

the "Ruapehu," through a freezing-chamber, and that it was equally hopeless to use salt along with the ice around the salt-water supply-pipe. When a mixture containing 5 of ice to 1 of salt was used, the water in the supply-pipe became ice when the circulation was stopped for two minutes.

Recognizing (1) that "the temperature of a mixture of ice and water remains constant till either all the ice melts or all the water freezes," and (2) that "a given quantity of ice in melting is sufficient to reduce the temperature of 144 times its weight of water by 1° Fahr., or to reduce the temperature of once its own weight by 144° Fahr.," I gave up the rule of thumb for the scientific method, and began experiments with pure ice. As the result of these preliminary experiments I find: (1.) That it is possible to reduce the temperature of the sea-water without the remotest chance of freezing it by passing it through a small tank or cask containing trays filled with ice. The water can be reduced in this way without any difficulty to 32° Fahr. For hatching purposes I anticipate fresh-water ice will do as well as sea-water ice. (2.) That by means of a "well" containing a freezing-mixture, the sea-water can, without danger of freezing, be reduced easily to about 40° Fahr. before it is passed over the ice in the cask. I believe that little over six tons of ice would be required during the voyage; for 3cwt. of ice would reduce 720 gallons of water from 40° to 32° Fahr., and less than 720 gallons would suffice per day. So encouraging are these and other results that I venture to suggest that we should continue the work.

I have already incurred, for assistance and apparatus—without which, of course, progress was impossible—some outlay; but I think, if the whole arrangements are left to me, a sum of from £150 to £200 ought to cover all the expenses for determining the best methods to be employed, and for providing the necessary additional tanks and hatching-appliances required for transit.

Regretting the delay in writing.
The Agent-General for New Zealand.

I have, &c.,
J. C. EWART.

No. 6.

The AGENT-GENERAL to the Hon. the COLONIAL TREASURER.

SIR,—

7, Westminster Chambers, London, S.W., 28th May, 1886.

I sent a copy of your letter of the 8th April on the salmon-ova to Sir James Maitland, and I now beg permission to transmit copy of a letter I have received from him touching on the various points to which you had called our attention. You will read Sir James's letter with much interest, especially if you propose that our experiment shall be repeated in the coming season.

The Hon. the Colonial Treasurer, Wellington.

I have, &c.,
F. D. BELL.

Enclosure.

Sir J. R. G. MAITLAND to the AGENT-GENERAL.

MY DEAR SIR FRANCIS,—

Stirling, N.B., 25th May, 1886.

I have yours of the 24th, kindly enclosing Sir Julius Vogel's despatch of the 8th April, with which I am very much interested, and it entirely bears out my anticipations.

We can now rely upon salmon-ova placed in a chamber such as was constructed on the "Ionic;" and, if the eggs were a week older when packed, there is no reason why every egg should not arrive alive. The fertilization was not, I consider, good; but all unfertilized eggs had been removed during packing, which would make it seem almost perfect. "The thick, heavy coating of moss" is necessary and harmless. In the first place the eggs are transferred to the moss, and the moss, with the eggs on it, lifted into the tray, thus avoiding all handling; and, when it is remembered that in both the consignments of salmon-ova we sent the ova was packed before the eye was coloured, it is quite clear the American packing—which is only possible with much farther advanced ova—would have killed every egg. I get plenty of eggs over from America, and my experience is very much against their mode of packing. Sir Julius is right as to the drip of the ice killing eggs; but it is the wet, and not the moss, that suffocates them. In the chamber on board ship there will be no drip, as the temperature should be so low that the ice in the boxes melts slowly. The moss probably gets wet after it leaves the ship; but a small handful of sawdust thrown over the ice in the ice-tray when the box is taken from the ice-chamber will obviate all danger. The thick felt of moss has a very important duty to perform—viz., to absorb the carbonic acid given off by the ova. This it does best when merely damp—not wet. The pad also prevents the eggs from shifting; and, if the eggs are bunched together and near the point of hatching, they invariably suffocate each other. Lastly, they do not seem to have realized over the water that the pads of moss can, by bending up the four corners, be removed from the trays, eggs and all, and the eggs transferred on to a piece of muslin by merely covering the pad and then inverting it—an operation requiring little time and trouble, and absolutely harmless to the ova. I am very glad we put the trout-ova in the refrigerating-chamber. Those dozen ova which did not turn opaque would be the only unfertilized ova in the lot. Dr. Francis Day kindly undertook a set of experiments with frozen ova, which appeared in the *Field*. He tells me that cold will cause decomposition of the blood. I have frozen ova in air, and afterwards hatched them; but I probably did not carry the freezing far enough to affect more than the shell. I thought of the thermometer; but did not suggest it on purpose, as I considered that the less the chamber was opened for inspection the better for the ova; that the minimum temperature was, from the construction of the chamber, 33° Fahr.; and that the maximum and daily temperatures could be easily deduced in the ova-boxes themselves from the frequency with which their ice-trays require replenishing.

Sir F. Dillon Bell, K.C.M.G.

I have, &c.,
J. R. G. MAITLAND.