tity can be ascertained in the following manner: A common, solid fish-barrel is taken, whose height is supposed to be about 20 inches. This barrel is placed inside a large barrel or box, and the remaining space is filled with sawdust or closely-packed hay. After the fish-barrel has been well cooled off with snow or ice-water, there are put into it 50 pounds of finely-ground and cooled salt and 150 pounds of finely-crushed ice or snow. These two ingredients are well mixed, and in this mixture is placed the square tin can containing the herring and the fresh water. This tin can is about 22 inches high on every side, and its upper opening measures about 4 inches on every side. The whole is well covered with a lid and a piece of cloth or matting. The tin can holds about 20 *potter* (one *pot* equals 1.6 pints), and by experience one should ascertain in what proportion the herring and the fresh water should be filled in. No salt or salt brine should get into the tin can.

For several reasons it will be more profitable to freeze a large quantity of herring at a time than to freeze smaller quantities at frequent intervals. In the latter case it will be necessary to have several tin cans and as many insulated double barrels. These should then be used so as first to put the cans in the least cold barrels and gradually move them to the colder ones. As soon as the temperature of the mixture is at the freezing point it has lost its strength.

Such blocks of ice with bait frozen in them might be a remunerative article of trade, if we consider on the one hand the frequent complaints as to the scarcity of bait which we hear from time to time and from many different places; and if on the other hand we remember that just during the cold season when ice is very plentiful large quantities of herring are caught in many places. If artificial cold was used on a large scale, it would probably pay to use again the salt brine from the mixture, which will hardly be possible if the freezing is done on a small scale.

50.—THE FISH-CULTURAL ESTABLISHMENT OF LAKE SAINT-FRONT, HAUTE LOIRE, FRANCE.

By Viscount DE CAUSANS.

[Abstract.*]

This establishment, founded in 1852, has an altitude of 4,100 feet; while the lake, on which it is situated, has an area of about 86 acres; 20,000 fry, on the average, are yearly put into the lake. In 1852 the establishment did not pay expenses; but since 1860 the sale of trout has never been less than $570, and it has sometimes reached $1,500. Since 1880 the establishment has put into the lake an average of 100,000 fry hatched on the spot.

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* *Bulletin de la Société d'Acclimatation*, March, 1885, p. 148.

Two copious springs, recognized after many experiments as most favorable for hatching trout eggs, now furnish all the apparatus for fish-culture. The room used for hatching is about 56 feet long and 13 wide. All around this are arranged in shelves cemented troughs, from 2 to 3½ feet wide. A lodging for the janitor extends from the building.

Some indispensable covered reservoirs, with an area of about 65 square yards, communicate with the hatching room. In front of this building there has been dug a basin, with an area of 144 square yards, divided into four compartments. The level of the water is regulated from the inside. The different compartments are filled or emptied separately with great rapidity, so as to capture easily the spawning fish. Being fed from abundant springs, this basin never freezes. A boundary-wall adjoining the buildings shelters it from all danger. All these reservoirs are intended to receive trout at spawning time.

Taking trout for market begins about April 1, and ends about October 1; and about October 15 they begin to collect the eggs. At this time the fish are taken either by the aid of ditches, spoken of by Raveret-Wattel in a report on foreign fish-culture,* or with nets. In 1882, from October 20 to November 15, there were taken 500 trout, one-fourth of them females, which yielded 120,000 impregnated eggs. In 1883, during the same time, 1,500 trout were taken, one-third females, and 330,000 eggs were obtained. Of these 1,500 fish, 112 died in consequence of the extraction of the eggs or from hurts received from the nets, the rest being put back in the lake. From these figures we can judge of the number of trout necessary in order to obtain a large number of eggs. Notice here that many females are either infertile or seem not to spawn every year. It seems also that trout raised in captivity are too often infertile or slow in breeding.

Do not these considerations support this opinion, that a great fish-cultural establishment can exist only on the border of a lake? Such establishments can succeed everywhere where there are trout and spring water; but so far as the reservoirs are only small bodies of water or basins, they will produce only limited numbers of eggs.

In 1884 they hope to obtain 1,000,000 eggs at Saint-Front. The grounds, reservoirs, nets, &c., are sufficient for this; 100,000 eggs will be kept for the lake; the other 900,000 will be sold. There is no trouble here about getting trout enough from which to obtain the eggs. On November 20, 1883, the fishing of a single morning gave 118 trout, weighing about 100 pounds. The supply of the eggs will then be limited only by the demand. It will be sufficient to begin fishing for these eggs some days earlier, or at the time of the last forwarding of trout to the provision dealers, to save out the females and place them in the basins at the time of spawning. The establishment will then be able to respond fully and satisfactorily to all the demands for eggs which may be made upon it.

Bulletin de la Société d'Acclimatation, November, 1883, p. 638.