

warnings, and gave me a list of the publications issued under the authority of the Meteorological Office, pointing out at the same time those which he thought would be desirable I should procure. Before leaving London, I ordered these publications to be sent out to the colony.

It will be seen that during my absence from New Zealand I have had opportunities, probably rarely enjoyed by one person, of conferring personally with the principal executive officers of the Marine and Revenue Departments of the Dominion of Canada, of the United States, and of Great Britain. I endeavoured during the comparatively limited time at my disposal to take full advantage of those opportunities, and I feel that I am justified in saying that much of the information I have acquired, especially in regard to matters of various kinds connected with the Marine Department, will prove to be most useful. * * * *

Having specified the sources from which I obtained information on the several subjects referred to above, I now proceed to transcribe some of the notes I made in the course of my enquiries, in order that they may be placed on record in a convenient shape for future reference if necessary.

LIGHTHOUSES, CANADA.—The lighthouses in Canada are under the management of the Department of Marine and Fisheries. * * * *

The department asks for an annual appropriation of 120,000 dollars—about £24,800—at the commencement of the session; later on, the Minister, aided by the deputy or permanent head of the department, decides what particular lights are to be erected. Tenders for their erection are then called for from time to time; these tenders are opened by the deputy, and the Minister decides which are to be accepted. The kind of light to be adopted in each case is fixed by the deputy, who very frequently orders one similar to some that have been already erected, and does not consult the Engineer at all. If anything special about the construction of the tower is required, Mr. Smith instructs the Engineer to prepare plans. There are no scientific men attached to or employed by the department, and no scientific refinements are attempted in the construction of the lights, which are nearly all catoptric. All the towers are built of wood. The department goes on the principle of getting as many lights as it can for the funds placed at its disposal, so as to have the coasts and inland waters of the Dominion lighted as quickly as possible. Mr. Tomlinson gave me copies of the working drawings and specifications of some of the recently erected lighthouses. These documents I transmitted to you from London, in order that they might be referred to the Marine Engineer, for his consideration, in connection with the designs he had to prepare for the new lighthouse buildings. Mr. Tomlinson considers that their structures will last for seventy or eighty years, by which time the Dominion will be rich enough to provide better ones, if experience should then show that this would be desirable. It is right, however, to add that whilst he considers the Canadian system cheap and effective, yet he thinks that economy is pushed rather too far, especially in the adoption of catoptric or reflecting, instead of dioptric or lenticular apparatus for places where powerful lights are required. The lanterns, lamps, and reflectors, are made by M. E. Chanteloup, of 587, Craig Street, Montreal, much more cheaply than they could be if procured from England. Dioptric lenses alone, of which few are used, are ordered from Messrs. Chance, of Birmingham. Lanterns are made of cast-iron, the glass is embedded against a soft wooden fillet, which is inserted in a groove provided in the castings of the astragals; these wooden fillets answer admirably in preventing the glass from breaking when the metal contracts and expands from changes of temperature. M. Chanteloup makes excellent lamps for burning kerosene or petroleum, somewhat similar to the head lamps of locomotives. The largest sized lamp for fixed lights has the oil cistern under the burner like an ordinary kerosene lamp, except that there is an aperture for the passage of air round the burner. Experience has shown that these lamps burn admirably, and that there is no risk in using kerosene in them. The lamps for revolving apparatus have flat shallow cisterns for the oil placed behind the reflectors, level with the burner. Wherever manual labour, more than machinery, is required, M. Chanteloup, who employs about 250 hands, can produce anything in his business much cheaper than manufacturers in England can do; for instance, he makes all the electrical apparatus used throughout the Dominion, at prices much lower than those at which they can be imported. All his lighthouse lamps are made to gauge, so that the various parts and the glasses for each size are interchangeable. * * *

Light keepers are never shifted from station to station. Assistant keepers are not now appointed by the department; the principal keeper gets so much salary, with the proviso that he is to provide an efficient assistant. * *

Keepers find themselves in rations, even at rock and island stations. The Government steamers, as a rule, visit all stations once a year, with supplies of oil and other necessaries. The Dominion is divided into districts, in each of which there is a resident officer who acts as agent for the department. He has charge of the lights, buoys, and beacons in his district, forwards supplies to the lighthouses, and attends generally to all local marine business for the department. I visited Quebec, which is the head quarters of the most important district, and as I was provided with a letter of introduction to Mr. Godfrey, the local agent, he received me very cordially, and spared no pains to make me thoroughly acquainted with every detail of the business under his charge, and by his hospitality and kind attentions to make my short stay in Quebec as agreeable as possible. Mr. Godfrey has extensive workshops under his charge, in which blacksmiths, machinists, and carpenters are employed on various works for the department. Attached to the establishment there is an extensive buoy yard in which buoys are made and repaired. I went on board the "Napoleon," the largest of the lighthouse tenders, then undergoing extensive repairs and alterations, and I visited one of the light ships which was being got ready to be taken to its station as soon as the ice broke up.

UNITED STATES.—The lighthouses (including harbour and river lights), light-vessels, beacons, and buoys in the United States are all under the management of a Lighthouse Board, composed of two officers of the Navy, two engineer officers of the Army, two scientific civilians, and two secretaries,