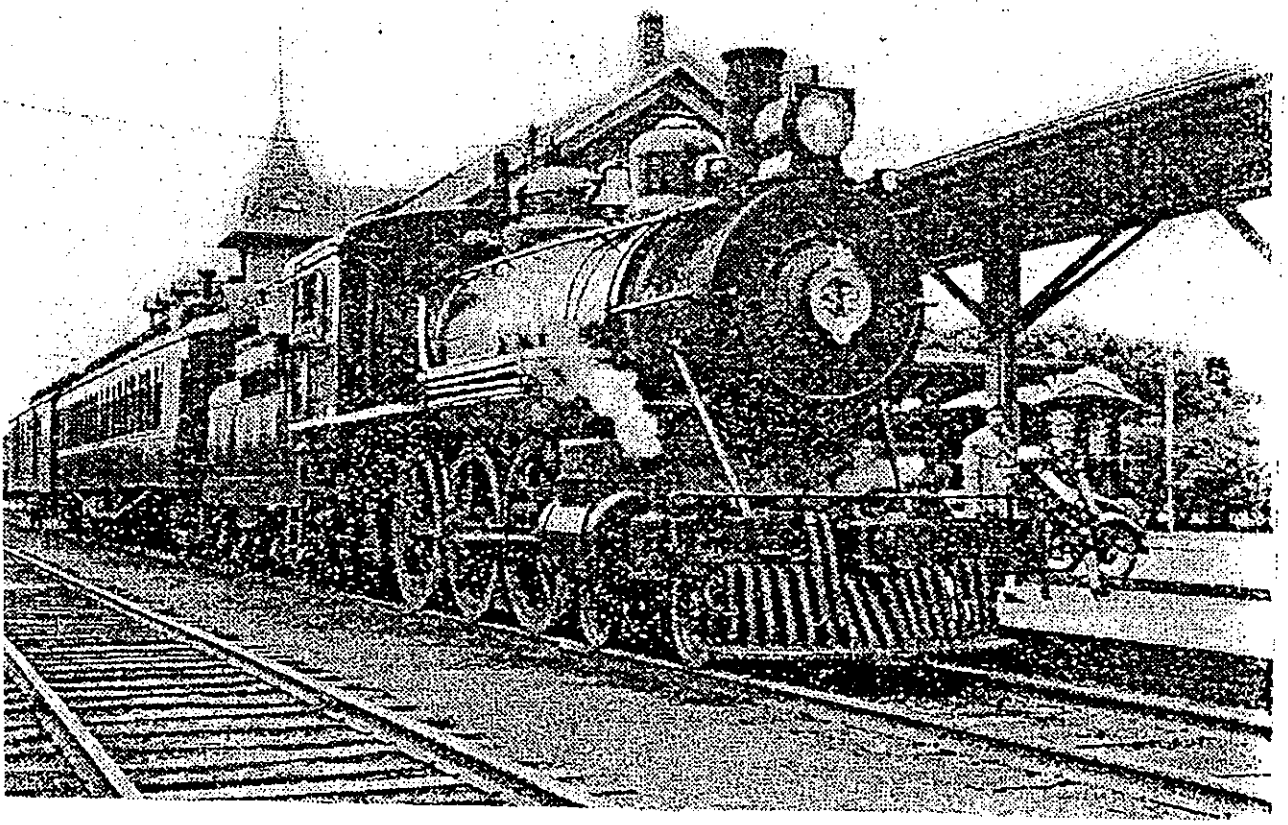
MR. STROBEL—I would like to ask what are the dimensions of these piers?

MR. THOMAS—Size under coping, 24 ft. long by 8 ft. wide; coping, 2 ft. thick, of granite.

MR. STROBEL—What batter?

FIGURE 6.—TOWER SUPPORTING CABLE RAILWAY.

* * *



ıe Kingsport Local at Kentville, N. S., on the Dominion Atlantic (Canadian Pacific)

Railway Age—November 27, 1943

A C.P.R. Locomotive Conversion.

The compound locomotive is going out of use on Canadian and U.S. railways, being replaced by the modern power unit equipped with superheater and piston valves and other refinements of locomotive practice. The accompanying illustrations show a 10-wheel 4-6-0 compound locomotive, built in 1904, and using saturated steam, which was converted into a simple locomotive, equipped with superheater, at the C.P.R. Angus shops, Montreal, recently. Fig. 1 shows the original locomotive after stripping and de-wheeling, but before the removal of the original cylinder castings, the low pressure cylinder and slide-valve steam chest being evident. New piston valve cylinder castings were applied, necessitating slight modifications in the front ends of the frames; new front and back tube sheets, to take the superheater flues, were put in, and a V-H superheater was installed. The Stephenson valve gear was retained, but modified in design. A new dry-pipe was used, and the firebox was equipped with arch tubes and brick arch. Fig. 2 shows the remodelled locomotive on completion of the job. There can be no doubt that the rebuilt locomotive, by its greater power and superior economy, will soon make good the cost of the work of modernizing.

Locomotive Conversion at C.P.R. Angus Shops, Montreal.

Fig. 1. Original compound locomotive, after stripping and de-wheeling.

Fig. 2. The resulting efficient simple superheated locomotive.

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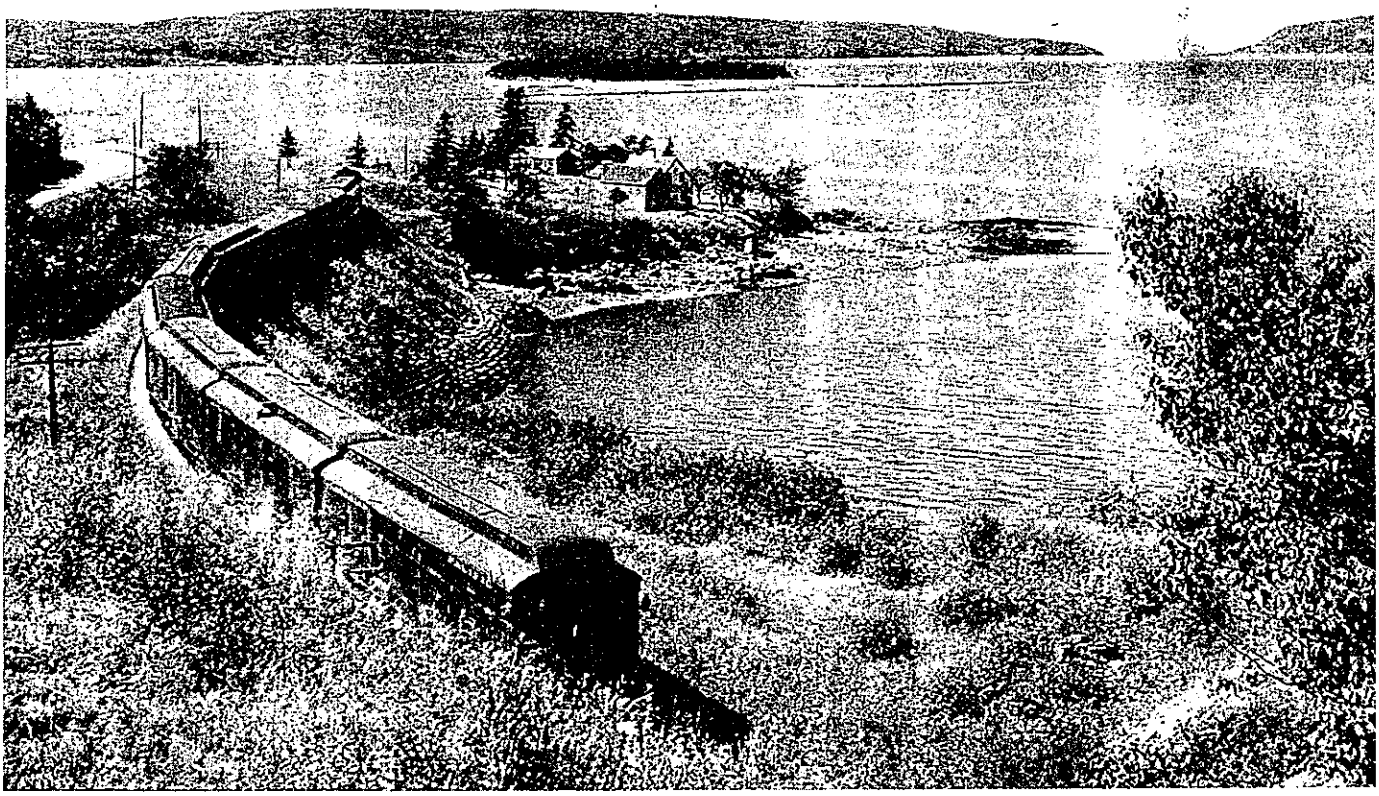
Canadian Railway and Marine World

NADIAN PACIFIC

Spanner

August — 1957

In the Land of Evangeline



Nova Scotia Bureau of Information.

Dominion Atlantic No. 95 follows the shoreline of the Annapolis Basin between Annapolis and Digby. Her steel coaches are ahead of the baggage cars.

BY M. ALLEN GIBSON

SMOKE, steam and the first glimmer of dawn dimmed the lights in the train shed at Halifax, Nova Scotia, as the overnight mixed train from Yarmouth, which carries a Pullman, eased to a stop on track 5. A carman cut Pacific No. 2552 from the train and another run was ended for the Dominion Atlantic Railway's train No. 100.

Trip-weary, sleepy-eyed passengers hurried toward the station concourse with scarcely a glance for the engine or for the crew which had brought them safely through the night. Perhaps a few even complained about the journey, forgetting the ease and comfort which had been theirs on the 217-mile trip. Sixty-five years ago such ease and comfort were unknown. Indeed, at that time any trip from Yarmouth to Halifax was long and arduous, and it was made even more difficult by stopovers and transfers. But then it's human nature to complain, for one generation soon forgets the advantages it enjoys over the previous generation.

Most people who know the Dominion Atlantic, however, are quick to defend it as a "mighty good railway," although they may not admit it at 6:20 a. m. after an all-night trip from Yarmouth. The "Land of Evangeline Route" ranks with the best of the short-line carriers. It taps the rich agricultural district of the Annapolis Valley, serves several industrial and seaport towns, and connects Halifax, the capital of the province, with one of the most highly developed parts of Nova Scotia.

The Dominion Atlantic offers good service with a total trackage of about 300 miles, modern equipment, and a fine fleet of locomotives. Nerve center for the line is Kentville, where all engines and crews on through trains change. Here too are machine shops, paint shops, dispatchers' offices. and all the necessities of a railway headquarters.

Not only does the Dominion Atlantic offer good service on its own line. but it provides excellent interline connections. At Yarmouth it connects with Canadian National's Halifax & South Western, which runs to Halifax along the south shore of the province. A Canadian National branch

OFF THE BEATEN TRACK

Sixty-five years have made a profound change in Nova Scotia's transportation system. Let's take a look at the modern Dominion Atlantic

from Bridgewater, on the south shore, connects with the Dominion Atlantic at Middleton, and the Dominion Atlantic also connects with the Canadian National's main line at Truro and at Windsor Junction, 12 miles out of Halifax. Actually the Dominion Atlantic operates over the Canadian National from Windsor Junction to Halifax.

The Dominion Atlantic was incorporated in 1895, but the events of the preceding 35 years are interesting and significant enough to deserve mention.

The Windsor & Annapolis Railway was the forerunner of the Dominion Atlantic. It was opened for traffic on August 19, 1869. An agreement was made in the same year with the government-owned Intercolonial Railway, which had a line from Windsor to Halifax, to permit through traffic to Halifax. In 1892 the Windsor & Annapolis bought out the Cornwallis Valley Railway between Kentville and Kingsport. Then in 1894 the Windsor & Annapolis purchased the Yarmouth & Annapolis Railway, which had been known until the year before as the Western Counties Railway.

You might wonder why so many short railways existed in such a small district. Geography was an important reason. Several large rivers cut across the present right of way, making construction of a through line impossible. In fact, it was not until 1891 that the 18-mile stretch between Digby and Annapolis was completed. This section connected the Western Counties Railway and the Windsor & Annapolis, and involved the construction of two large bridges. For years this gap, which travelers had to cover by boat or stage, was known as the "missing link."

No history of the Dominion Atlantic would be complete without mention of the two great "acts of God" which caused the infant railroad serious difficulties. In 1869 the Saxby Gale washed out miles of the roadbed east of Wolfville. Then in 1905 snows of unprecedented proportions completely blocked the line. Traffic was suspended for weeks. Students and citizens from all along the line were pressed into service in order to get the trains rolling again.

Also in 1905 the Midland Railway, running between Windsor and Truro, became part of the 10-year-old Dominion Atlantic, and the line adopted standard operating rules. On January 1, 1912, the Canadian Pacific acquired the Dominion Atlantic as a subsidiary under a 999-year lease.

THE prosperity of the Annapolis Valley, through which the Dominion Atlantic runs, has depended a great deal upon agriculture. Here are some of the finest apple orchards in the world. Consequently, warehouses and apple processing plants line the track all the way from Digby to Windsor. Mixed farming, too, plays a large part in the economy of the area. The Dominion Atlantic has filled an important place in the agricultural development of the Annapolis Valley.

A very important source of revenue for the railway has been the gypsum quarries near Windsor. Through the summer months the Dominion Atlantic carries the gypsum from the quarries to Hantsport, where it is shipped by boat to processing plants in the United States. During winter months, when shipment from Hantsport is impossible because of ice, the gypsum is shipped from Deep Brook, with the Dominion Atlantic still acting as the initial transportation medium.

Several smaller industries, lumber, pulp, leather, textiles and peat moss add their products to the freight trains of the Dominion Atlantic. The freight volume is further increased by the great quantity of commodities needed in the thickly settled area served by the "Land of Evangeline Route." Acadia University at Wolfville, some private schools, and armed-services establishments at Deep Brook and Kingston add substantially to the passenger traffic over the line.

The officials of the Dominion Atlantic recognized early the possibilities in the tourist traffic, and great advances have been made by the Canadian Pacific in promoting it. Summer hotels are in operation by the railway at Yarmouth (Lakeside Inn) and at Digby (The Pines). The road also operates the Cornwallis Inn at Kentville, offering year-round accommodations.

This part of Nova Scotia has had a fascinating history, and the Dominion Atlantic has capitalized on it to further the tourist industry. But railway officials have not commercialized the historical assets of the province. Thousands of tourists come annually to a beautiful railroad-established and -maintained memorial park at Grand Pre, near Wolfville, the village of which Longfellow wrote in his poem, *Evangeline*. The old fortress at Annapolis Royal is another historical attraction which the Dominion Atlantic has publicized widely.

Dominion Atlantic officials, long aware that the welfare of the railroad depends upon the welfare of the province, have been active in working for the advancement of that part of Nova Scotia which the railroad serves.

Early locomotives on the Dominion Atlantic bore such prosaic names as *Mayflower* and *Gabriel*, but in more recent years the railway turned to Nova Scotia's history for locomotive names. This practice was lost in the confusion of the Second World War, and today nameless locomotives haul the trains.

There was something thrilling about such names as Cornwallis, founder of the city of Halifax; Membertou, first Indian in the region to be converted to Christianity, and DeMonts, founder of Port Royal in 1604. (This town, now known as Annapolis or Annapolis Royal, is the oldest in North America north of Virginia.) These historical figures had their names emblazoned on the red Dominion Atlantic locomotives, but even the red color disappeared during the war. It was a fitting tribute, too, that the names of those who helped develop the country were given to locomotives which were playing a further part in that development.

The Dominion Atlantic has no name trains. In the years before World War II the *Flying Bluenose* ran during the summer months, and was the crack train of the line. But it also appears to have been a war casualty; it is not on the timetable now.

A GLANCE at a map of Nova Scotia will show that the area served by the Dominion Atlantic occupies a peculiar position. Land travel from any part of Nova Scotia to the rest of Canada