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THE USE OF

ICE ON THE FARM

BY

J. A. RUDDICK

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LETTER OF TRANSMITTAL.

OTTAWA, July 15, 1907.

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit Bulletin No. 20, Dairy and Cold Storage Commissioner's Series, entitled 'The Use of Ice on the Farm.' A great waste of valuable food products occurs every year on the farms of Canada owing to lack of a simple means of preservation within reach of every farmer at a very small cost. A supply of ice, while preventing loss of perishable articles, adds very much to the comfort of the farmer's household in hot weather. This bulletin is intended to encourage the practice of providing a supply of ice for the needs of the household and the dairy, and to furnish information to those who may not have had any experience in the storing and handling of ice.

I beg to recommend that it be printed for general distribution.

I have the honour to be, sir,
Your obedient servant,

J. A. RUDDICK,
Dairy and Cold Storage Commissioner.

THE USE OF ICE ON THE FARM.

By J. A. Ruddick.

Every farmer in whose vicinity natural ice is available should store a sufficient quantity for use during the summer months. A supply of ice is worth all it costs, if properly applied in the preservation of milk, butter, meat, vegetables and other perishable articles. The dairy farmer especially will find in a supply of ice a great saving of labour and a positive safeguard in keeping his milk during hot weather. The crudest kind of building, which will keep out the sun and the rain, or the corner of a shed, will serve for the mere storage of ice if dry saw-dust or marsh hay is available in which to pack it for protection against the heat. All that is necessary to do is to provide for some drainage and cover the ice on all sides, top and bottom, with about 12 inches of saw-dust, or 24 inches of hay or cut straw, and protect the covering from the weather.

THE NECESSITY FOR COOLING MILK.

Patrons of cheese factories or creameries, who wish to keep Saturday evening's or even Sunday morning's milk until Monday morning during the hottest weather, will find a supply of ice indispensable, as well as useful on other nights of the week, if the milk is to be delivered to the factory in proper condition. Proper condition implies not only that the milk must be sweet enough to be accepted, but that it shall not have passed the stage of 'ripeness' which permits of a first-class quality of product being made from it. Milk which is too 'old' or too far advanced towards the stage when it is known as 'sour' will make neither a fine quality of butter or cheese, nor a maximum amount of it. An enormous loss results to the patrons of factories every year in both directions. The amount of waste which occurs from the handling of overripe milk at cheese factories would be astonishing if it could be accurately measured or were more generally known. This waste may be prevented by a proper cooling of the milk at the farms. A supply of ice will facilitate the work and insure successful handling of the milk under any conditions imposed in practical dairying.

A supply of ice on the farm is very necessary for those engaged in a city milk trade. Immediate cooling after milking, to the lowest possible point, is the true secret of preserving milk. Those engaged in supplying milk for direct consumption cannot escape the responsibility which rests on them for exercising every precaution which will enable them to furnish such a necessary and universal article of diet, carrying the least possible danger to public health.

COOLING WITH WATER ONLY.

The water available for cooling purposes, in the principal dairy districts of Canada, will vary during the hot weather from about 50 to 60 degrees. It is obviously impossible to reduce the temperature of the milk lower than the temperature of the water. In fact, without a specially constructed milk cooler, it is impracticable to bring the temperature of the milk much below the average of the temperature of the water and that of the milk when cooling is begun. Such cooling is not sufficient for preserving milk through a period of twenty-four hours or more in hot weather.

The effectiveness of water as a cooling medium depends, as has already been stated, on the manner in which it is utilized. A very common plan is to place the can containing the milk in a tub or tank of water so that water surrounds the lower part of the can. A few figures will demonstrate the measure of efficiency which this plan affords.

Suppose there are 100 pounds (10 gallons) of milk to be cooled, and the temperature directly after milking, allowing for some air cooling, is 90 degrees. If this milk is placed in a tank containing an equal quantity of water at 56 degrees, the result, theoretically, would be to reduce the temperature of the milk to 73 degrees ($90 + 56 \div 2 = 73$). In practice, however, the actual cooling would be less, because the water will absorb heat from the air in the meantime. Even if the water is changed after the first supply has lost its cooling power, the very best that could be expected after one change, would be to bring the milk down to about 64 degrees. A temperature of 64 degrees is not low enough for preserving Saturday night's or Sunday morning's milk.

The advantages of using a special milk cooler are twofold. First, the cooling may be done more rapidly and therefore more effectively, and second, only about half the quantity of water will be required to reach a result similar to that secured by surrounding the milk cans with water.

ICE NECESSARY FOR LONG KEEPING.

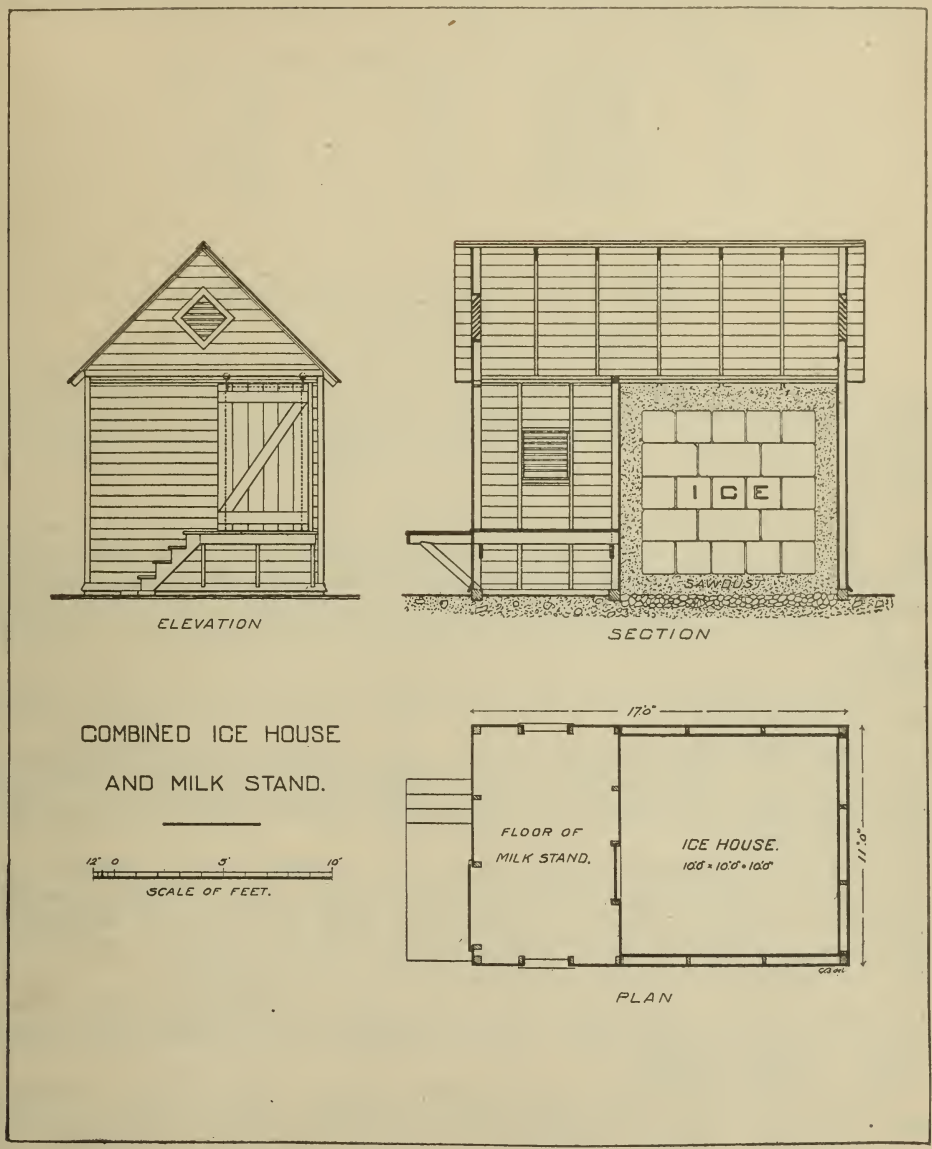
Roughly speaking, 10 pounds of ice are equal in cooling power to 100 pounds of cold water. Thus 100 pounds of water containing 10 pounds of ice will do as much cooling as 200 pounds of the same water. Or, in other words, the use of ice in the water surrounding the milk may do away with the necessity for changing it. The same advantage applies in the case of using a special milk cooler. The ice can be placed in the receptacle which contains the supply of water for the cooler.

But the most important advantage in the use of ice arises from the fact that by its use the temperature of the milk can be reduced to, and maintained at, a lower point than is possible with the use of water alone; and a low temperature is absolutely necessary for preserving milk for lengthy periods. The temperature should be reduced to 50 degrees and maintained at that temperature when milk is to be kept from Saturday night or Sunday morning till the following Monday morning.

The accompanying plan (Plate 1) shows a convenient arrangement for the storage of ice in connection with a milk stand, designed to meet the needs of patrons of cheese factories and creameries. This plan was first brought to the writer's attention by Mr. G. G. Publow, Chief Dairy Instructor for Eastern Ontario, when travelling with him through Hastings and Prince Edward counties, where many of the progressive farmers have adopted this plan. A model combined milk stand and ice-house was erected on the grounds of the Central Canada Exhibition Association at Ottawa last autumn, and attracted considerable attention. This arrangement, which affords both protection from the weather and dust, and also from animals or insects, if all openings are provided with screens, and convenience for the cooling of the milk, cannot be too highly recommended. Very great improvement would be made in our hot weather cheese if the night's milk was always properly cooled, and the saving of loss in cases where the milk turns sour before reaching the factory would amount to a very considerable sum.

To utilize the ice for household purposes in connection with an arrangement of this kind, it would be necessary to provide an insulated ice box in which to put articles of food along with a quantity of ice from time to time. A simple arrangement, which will give good satisfaction, is to make a box in the shape of a trunk or chest, lined with galvanized iron, and divided in the centre by a partition open at the top and bottom to allow for a circulation of air between the two compartments. The ice can be placed in one side of the partition and articles of food on the other side. A box constructed as follows will give good satisfaction: One layer of matched boards covered with one inch of hair felt and finished with another layer of inch-boards. That is to say, the sides, top and bottom will consist of two ply of matched boards with one layer of one-inch hair felt between. The cover should fit tightly and be provided with a cushion of some kind to make it air-tight. The galvanized iron lining is necessary to prevent the dampness from affecting the wood and destroying the insulation. It is necessary to provide a drainage pipe for the melting ice, and the

outlet should be trapped to prevent passage of air. If hair felt cannot be procured easily, leave a space of 3 or 4 inches between the outside and the inside finish of the box and fill this space with planing mill shavings or thoroughly dry saw-dust.



Those who desire to have a more complete cold storage on a small scale, will find a plan and specification in the Dairy Commissioner's Report for 1906.

QUANTITY OF ICE REQUIRED.

A cubic foot of ice weighs 57½ pounds. One ton of solid ice measures, approximately, 35 cubic feet. A consumption of 2 cubic feet (115 pounds) per day for four months would amount to nearly 7 tons. Allowing for the waste when such a comparatively small body of ice is stored, a building 10 feet square and 10 feet high will afford ample space for that quantity of ice, if it is carefully packed.

Fifty pounds per day for four months would amount to 3 tons. Allowing for waste, a solid block of ice 6 feet square and 6 feet high should be sufficient if properly stored.

For the purpose of estimating the weight of ice roughly by the number of blocks, the following table will be found convenient:—

12	blocks	18 x 36	inches,	8	inches	thick	= 1	ton
10	"	18 x 36	"	10	"		= 1	"
8	"	18 x 36	"	12	"		= 1	"
7	"	18 x 36	"	14	"		= 1	"
6	"	18 x 36	"	16	"		= 1	"
5	"	18 x 36	"	20	"		= 1	"

INSTRUCTIONS FOR THE ORDINARY STORAGE OF ICE.

(Extract from Bulletin No. 10.)

1. Provide for drainage by filling the area of the ice-house with broken stones or cobble stones, covered with cinders or gravel. A few inches will do on the top of a gravelly and porous soil. On a heavy clay soil a greater depth will be necessary. A tile drain should be laid in the earth, under the gravel, along the centre of the building.

2. Lay 2 x 6-inch sills, double, and binding at corners, or one sill 8 x 8 feet, on posts. Set up 2 x 6-inch studs at 24-inch centres, topped with 2 x 6-inch plates, double. Sheet the outside of the studs with matched siding. Line the inside with rough boards, as well as the under side of the rafters. Leave space between studs empty.

Have doors in sections running up from the sill to the gable at one end of the ice-house.

3. Before putting in the ice cover the stones or gravel in the ice-house with 12 inches of *dry* saw-dust.

4. Pack the ice directly on the sawdust. Leave a space of 12 inches between the walls and the ice. Place the cakes of ice as close together as possible, and fill in all unavoidable spaces with crushed ice or snow, well rammed. Never use any saw-dust between the tiers.

5. Fill the 12-inch space between the ice and the wall with *dry* saw-dust. Be careful that the saw-dust does not contain any ice chips or snow. When no saw-dust is available, cut hay or cut straw, or chaff, may be used, but in this case the space between the wall and the ice should be twice as large (24 inches instead of 12) and care should be taken to have the hay or straw packed as well as possible.

6. Cover the ice on top with saw-dust or long hay; 12 inches of saw-dust will do. Hay should be put on 2 feet thick. Hay and saw-dust make an equally good covering, if used in proper quantities.

When saw-dust is used, put on 2 feet thick at first. This will leave 12 inches to spare to fill in the sides in the spring, when the saw-dust along the sides has settled.

7. A loft floor over the ice-house does more harm than good, as it prevents circulation of air and keeps the covering damp. Have an opening at each end of the gable fitted with louvre boards, and have a ventilator 18-inch square going through the middle of the roof to create a thorough circulation of air and thus prevent accumulation of heat under the roof.

8. Bank the ice-house up above the sill with earth or saw-dust, in order to prevent any entrance of air around the sill.

Copies of Bulletin No. 20 may be obtained free for each patron of a creamery, by application to the Dairy and Cold Storage Commissioner, Ottawa.