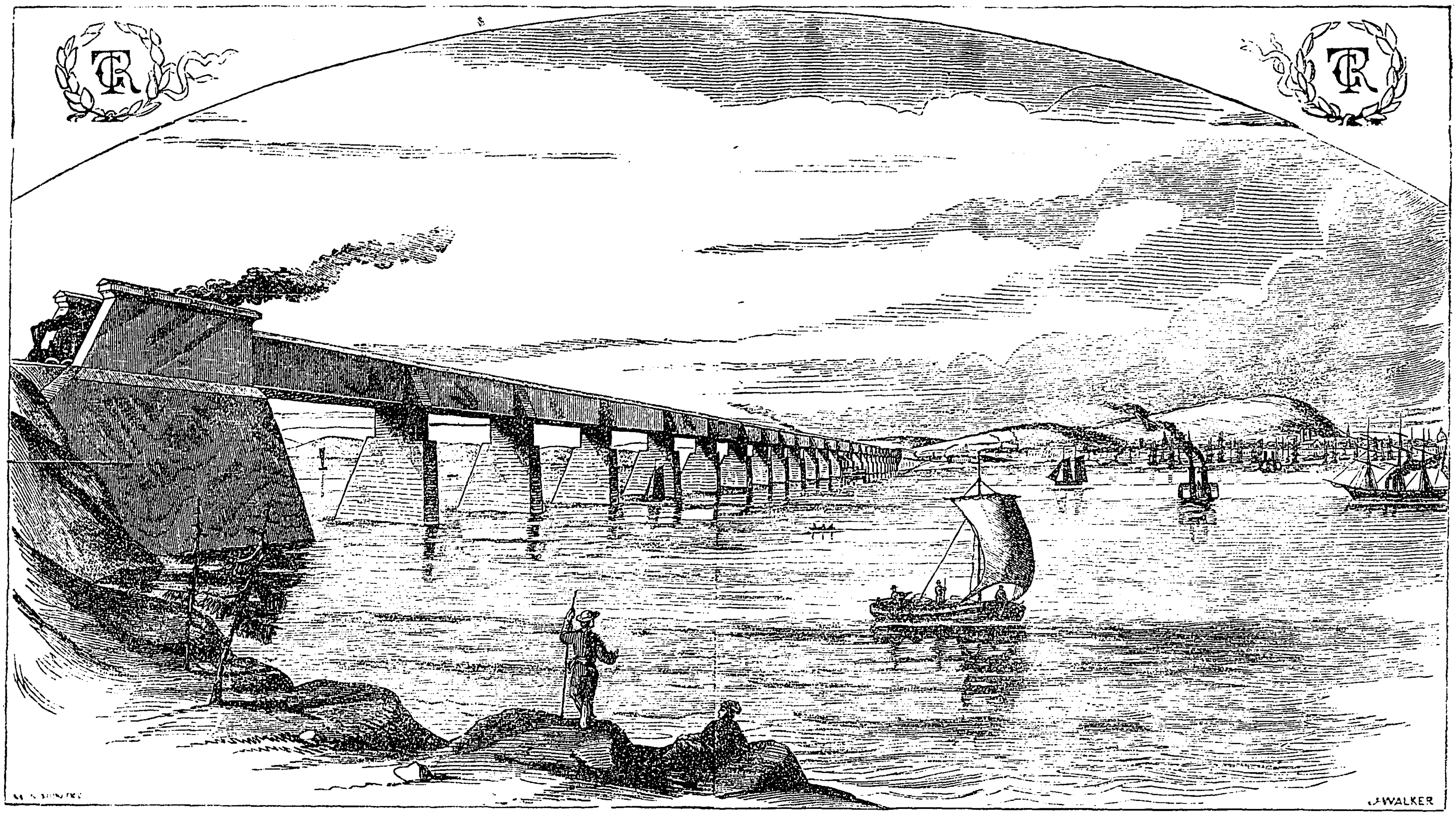

VICTORIA BRIDGE.

THE VICTORIA BRIDGE.

This stupendous work, now so near its completion that it is confidently expected to be ready for public accommodation in the ensuing autumn, will render the Railway from the seaboard to the upper lakes, one unbroken line, one continuous route from *Portland to Sarnia.* Yes, the long talked of structure is so far advanced, that its being fully completed is only a question of a few months! And then, the noblest bridge of which the world has ever .... will span the noblest river of the world!!

It is no stretch of boldness to claim this priority for the St Lawrence. More than two-and-a-half times the length of the Danube, one fourth the extent greater than the Mississippi —the Amazon but a few miles exceeding it—where is there a stream to be found with a greater variety of scenery, or a climate of greater salubrity than the St. Lawrence? The lakes which form a continuation of it are inland seas, bearing thousands of craft of every description, and of every variety of build and tonnage. They bid fair to be the seat of fisheries—a commerce in themselves. For a thousand miles in this fertile valley now dwells a busy, energetic population, marked by a high civilization, who have pushed up to its very source. The tributaries are in themselves second only in magnitude to the parent stream; and on the area thus drained, large cities have risen up, each year increasing in opulence and magnitude, while the waters which flow by them are as clear as crystal, and supply every want. It seems indeed but a poetical corollary, that where nature to the west has formed that marvellous wonder, the Falls of Niagara, men to the east should raise up by art, as a co-mate, that stupendous pile, the Victoria Bridge.

ITS HISTORY.

It will not be out of place to say a few words upon the circumstances and period when this idea first became a recognised necessity in the public mind.

In examining into this part of the subject, it is necessary to go back some twelve years, when an effort was made to commence the St. Lawrence and Atlantic Railway. As one turns to those days, it seems that the Province has advanced a century. At that period the Railway from Laprairie to St. Johns—which was worked only during the summer months, and that at the rate of twelve miles per hour—and the six miles of Railway to Lachine, formed the whole of our Railway system.

In those days travelling was considered an effort; in some months of the year the mails took six days to pass from Toronto to Montreal, and really one travelled at the risk of life, and the trade which, before the days of Railways, had turned by the Ottawa and St. Lawrence to Montreal, passed through the State of New York to the commercial capital of the Union. In this position of affairs the mercantile community of Montreal projected the St. Lawrence and Atlantic Railway. We are not writing a history of that work, but were we doing so, it would be one record of difficulties and trials; of hopes which at the time appeared desperate, and which indeed were only conquered by invincible determination and unceasing energy. The line, however, was completed; and although when commenced, it was felt that a connection between Montreal and the Ocean was the thing to be desired, as the work came to completion, it was seen, that in reality it only formed the first link in the chain of Railways; for in winter they were as remote and as unconnected with the West as ever. The arguments accordingly worked itself to the natural conclusion; and it was recognized that even were the present Grand Trunk Railway in existence, the line would only indifferently supply the commercial requirements for its construction, if the St. Lawrence divided it into two parts. Then arose the question, can the St. Lawrence be bridged? And here it is our pleasing, as we believe it to be our imperative, duty, to inform the reader, that to a distinguished Merchant—citizen of Montreal, the HONORABLE JOHN YOUNG, belongs the merit of having first recognized, agitated, and urged the commercial necessity of this work. The first formal preparation to carry out such a scheme appeared in a Montreal newspaper called the *Economist*, published in 1846, and the particular article referring to our subject appeared on the 26th June in the same year. THIS ARTICLE WAS WRITTEN by the HON. JOHN YOUNG, and the immediate result was the formation of a Committee to enquire into the feasibility of the undertaking, of which Committee Mr. YOUNG was Chairman, who employed Mr. Gay, an eminent engineer of Pensylvania, to survey and report on its feasibility. That gentleman located the Bridge in his plan across Nun's Island. In the same year Mr. A. C. Morton, the then engineer of the St. Lawrence and Atlantic Railway Company, also surveyed and laid down several lines of soundings for a bridge, and located the same below Nun's Island. Although the enquires thus set on foot were satisfactory as to its being practicable to erect the Bridge, the question—owing chiefly to a succession of years of Commercial depression—did not take a sufficiently firm hold of the public mind till the year 1851, when Mr. YOUNG's watchfulness again shewed itself by the introduction into the instructions to Mr. Thomas C. Keefer (who was charged with the survey of the Montreal and Kingston Railroad). Finally in the year 1853, under the large and liberal financial administration of INSPECTOR GENERAL HINCKS, (now Governor General of the Windward Islands), the Victoria Bridge was included in the government policy for the construction of the Grand Trunk Railway. At this eventful period Mr. YOUNG's labours began rapidly to fructify, and now the great idea of his practical brain had assumed a form and fixedness with which his name will ever be associated, and which will mark his character for intellect and energy, not only in his own time and that of his children, but in the far distant future.

To Alex. M. Ross, Esq., the Chief Engineer of the Grand Trunk Company, is due the conception of the design and plan of the present magnificent work.

Next we have to introduce the name of Mr. JAMES HODGES—the Engineer who acted on the part of the Contractors, Messrs. PETO, BRASSEY & BETTS—under whose management the works have been prosecuted with such great energy and ability. The whole period, which on completion of the work will have been devoted to it, will be six years. Commencing in 1854 it will be finished in 1859; but undoubtedly its progress has been impeded by the monetary crisis, which have affected the affairs of the Company, for it might have been fully two years earlier completed. Thus the amount of work performed in 1856 was equal to that effected in 1854 and 1855. In 1857, but a very trifling addition was made to the amount of the previous year, whereas, in 1858, as much work was done as in the two preceding years. When we say that the cost of the Bridge is $7,000,000, we give only a faint idea of the responsibility of directing so great a work. The very force on the River during the last season was a small army. It consists of six steamboats, seventy-two barges, besides several small craft. These measured about 12,000 tons. The steamboats were in the aggregate 450 horse-power.

They were manned by	500 men
In the two stone quarries were	450 "
On the various works engaged as artizans and laborers	2090 "
Total laborers and artizans	3040

To this strength must be added 142 horses, variously employed, and 4 locomotives; the amount of wages being daily $5,000.

The whole of this force was handled by the assistants of Mr. HODGES, of whom he was himself the motive power, laying down the laws by which they were to be governed, and creating the discipline by which they were to be guided with admirable skill and management; and while dealing with the amount of labor, it will not be amiss to set against it the amount of material. In round figures there will be 3,000,000 cubic feet of masonry, 10,000 tons of iron in the tubes; 2,000,000 rivets, each one fastened by a peculiar process, and 168 acres of painting. The tubes being painted four times in oil and color, and each coat giving 32 acres These figures convey some idea of the forethought and practical combination which are necessary to carry out a design profitably to a contract.

There have been trying times during the last five years, as any one may readily conceive, and Mr. HODGES may not have spared others; indeed it was not possible to do so, but he never spared himself. Where there was difficulty and danger—there he was to be found, and no man has been asked to go, where he would not have followed.

We do not say that Mr. HODGES is the only one connected with the Bridge, who has his reminiscences tinctured with sadness, for all connected with it have had their anxieties; but he has played no insignificant part in its progress, and should equally participate in the common triumph. We must not omit to state that during the last six years the water has been carefully marked in its daily height and temperature. The temperature of the atmosphere and all meteorological phenomena have been carefully observed. It is premature to speak of this part of the subject; but, from the observations made, there is a fair inference that there is a governing law in the matter of the rise and fall of the river. At least, the phenomena would so indicate; but they require a special and careful analysis, before anything be said on the subject.

THE BRIDGE—DESCRIPTION.

The Bridge contains 25 openings of 242 ft., with the exception of the centre span, which is 330 ft. hence the length of tube is 6,600 ft.. approached by embankments, the Montreal end being 1,200ft., the southern shore of 800 ft., which, including the abutments, makes a total of 9,084 ft., or 1¾ miles, nearly. The abutments are at the base each 278 ft. long, divided into cells of 24 ft., with intervening tie-walls of 5 ft., but at the top they correspond exactly with the length of a tube, 242 ft., in length, and indeed are carried up to the same height, the cells being filled with gravel. To resist the thrust of the ice, both the abutments and piers are furnished with a cutwater, which meets the pier proper thirty feet above summer water, the whole height of the abutment being 36 ft., above summer water, the centre pier being 60 ft.; hence the Bridge rises in a grade of 1 in. 132, or 40 ft. to the mile, the centre again being pure level. The centre pier is 24 feet in width, the remaining piers are but 16 ft. These dimensions are directly under the girder, for at the foundation the piers are 22 ft. in width and at summer water 16 ft. Transversely the piers are 33 ft. under the girder. Thus the dimensions at the junction with cutwater is 16 × 33 ft., extending outwards to the foundation up stream makes the area of the course whence the cutwater is commenced 16 × 90 ft. For the foundations vary. In some cases, they were as low down as 23 ft. below the water, and to obtain good and perfect foundations was a work of very great difficulty. Indeed here lay the whole solution of the problem. If perfect stability could be obtained for the structure, so that all ordinary disturbing causes would be of no account, the pressure of the ice was the only immediate danger to be met. But that in Canadian Engineering was already a *fait accompli.* Indeed it is a matter of wonder how "ice-breakers" do protect the slightest structure, if the whole be properly calculated; as, on the other hand, compact masses of masonry fail to withstand even limited pressures of ice, if the precaution of turning the ice back on itself be omitted. For the effect of the ice-breaker may be so described, in itself being a simple addition to the pier projecting outwards in an angular form, both sides sloping upwards at an angle of 45°. No dread is felt about withstanding the ice. There was a great deal of dreary nonsense written at the time, below even the general average merit, of *amateur* newspaper-writing about *frasee* ice; and certainly it influenced, for the time, those melancholy minds who seem sent into the world to presage misfortune; and as public opinion was much watched by those who were connected with the bridge, every thing of this sort had to be read and pondered over. For there is a responsibility which leads the experienced engineer to turn a deaf ear to no one. What are called *suggestions* he receives in abundance. Every one deals with him as public property, and writes to him in private, courteously, or through the newspapers, rudely, as the fit takes. But no one who was at all acquainted with the peculiarities of the Canadian climate, and with the success which had been obtained in dealing with those peculiarities, at all feared the influence of the ice. The foundations were, however, the sheet anchor in the theory of statistics, as in practice they formed the security of the mass. There was a certain force which required to be resisted by a certain *inertia.*

It had been supposed that the bed of the river was rock, which the scour of the rapid stream had kept clear from all deposit: but it was discovered on the contrary to consist of boulders packed with gravel, and that material called hard pan, an indurated clay mixed with stone, varying from six to ten feet in depth. Nor must we omit mention of the quick sand which intervened frequently. All this had to be taken out, so that the bed proper of the river—the rock—could be reached, on which the foundations had to be commenced. This was the crisis of the work; for, until the masonry was above water, the parties labored night and day. It must be recollected that during this period, the current was running past the works at ten and twelve miles an hour; for, owing to the contractions of the water way by the coffer dams, the speed of the river was thus accelerated. These dams were of two kinds floating dams, and the ordinary coffer dams.

DAMS.

Before, however, entering upon the subject of the dams, a few words about the mode of laying off the work are necessary. We have alluded to the elaborate survey made on the ice by Mr. THOS. RUBIDGE, in 1853, by which the exact and precise depths of the river were determined, and on the map the location of the bridge was made, the usual reference points being preserved, by which the exact site could be obtained on the ground. The working season of 1853, immediately preceding the winter survey, was passed in preparation; and it was in the winter following 1853–4, that the first steps were taken to lay off the abutments and piers on the line already traced during the summer. This work was done on the ice, the distances being carefully measured, and on the centre of the pier being found, "guides" were framed so that a long iron rod could be lifted and let fall in the one spot, technically called "jumped," until a hole was drilled into the rock into which a bolt was inserted and driven. By these means, the precise centre of the pier was established within a few inches; for in all cases on pumping out the water from the dams the bolt was found, practically speaking, establishing sufficiently the position of the pier. It has been said that the dams were of two kinds, each having its advantages and disadvantages. The floating dams were, in themselves, framed structures of no mean character, and consisted of two parts. One part, which for the moment, we will call three sides of a square figure—the sides being larger than the head—the other piece forming the square. But in order to turn off the current, the head of the square was formed of two minor sides turned to an angle up stream. They were carefully and strongly framed; and, being caulked, floated of themselves. To place these dams in the proper position, the piece of three sides was taken by a steamboat in tow, and when the dam was approximately in position, determined instrumentally from the shore, a sluice gate was opened, and the water passing within it, it sank at the required place. The tail piece was subsequently towed into position. Necessarily a great margin, as to area had to be left, in case of want of success, in sinking the crib, at the exact spot. At the foundation, the piers were 22 x 90, whereas the cribs were 120 by 210, which area was of perfectly still water. Operations could accordingly at once be commenced. A dam proper was constructed within this workable water, and on its completion the pumps were set to work. The other form of dam was the ordinary cribbing of the country; and owing to the rapidity of the stream, unusual care and tact had to be observed in its construction. It was commenced with some preliminary cribbing, if we may use the word, 20 wide and 100 long; constructed in approximate