

end stringers to rest direct on the masonry, was bad. In light bridges, the bottom chord might easily be put in compression by overstraining the laterals, and hence, in such bridges, the bottom chords should be rigid for their whole length, and in other cases the end panels should be stiff. The practice of using a thin wall plate of wrought iron or steel was bad, and expansion rollers were often made too small in diameter. His own practice was to use in the first place a heavy cast iron wall plate. Above this came a stout plate of wrought iron, to which were riveted a series of steel rails. After riveting, the tops of the rails were planed smooth and level to form a bed for the rollers. By this construction the rollers were not clogged with dust, as any that collected fell between the rails, where it could be swept out. The rollers were segmental, 12 in. in diameter and spaced at six inch centres. Above them came a cast-steel bearing plate, and then a rocker plate, which was a steel forging, having ten cylindrical surfaces at right angles to one another, one of which took the load of the truss from the upper bearing plate fixed at the end of the truss, while the other transferred it to the bearing plate immediately over the rollers. This construction insured a distribution of load, even if the bottom plate were not quite level. With respect to the system of single triangulation as compared with double triangulation, Mr. Morrison holds that for moderate spans the former is best, as there is then no doubt as to the distribution of the stresses. In case of large spans, however, the connections become clumsy, and the double system of triangulation is to be preferred. In that case the members of one system can be used to stiffen the other system. The use of curved or broken upper chords is objected to by Mr. Morrison, though it saves weight. With this only the single system of triangulation can be used, as the web strains become indeterminate at the points where the lines of the chords change. The work is very much lightened, but counters are required through nearly the whole span, and the distortion of the span is greater than when straight chords are used. As regards cantilever bridges, they had advantages where the fixing of false work was difficult or impracticable, but though the main span was lighter than an ordinary main span of the same length, this saving of metal was made up for by the additional metal required in the anchorages and the outside limits of the main span.

ST. JOHN AS A SHIPPING PORT.

The citizens of St. John, N.B., and the Provincial Government have spent enormous sums of money equipping that port in the best style for the handling of all classes of freight. This they have done without calling for aid upon the Dominion Government, and they now think they have a right to ask for the support of their countrymen in the west in securing at least a part of the winter traffic which now goes to United States ports. With this end in view a special committee of the St. John Board of Trade has compiled some information as to the capabilities of their city for doing a large export and import trade.

St. John, New Brunswick, is situated at the mouth of the River St. John, which is 500 miles in length, and its harbor is known as the only one on the Atlantic coast, north of Charleston, S.C., which has such deep water and which does not freeze in winter, never having been known to have had ice in it to interfere with

navigation. The Board is in possession of numerous certificates from masters and pilots of steamers and sailing vessels as to the ease of access to, and safety of, the Bay of Fundy and Harbor of St. John.

H. M. S. "Blake," Admiral Sir John Hopkins, 9,000 tons displacement, 20,000 horse power, drawing 26 feet of water, one of the largest vessels of her class in the British Navy, visited St. John recently. The Admiral and his officers gave it as their opinion that "it is an excellent harbor, easy of access, and perfectly, *absolutely* safe, and has plenty of water for the largest ships of the British fleet. On the anchorage ground in the harbor the depth of water is from 70 to 123 feet at low water. The tide rises and falls from 24 to 28 feet, which is the means of keeping the harbor entirely free from ice in winter.

The only Atlantic deep water terminus of the Canadian Pacific Railway owned by it, is now at St. John, 481 miles from Montreal, and running on its own rails 3,600 miles from Victoria, British Columbia. Freight can be discharged into vessels from cars on both sides of the harbor. The Intercolonial Railway has two deep water termini here, receiving and delivering freight by cars and from and to vessels at the wharves along the harbor front, thus saving transfer and cartage charges.

The Canadian Pacific Railway Company, assisted by the city and the Provincial Government, has recently completed a first-class grain elevator fitted with all the latest improved machinery for hoisting, weighing and shipping, and is now ready to receive and ship grain, the size and capacity of which is a total storage room of 301,716 bushels, and can deliver 15,000 bushels per hour. The average receiving capacity of elevator is about 53,000 bushels per day. The first cargo has just been shipped from the elevator, consisting of 34,000 bushels of peas, 1,000 tons of hay, and a quantity of deals. Vessels drawing 27 feet of water when loaded, can lay afloat at low water at the Canadian Pacific Railway and corporation wharves; general merchandise can be landed from vessels or received from the cars into the warehouse on the wharves.

There is now a well managed and very successful line of passenger and freight steamers, whose capacity is from 10,000 to 13,000 barrels, each carrying goods and passengers from China, Japan and the western provinces of Canada, running from St. John to the West Indies, carrying the West India mails under contract with the Dominion Government, calling at Bermuda, St. Thomas, St. Croix, St. Kitts, Antigua, Montserrat, Dominica, Martinique, St. Lucia, Barbadoes, Trinidad, and Demerara, and leaving St. John every 28 days and returning to St. John via the same ports.

There is also a regular and very satisfactory line of steamers (the Furness Line) running between St. John and London, G. B., also under contract with the Dominion Government, which leaves each place simultaneously about every 16 days. There are several lines of schooners running to all ports in the Bay of Fundy, which can deliver flour and other produce on through bills of lading at a lower rate via St. John than by way of Boston, New York or Portland.

Vessels of all sizes (steamers and sailing vessels) are open for charter at St. John at all seasons and at lowest rates. Atlantic insurance on vessels and all kinds of merchandise can be effected in St. John with reliable companies at the same (and occasionally at less) rates of premium as from New York, Boston, Portland or Halifax. Vessels can always depend on being