LIST OF PUBLICATIONS

OF THE

DAIRY AND COLD STORAGE COMMISSIONER'S BRANCH.

Date Issued.	No.	Title.
1905	1	List of Some British Importers of Farm Products.
1905	†2	Care of Milk for Cheese Factories.
1905	†3	Care of Milk for Creameries.
1905	†4	Some Phases of Dairying in Denmark.
1905	5	Improvement of Dairy Herds.
1905	6	Chemical Investigations Relating to Dairying in 1904.
1905	7	List of Exporters of Some Canadian Products.
1906	8	Some of the Factors that Control the Water Content of Butter.
1906	†9	Instructions for Testing Individual Cows, &c.
1906	10	Creamery Cold Storage.
1906	11	General Instructions *re* Fruit Marks Act as Amended, 1902, 1906 and 1908.
1906	12	Cow Testing Associations, with Some Notes on the Sampling and Testing of Milk.
1907	13	Sweet-Cream Butter.
1907	14	Apparatus for the Determination of Water and Fat in Butter.
1907	*15	Gathered Cream for Butter Making.
1907	16	Subsidies for Cold Storage Warehouses.
1907	17	Buttermaking on the Farm.
1907	†18	Co-operation in the Marketing of Apples.
1907	19	The Packing of Apples in Barrels and Boxes.
1907	*20	The Use of Ice on the Farm.
1907	†21	Report of the Cow Testing Associations.
1906		Report of the Dairy Commissioner, January, 1905, to March, 1906.
1907		Report of the Dairy and Cold Storage Commissioner, 1907.
1908		Report of the Dairy and Cold Storage Commissioner, 1908.
1909		Report of the Dairy and Cold Storage Commissioner, 1909.
1907		Map Showing the Location of Cheese Factories and Creameries in Canada.

Any of these publications will be sent free of charge on application to the Dairy and Cold Storage Commissioner, Ottawa, Ont.

---

* A sufficient number of bulletins No. 15 and 20 will be sent to the manager of any cheese factory or creamery to supply one to each patron.

† Out of print.

DEPARTMENT OF AGRICULTURE
Dairy and Cold Storage Commissioner's Branch
OTTAWA, CANADA

COLD STORAGE

AND

THE COLD STORAGE ACT

BY

J. A. RUDDICK

Dairy and Cold Storage Commissioner

Bulletin No. 23

Dairy and Cold Storage Commissioner's Series

Published by direction of the Hon. SYDNEY A. FISHER, Minister of Agriculture, Ottawa, Ont.

MARCH, 1910

14366—1

LETTER OF TRANSMITTAL.

OTTAWA, March 16, 1910.

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit for your approval the manuscript for a bulletin entitled, 'Cold Storage and the Cold Storage Act.'

In preparing and selecting the material for this bulletin I have included a paper on 'The Refrigeration of Dairy Products,' which I read before the American Society of Refrigerating Engineers at the last annual meeting of that society, and an address on 'Cold Storage for Apples and Other Fruits,' delivered before the Ontario Fruit Growers' Association at Toronto, in November last.

The Cold Storage Act, with the new Regulations thereunder, and the form of contract entered into for the payment of cold storage subsidies, are reprinted for the information of the public.

I beg to recommend that the subject matter of this manuscript be published as Bulletin 23 of the Dairy and Cold Storage Commissioner's Series.

I have the honour to be, sir,

Your obedient servant,

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

14366—1½

COLD STORAGE AND THE COLD STORAGE ACT

By J. A. Ruddick.

COLD STORAGE.

INTRODUCTION.

The cold storage industry has grown out of the practical experience of people living in northern climates who have observed the preservative effect of 'cold' when perishable food products are exposed to it. Every family that makes use of a kitchen refrigerator, or that places milk, butter, meats, fruit or other vegetables in a cold cellar, puts into practice the principles which underlie the operation of the most up-to-date cold storage warehouse in the country. The difference is one of degree as measured by the temperature employed in each case.

The thrifty householder who lays in a supply of butter, poultry, meats, &c., during the early part of the winter, when such things are in supply, and then keeps them in some unheated storeroom in a frozen condition for several months, is employing exactly the same means to preserve them as if they were taken to a cold storage warehouse, with this qualification, that in the warehouse there is practically no change of temperature—no danger from thaws—and therefore, greater certainty of preservation.

The farmer who keeps apples, potatoes or any other vegetable in a 'pit' during the winter, is taking advantage of the preservative effect of a low temperature when he covers them only sufficiently to prevent the frost from penetrating.

The fruit grower who stores his apples in a frost-proof warehouse, depends on the same means of preservation as the cold storage man does, namely a low temperature without frost. There is no difference in the effect, whether the temperature is reduced naturally or whether the same result is brought about by artificial means. The advantage, however, is with the cold storage warehouse, because the temperature can be absolutely controlled and the preservative effect of 'cold' can be applied when it is most needed, namely during the warm weather of autumn, or immediately after the fruit is harvested and before cold weather arrives.

Perishable food products are so-called because of the tendency to undergo change and decay. These changes are controlled to some extent by the degree of heat to which the articles are exposed. Thus milk will keep sweet longer in a cool cellar than it will in a warm pantry, and a well iced refrigerator will keep it longer than the cellar, because of the lower temperature. These somewhat obvious facts are mentioned to show that the cold storage industry is merely the organized and systematic application of well known and long practised principles.

The cold storage industry benefits both the producer and the consumer by working to prevent alternate periods of glut and scarcity, accompanied by unprofitable prices at one time and exorbitant or prohibitive prices at the other extreme. The benefits derived from cold storage are well illustrated in its influence on the egg trade. There are other methods of preserving eggs, but of late years cold storage has been recognized as the most efficient. If it were not for the cold storage facilities which are now available, the price of eggs would, for lack of a market, go so low during the laying period of spring and early summer that production would be seriously discouraged and the scarcity which would result during the off season would boost prices for all

kinds of eggs to such an extent as to make them prohibitive for the majority of the people.

The use of cold storage gives the producer a fair price for his eggs at all seasons, and the consumer can secure a storage egg in fair condition during the fall and winter months at reasonable prices. No one would claim that a cold storage egg is equal to a fresh laid egg, but fresh laid eggs are not available in any quantity, and without the storage eggs, a large proportion of the people would be unable to secure eggs of any kind during the winter months, no matter what price might be paid for them. The same thing applies to butter, poultry, meat and fruit in a lesser degree.

Prejudice against Cold Storage and Cold Stored Foods.

That many people are prejudiced against any article which is said to have been in cold storage, can hardly be denied, and it must be admitted that they sometimes have reason to be suspicious of cold storage goods. The average consumer is not in a position to discriminate between effects which are actually due to cold storage and those which are the result of improper handling, or lack of ordinary precautions in the storing of goods already out of condition. It is true that food products do not always come out of cold storage in good condition, but it is also true that they do not always go into cold storage in good condition. It is not often that goods are kept long enough in cold storage to show serious deterioration if the storage conditions have been right and they have been placed therein in proper condition.

The cold storage business has suffered indirectly from the actions of dishonest dealers who misrepresent cold storage goods, as in the case when storage eggs are sold for strictly 'new laid' or even for 'fresh' eggs. This is probably not the proper occasion on which to discuss the ethics of the cold storage business, but one thing is certain, such practices will not assist in securing for it its proper place in the estimation of the people.

The cold storage industry is founded on sound economic principles and, properly conducted, is of benefit to both producer and consumer. There are faults of management in the operation of the cold storage business, as in other kinds of business. The cold storage business is a new one and it has been undertaken, in many cases, by men with no previous experience and with no accurate knowledge of either the principles or the practice of refrigeration. Lack of experience and knowledge has also resulted in badly constructed, poorly insulated and insufficiently refrigerated warehouses. These defects are gradually being remedied through the lessons taught by experience. The housekeeper who may be inclined to sneer at cold storage provisions, as such, should discard the ice box and all other attempts to keep things 'cool.' The fruit grower or dealer who does not believe in cold storage should be consistent and keep his apples or other perishable products at ordinary room temperatures during the winter months.

The Field for Extension of the Cold Storage Industry in Canada.

The field for the expansion of the cold storage business, through the public cold storage warehouse is not very extensive in Canada at the present moment. The larger centres have already been supplied and the openings where a purely cold storage business may be conducted successfully in distributing centres are not numerous. On the other hand, the opportunities for the successful operation of small warehouses in producing districts, seem to afford the best opening for the extension of the industry at the present.

There are many localities where small cold storage warehouses operated in connection with the produce business should prove of advantage not only to the owners, but to the producers in the locality. The apple trade is susceptible of much improvement by the judicious adoption of cold storage facilities. It would be a comparatively simple matter to convert many of the present apple warehouses, of which there are so many at points on Lake Ontario and along the Dominion Atlantic Railway in Nova

Scotia, into cold storage warehouses. It would be quite practicable in many places to establish a central refrigerating plant with pipe lines running to each warehouse. Only slight alterations in the insulation would be necessary. Such warehouses could be equipped with cold storage at comparatively little cost.

The fishing industry and the trade in fish products probably offer as good a field for the extension of cold storage as any other line in Canada at present. The great distance from the sea at which a large number of the people of Canada must always reside, makes it impossible for them to procure sea fish in fresh condition without the use of cold storage and cooling facilities. The application of cold storage to the fishing industry of Nova Scotia within the last two or three years has resulted in the rapid development of the inland trade and it is undoubtedly capable of great extension with the aid that may be rendered in this manner.

THE REFRIGERATION OF DAIRY PRODUCTS.*

In presenting this subject to the society, I wish to remind the members that I deal with it from the point of view of the dairy expert rather than from that of the refrigerating engineer. I do not suppose that anyone will object to having the subject approached from that side, because it seems to me that the engineer must have some knowledge of dairy requirements if he is to manage the refrigeration of dairy products with complete success. If I should appear at times to wander rather too far into the field of dairying, I hope I shall be forgiven, for it was my first love and I am still much more of a dairy expert than an engineer.

Any discussion on this subject would be somewhat simplified if we had a clearer definition of the term 'refrigeration.' Strictly speaking and with regard to the derivation of the word, I suppose it means the employment of temperatures below the freezing point of water, but in practice it has received a broader meaning and to most people the term 'refrigeration' implies the employment of some mechanical or chemical system for securing low temperatures as compared with the use of ice. For the purposes of this paper, however, we shall be obliged to adopt an even broader application of the term, and include under the head of refrigeration any reduction of natural temperatures for the preservation of dairy products.

The refrigeration of dairy products may be divided under three heads, viz.—(1) the refrigeration of milk; (2) the refrigeration of butter; (3) the refrigeration of cheese.

The Refrigeration of Milk.

Housewives and dairymaids have, from time immemorial, employed a measure of refrigeration for milk when they placed it in various receptacles, in cool cellars, for the purpose of securing a maximum amount of cream or to keep it sweet as long as possible. It is only within recent years that actual refrigeration has been used in the preservation and handling of milk. Absolutely pure milk, that is milk free from germs of fermentation, or as it exists in the cow's udder, will keep indefinitely at any temperature if protected from infection, but if any of the members of this society were brought up on farms, as your humble servant was, they will know how impracticable it is to procure milk without more or less, generally more, impurities finding entrance into it. If the multiplication of these germs which are thus introduced, is not checked in some manner, most profound changes soon take place in the milk.

I should be the last person to decry the efforts which are being made all over Christendom to obtain cleaner and more sanitary milk, because I know the need thereof, but I would emphasize the importance of cooling in that connection, because I believe it to be probably the most potent factor in preserving milk in a sweet and wholesome

*A paper read by the author before the American Society of Refrigerating Engineers at Chicago, Ill., October 18, 1909.

condition, and one that has not been given the prominence which it deserves. The process of pasteurization, very often looked upon as a heating process, is half refrigeration, because the heating without immediate and rapid cooling would, in most cases, be worse than useless. Refrigeration will not remove impurities from the milk, but it does have the effect of checking the multiplication of bacteria. It is of the utmost importance that the cooling of milk should be proceeded with as quickly as possible after it is drawn from the cow. Milk which is cooled immediately, say, to 60° F. will keep longer and be in better condition than if it is allowed to remain at a temperature of 70 to 80 degrees for several hours and then cooled to 40. I use these figures more to illustrate my meaning than to record actual experience. The refrigerating engineer who is called upon to design or erect a milk-cooling plant, should provide for quick cooling with as little exposure to the air as possible.

Some years ago an attempt was made to ship milk long distances in a frozen condition. Milk was sent from Scandinavia to Great Britain, covering a journey of two or three days, and it was predicted that it would be possible to ship it by this method across the Atlantic. The scheme has apparently not been commercially successful, because we have heard nothing about it of late years. One of the objections to the freezing of milk is the formation of flocculent particles of albumen or casein compounds which are not readily dissolved when the milk is thawed. It also has the effect of collecting the fat globules into small lumps of fat.

It may be said, therefore, that for practical purposes, a temperature of 40° F. or under is low enough for the preservation of milk, and that its preservation can only be a matter of days under ordinary commercial conditions.

Refrigeration of Butter.

Refrigeration is probably more useful to the butter-making industry than it is to the industry pertaining to any other food product. It is also highly essential in the practice of the art. The principal butter-making countries of the world are in the northern hemisphere and the periods of production are more or less intermittent, owing to the fact that the summer season is more favourable for production than the winter months are. It follows, therefore, that there is a large surplus of production over consumption at certain periods of the year, which must be held in reserve to supply the shortage at other periods. Before the days of refrigeration, the consumption of butter during the off-season was very much curtailed, owing to the fact that it was difficult to secure supplies in good condition. With efficient refrigeration available for storing the surplus product during the summer months, consumers can now obtain their requirements in practically as good condition during the winter months as at any other time of the year. This has resulted in an enormous increase in the consumption of butter all over the world, because we spread it thicker when the quality is good, and the business of dairying has grown and developed to an extent which would not have been possible without the aid thus rendered by refrigeration.

Butter is an unstable product. It is at its best when freshly made, and its fine quality will last only a few days at ordinary temperatures in the summer months. As the temperature is reduced, the changes which take place in the butter to bring about rancidity and other undesirable flavours proceed more slowly, so that the 'age' of butter is determined by the temperature at which it is kept rather than by the number of days or weeks which may have elapsed since it was made. At one time it was thought to be undesirable to keep butter below the freezing point of water under any circumstances, but gradually, in the light of experience, the storage temperature of butter has been reduced, until at the present time we have it being held as low as zero F.

Experiments and investigations have shown that butter eventually changes perceptibly under any storage temperature that has so far been tried, and that the effect of storing at different temperatures is only a matter of degree and not of absolute stoppage of all change in any case.

As far as I have been able to learn from recorded experiments and observations, slightly better results have always been obtained at the lowest temperature, even as low as —10° F. This applies to long periods of storage extending to six months and over. In view of this fact, one can hardly say what is the best temperature, having regard only to the best possible preservation. There is so little gain, however, when the temperature is reduced below 10° F. that the point of diminishing return may, I think, be fixed between zero and 10 degrees above. That is for long storage. When butter is to be stored for short periods under four or five weeks, I do not consider it necessary to go below 20 degrees F. A lower temperature means unnecessary expense, because the butter should be well preserved at 20 degrees F. The freezing point of butter, or rather of the liquids in it, depends, upon the percentage of salt therein. Freezing will occur in full salted butter at somewhere between 15 and 20 degrees F. We have no very definite information as to whether the quality of butter is injured by freezing or not, and that is fair proof that the injury, if there is any, is not serious one.

The engineer or cold storage manager, in determining the temperature at which butter is to be stored with an eye to economy and good results, must consider two things: first, how old the butter is and at what temperature it has been held previous to being offered for storage, and secondly, how long it is to be stored before it will go into consumption. A point worth noting in the storage of butter is that heavily salted butter does not keep as well as butter which is lightly salted. The difference has been attributed to the fact that it will require a low temperature to freeze the highly salted butter, but experiments at variable temperatures much below the freezing point of the butter, show a slight advantage in the lightly salted butter.

One of the troubles of butter storage is in the development of mould on the parchment paper lining of packages, on the surface of the butter and even throughout its mass. Mould is a low form of plant life. It is not a spontaneous growth, but comes only from seed, just as the more highly organized plants of the fields do. The seeds, or more properly speaking, the spores, of mould are very common in the form of dust almost everywhere. The conditions which develop them are dampness, suitable food and a favourable temperature, with a rather wide range, all of which are present in a butter package. The trouble can generally be traced to the creamery, where by careless handling, either the parchment paper or the packages have been infected. Packages made from unseasoned wood are sometimes responsible for the growth of the mould. The salts of unseasoned wood appear to furnish suitable food for mould growth. Conditions in the cold storage warehouse may favour the development of the mould. Thorough disinfection of butter rooms at least once a year is imperative if the rooms are to be kept sweet and free from mustiness. I have found the best results from washing all interior surfaces with a solution of one part of bi-chloride of mercury to 1,000 parts of water and, of course, everyone is aware of the beneficial effect of a periodical coating of whitewash.

The Refrigeration of Cheese.

When we place butter, meats, fish and similar products in cold storage, we measure the efficiency of the storage and the success of the undertaking by the extent to which the goods have been preserved without change from their original condition. Produce of this kind is, or should be, at its best when first placed under refrigeration.

The refrigeration of cheese intelligently conducted is an entirely different problem, for, unlike other products for which cold storage is employed, it continues to improve in quality for many months. I am not prepared to say how old a Cheddar cheese, properly cared for, will be before it reaches its best. I have kept them nearly three years with continual improvement in quality, and I wish to point out that my standard of quality is a rich, meaty texture and a mild though distinctly 'cheesy' flavour.

Perhaps I should explain that my remarks refer only to the Cheddar variety, or cheese of that type. This is the cheese which is chiefly made in the United States and is the sole product of Canadian dairies. Other varieties of cheese are not stored extensively in America.

The highest type of Cheddar cheese—that which is produced in Great Britain—is never placed in cold storage, but is cured and stored at a temperature of 60 to 65 degrees, and it is at that temperature that the most desirable flavour is developed. In the United States and Canada the conditions are different, and the temperature which prevails during the summer months, in ordinary cheese curing rooms and warehouses, is too high for good results, as it often rises to 85 or 90 degrees. If cheese is exposed to these high temperatures for a few days only shortly after it is made, certain ferments are encouraged and developed which, if not checked by comparatively low temperatures, will eventually produce results which are detrimental to the quality of the cheese.

The role of refrigeration in cheese storage is therefore to control, rather than to check, those fermentative changes which in most other products mean decay or at least deterioration.

It is obvious that the temperature at which cheese should be held in cold storage will depend upon whether such cheese have been cool-cured or have been exposed to unduly high temperatures. Strictly cool-cured cheese of good quality should not be stored at temperatures under 55 or 60 degrees. At that temperature the desirable flavours will develop and the texture of the cheese will continue to improve for many months.

On the other hand, if cheese has been exposed to high temperatures, the ripening processes will have proceeded further, as well as those undesirable changes already mentioned, and in order to check these injurious ferments, a comparatively low storage temperature is necessary, say 36 to 40 degrees, according to the condition of the cheese. A Cheddar cheese will never develop its highest quality at these low temperatures. The flavour will be lacking in that peculiar, rich 'cheesy' quality from which it derives its highest value. It is a case, however, of choosing the lesser of two evils. We cannot secure the fancy quality, but we prevent the serious deterioration in quality, and value, consequent on the development of bad flavours. These remarks apply more particularly to cheese intended for long storage.

As a result of my experience with the cool curing rooms built and operated by the Canadian Government, I have been compelled to disagree with some dairy authorities who have advocated the ripening and storage of cheese at 40 degrees or even lower, under all circumstances.

The shrinkage in the weight of cheese in storage is an important item in the cost of carrying it. The shrinkage of cheese while in storage at any temperature may be almost entirely prevented if the cheese are coated with paraffin wax when they are ten days or two weeks old. It will pay to paraffin any cheese which are to be stored for one month or more.

The practice of paraffining also prevents the growth of mould on the surface of the cheese, which may be troublesome if excessive.

THE COLD STORAGE OF APPLES AND OTHER FRUITS.*

The possibilities of cold storage as an aid to the fruit growing industry in Canada is a subject in which interest is growing rapidly.

As the subject is a comparatively new one, on which it is not yet possible to bring very much authoritative data to bear, it is not surprising that there should be some difference of opinion concerning it, and that superficial and sometimes erroneous views should be put forward by perfectly honest and well meaning persons. Your humble

---

* An address delivered by the author before the Ontario Fruit Growers' Association at Toronto, November 11, 1909,

servant does not expect to say the last word on the subject on the present occasion, or on any other occasion, for that matter, but it is possible that exceptional opportunities for studying the whole question of cold storage in relation to the preservation and handling of food products may have enabled me to acquire some information which, I hope will be useful to the members of this association. Any one who has followed the matter closely, must be convinced that there is a fine opportunity to improve the fruit trade of Ontario by the intelligent employment of cold storage and refrigeration in transit. I could quote many instances where the value of apples stored or shipped in cold storage, has been greatly enhanced. As an instance, a sales catalogue from Glasgow, of recent date, shows that cold storage Kings ex SS. *Pretorian* fetched 31 shillings, while the highest price paid that day for the same variety shipped as ordinary cargo in the same steamer was 24 shillings and sixpence. Other varieties show similar differences. Wealthies in cold storage sold for 24 shillings, as compared with 14 shillings and sixpence for those carried as ordinary cargo, and so on.

I quote these figures merely to indicate the possibilities of shipping early apples in cold storage, and not as an attempt to prove that such results could always be obtained.

As fruit growers, rather than shippers, you are more interested in cold storage on land, and I shall confine myself to that phase of the question and get as near to the orchard as possible, for that is where cold storage will be the most effective.

Now there are some things which cold storage will not do, and it is just as well that we should have at the beginning a clear understanding of its limitations as well as its possibilities. Reference has frequently been made to the large quantities of apples which are wasted every year in Ontario orchards, especially when there is a heavy crop, and it has been urged that if cold storage were available, all this enormous loss would be avoided. I need hardly say to experienced fruit growers that such an assumption is an absolute fallacy; that it is not cold storage which is needed primarily, but better orchard methods and management. The fruit grower who depends on cold storage to preserve windfalls, worm-eaten, bruised and skin punctured apples from early decay, will be grievously disappointed.

The lowest temperature which it is possible to employ does not absolutely stop either the life processes of the apple or all of those destructive changes which include various forms of rot, &c. It only checks them, but some forms of decay are checked more effectively than others. Experiments at Geneva showed that Pink Rot, Black Rot and Bitter Rot developed very little in cold storage, but that the ordinary Soft Rot, which is due to the growth of the common blue mould (*Penicillium glaucum*) and which is probably the most common form of apple decay, is not prevented to any marked extent. Fortunately, the apple resists the attacks of this mould, unless there has been some puncture or weakening of the skin, due to fungi or bruising, until it begins to deteriorate with old age. The injury need only be of the slightest character —a mere pin prick, for instance—to provide an open door for the entrance of the spores of the destroying mould.

If you place over-mature or ripe apples in cold storage, they are bound to go down in a short time. Let me here digress to make myself clear on the two terms, 'maturity' and 'ripeness.' I would call an apple mature when it is fully grown and well coloured for the variety, and call it ripe when it reaches its best condition for eating. The length of time which elapses between maturity and ripeness varies greatly according to variety. In some earlier or quick ripening varieties, it is only a matter of days, while in others, it becomes a question of weeks and even months.

The foregoing is probably more of a practical definition than a scientific one, for I suppose nature intended all apples to ripen fully on the trees, but man, with his perverseness, has so shifted things around that he is growing many varieties in latitudes and climates where they cannot possibly ripen. I do not say there is anything wrong in that. We call apples mature when they reach the stage in which we are accustomed to find them as taken from the tree.

Early Varieties Should Not Be Held.

The earliest varieties should be rushed to the market as quickly as possible to take advantage of the early trade. Prompt chilling before shipment is all that cold storage should be expected to do for apples of this class. Even with varieties whose qualities would commend them in competition with others past their regular season, some caution is necessary, because if an apple is carried much past the time when experience has taught every one that it has reached its best and may be expected to 'go down,' dealers would hesitate before handling it.

Keeping Quality of Varieties of Apples in Cold Storage.

It is not an easy matter to determine experimentally the relative keeping quality of different varieties of apples in cold storage, because of the difficulty of securing the different varieties at exactly the same stage of maturity, and unless this is done, any test is unreliable and the results are misleading. Generally speaking, those varieties which ripen most slowly will keep the longest.

Some varieties hold their quality much better than others. That is to say, certain varieties retain their crisp, juicy texture and characteristic flavour almost to the end, while others become mealy and insipid long before the structure of the apple breaks down. Of course, they act the same way in any kind of storage. This, it seems to me, is a rather important consideration, in selecting varieties for cold storing.

Length of Time Apples May Be Kept in Cold Storage.

It is safe to say that any variety of apple may be kept as long as it is commercially desirable to do so. Late winter apples may be kept a year without difficulty; fall and early winter varieties, from 2 to 4 months. Canadian Fameuse of the previous season's growth were shown in good condition at the Dublin Exhibition in the month of August. Of course, only a percentage of those originally stored were sound at that time, and the circumstance does not prove that it would pay to keep the Fameuse to that date.

Cold Storage of Apples May Be Overdone.

The cold storage of apples might easily be overdone. It would be quite practicable, for instance, to preserve any of the early fall apples if placed in storage at the proper time, for several weeks or even months, but it would not be good business to do so, because the trade would be shy of such varieties out of season. It would be unbusinesslike to attempt to carry inferior varieties into the season for better ones.

Season May Be Extended.

By degrees, however, the season for superior varieties might be considerably extended. The Rhode Island Greening is a good type of this class. The season for the Greening has been extended for six weeks or two months in the United States by means of cold storage, with the decided advantage that it misses the competition of cheaper varieties. The question of variety should be carefully considered in selecting a stock for cold storing.

The Function of Cold Storage.

The proper function then, of refrigeration in connection with our fruit trade, is two-fold: first, the rapid chilling of early apples and tender fruits, and their preservation in transit; and second, the storage and early checking of the ripening process in late apples intended for long keeping. When the cold weather comes on, natural temperatures can be utilized, but the damage is done before that time arrives, especially in those seasons when warm weather prevails late into October or November.

In these two fields, there is a great opportunity. Of course, there is always the further advantage of being able to carry surplus stocks over a period of glut in the market. There is particular need for cold storage in those warmer localities where late apples approach more nearly the stage of full ripeness on the trees. There is this to be said also, that apples which are well matured and highly coloured keep better in cold storage than greener and more immature ones do.

But it would be a mistake to suppose that all Canadian apples require cold storage. In the cooler districts at least a portion of the late or slow maturing varieties may be preserved for early marketing if properly handled in ordinary frost-proof warehouses. While cold storage would lengthen the season of all apples, the gain in value would not be equal to the expense in all cases.

As one whose duty it is, as a public officer, to give all reasonable encouragement to the use of cold storage, I feel that it would be unfortunte if these things were not clearly recognized and well understood before there is any large expenditure made in this connection.

Packages in Cold Storage.

The question of package is of some importance in the cold storage of apples. In the case of the early varieties, for which quick cooling is important, the box package, on account of its smaller size and, therefore, greater extent of surface as compared with bulk, and the openings at the edges, undoubtedly facilitates the attainment of the object in view. With later varieties for which quick cooling is not so important, the barrel carries no serious objection.

Wrappers and Cold Storage.

All apples will keep better if wrapped in paper. The wrapper helps to prevent the bruises which may result from the handling and pressure of tight packing, and it also prevents the spread of mould spores or other germs of decay from one apple to another. The wrapper offers the further advantage that it prevents, to some extent, the collection of moisture on the surface of the apple when it is changed from a low temperature to a comparatively high one.

The wrapper is obviously more useful on early and tender varieties than on later and firmer ones. Circumstances and labour resources must guide the individual in determining how far it will pay to carry the matter of wrapping.

Pre-Cooling.

The so-called pre-cooling of fruit, vegetables, or other produce, consists of an arrangement whereby the circulation of air which is chilled with a refrigerating machine, is directed through a loaded car by means of temporary and adjustable pipes or ducts. That is to say, the car is placed in the same relation to the refrigerating machine for the time being as an ordinary chamber in a cold storage warehouse.

My attention was first drawn to this system by the work of the Bureau of Plant Industry of the United States Department of Agriculture in California, where they experimented in connection with the shipment of citrus fruits and vegetables in conjunction with the Pacific Fruit Express Company, a subsidiary company of the Southern Pacific Railway system, and by correspondence with Mr. L. A. Roy, of Chicago, who is interested in the promotion of the idea.

Two years ago, I fitted up the necessary connections at the St. Catharines Cold Storage and Forwarding Company's warehouse, but we were never able to give it a fair trial, on account of the small size of the plant. The partial cooling which was effected was undoubtedly of some benefit, but hardly worth the time and trouble. It would take too long with the 6-ton machine in use there. The pre-cooling of a carload of

warm fruit, in addition to the chilling of the car itself, which is a considerable item, takes about two tons of refrigeration, and as it should be accomplished in about four hours, it is equal to a machine capacity of 12 tons in 24 hours. If two cars were to be cooled at one time, it would require a plant of at least 25 tons capacity. Further, in order to be effective, the cold blast should have a temperature of not more than 20° to 25° and that precludes the possibility of using the same circulation in the warehouse where the temperature in fruit rooms must not go below 32°. As long as the fruit in the car is warm, the cold air blast can safely be reduced to several degrees below the freezing point, but this is not permissible in a warehouse where the contents are already reduced to the minimum of safety.

During the past summer, I had an opportunity of inspecting the large plants which have been erected by the Southern Pacific Railway in California. They have spent a million and a half dollars on two plants, one at Roseville in northern California, and the other at Colton, in the southern part of the state. I would like to take this first public opportunity of saying that I received every courtesy at the hands of the various officials, from the chief traffic director down to the superintendent of the works, and I was given every possible facility to get what information I wanted.

These two plants are at interior points where the traffic converges for the overland journey. The one at Colton has 500 tons of refrigeration and can handle a whole train of cars at one time. In addition to the cooling facilities, there is a large equipment for making the ice with which to fill the bunkers of the cars.

You will observe that these cooling facilities are being provided in California by the railway company and I am of the opinion that it properly falls to them to do it. In the first place, they benefit by the saving of ice, and a plant erected by the railway can be made to serve a whole district at very much less cost than the aggregate cost of erecting and operating a number of smaller plants. Moreover, it should be the business of the railways to carry the freight which is entrusted to them in the best possible manner and if pre-cooling comes to be one of the necessary aids to the transportation of Canadian fruit, it seems to me that it is up to the companies to furnish it.

I can see the possibility in the future, or I might say the practicability, of operating a plant, say at Hamilton, to serve the district between Niagara and that city in connection with western shipments. With some system of prompt movement of the cars from loading points to the cooling centre, they could be started on their overland journey without serious delay and with the best possible chance of reaching their destination with the contents in good condition.

It will be evident from what I have said that pre-cooling does not differ in principle from the cooling which is effected by placing the goods in a cold storage warehouse, but if it is conceded, and it certainly may be, that immediate and rapid cooling is important in the handling of perishable produce, then it must be admitted that, under certain circumstances, pre-cooling has decided advantages. One advantage that car cooling has over cooling in the warehouse is that it saves handling the fruit and the consequent exposure to warm air while being transferred from warehouse to car, a thing to be avoided as much as possible. With proper equipment, a carload of fruit may be cooled in this way as much in 4 or 5 hours as it would be in two or three days with ice only, in a refrigerator car. A more rapid circulation of air at a much lower temperature than can be secured with the use of ice removes the heat in a comparatively short time.

I have dwelt at some length on this matter of pre-cooling, because it is one which has attracted some attention and there is likely to be more or less inquiry concerning it.

The Cold Storage Warehouse.

Any treatment of this subject would be very incomplete without some reference to the cold storage warehouse. I am in favour of making the cold storage of fruit a special business, as a rule. Large general cold stores at important centres should

have provision for handling apples and other fruit, but in many cases, it will be more economical and more satisfactory all round to have warehouses built and equipped for the handling of fruit only. Cold storage is required for fruit in localities where little or no other kind of produce will be offered. Non-freezing temperatures only are required and those chiefly during the coolest part of the summer and in the winter months. This permits of lighter insulation and lower refrigerating power than is necessary for general storage where freezing temperatures must be provided.

The period of fruit storage covers only a part of the year. A special fruit-cold storage need be operated only when fruit is in storage.

Construction of Warehouse.

There are, of course, many different plans on which such a building may be constructed, and different materials may be used for insulation. I shall not attempt to describe all of them, but I shall endeavour to give you some idea of the kind of warehouse which would be suitable for a co-operative fruit association, because it is chiefly in connection with these organizations that I expect to see cold storage applied to the fruit trade in Ontario.

If the warehouse is to be on a railway siding, the ground floor should be on a level with the car floor, with a basement beneath, and as many floors above the ground floor as may be considered necessary. My preference would be, except in the case of very large warehouses, to have only a ground floor and basement with an attic for the storage of boxes, &c. Such a warehouse, 75 x 45 feet, with a one-storey addition for machine room and office, would be sufficient to store between 7,000 and 8,000 barrels of apples, or the equivalent of about 10,000 barrels if packed in boxes. Fig. 1 is a diagrammatic longitudinal section of such a warehouse.

The ceiling need not be over 8 feet high to accommodate 5 tiers of barrels, which is high enough for piling.

I think I may take it for granted that the cheapest possible construction, consistent with reasonable efficiency, is the one which will be most popular. I cannot say that I agree with the policy which prompts the erection of more or less temporary buildings in connection with an industry so well estalished and with so much promise for the future as fruit growing, but as we are dealing with a conditon rather than a theory, I am prepared to take things as I find them.

For the basement of this building, there is probably no cheaper or better material than concrete. The upper storey can be built of wood more cheaply than with other materials, because the structural parts can be combined with the insulation material in the most economical manner. Planer shavings make the best and by far the cheapest insulation, for wood construction. The empty air space, miscalled a 'dead air' space, is an obsolete form of insulation. Absolutely dead air is, next to a vacuum, probably the best insulator known, but experience has taught us that air in wall spaces is not 'dead,' and that it circulates within the space and carries heat from one side to the other. Hence the practice of filling these spaces with some light non-conducting material like shavings, which confines the air on the same principle as the air is confined in the fur of animals, or in our clothing to prevent the passage of heat. Sawdust is sometimes used for filling spaces, but it should not be unless it can be kiln-died, because it normally contains a great deal of moisture. It is always cut from green or water-soaked timber and this moisture destroys its insulating value and at the same time encourages the growth of moulds, which soon give rise to mustiness. Dryness is the first principle of successful insulation and must never be overlooked. Think of the difference between dry and wet clothing on a cold day.

Considering cost and efficiency, I would recommend the following combination for the walls of a building of this class. For the basement, a 10-inch concrete wall, waterproofed on the outside and finished on the inside with a 1-inch air space, 1 course of matched lumber, a 6-inch space filled with shavings and two courses of matched lum-

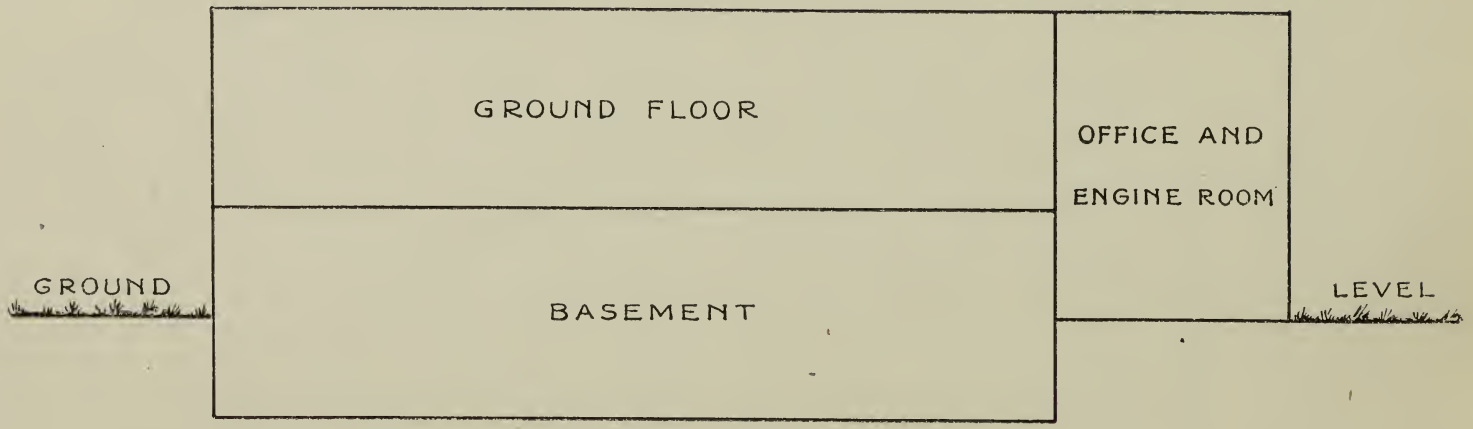

FIG. 1. DIAGRAM OF SECTION.

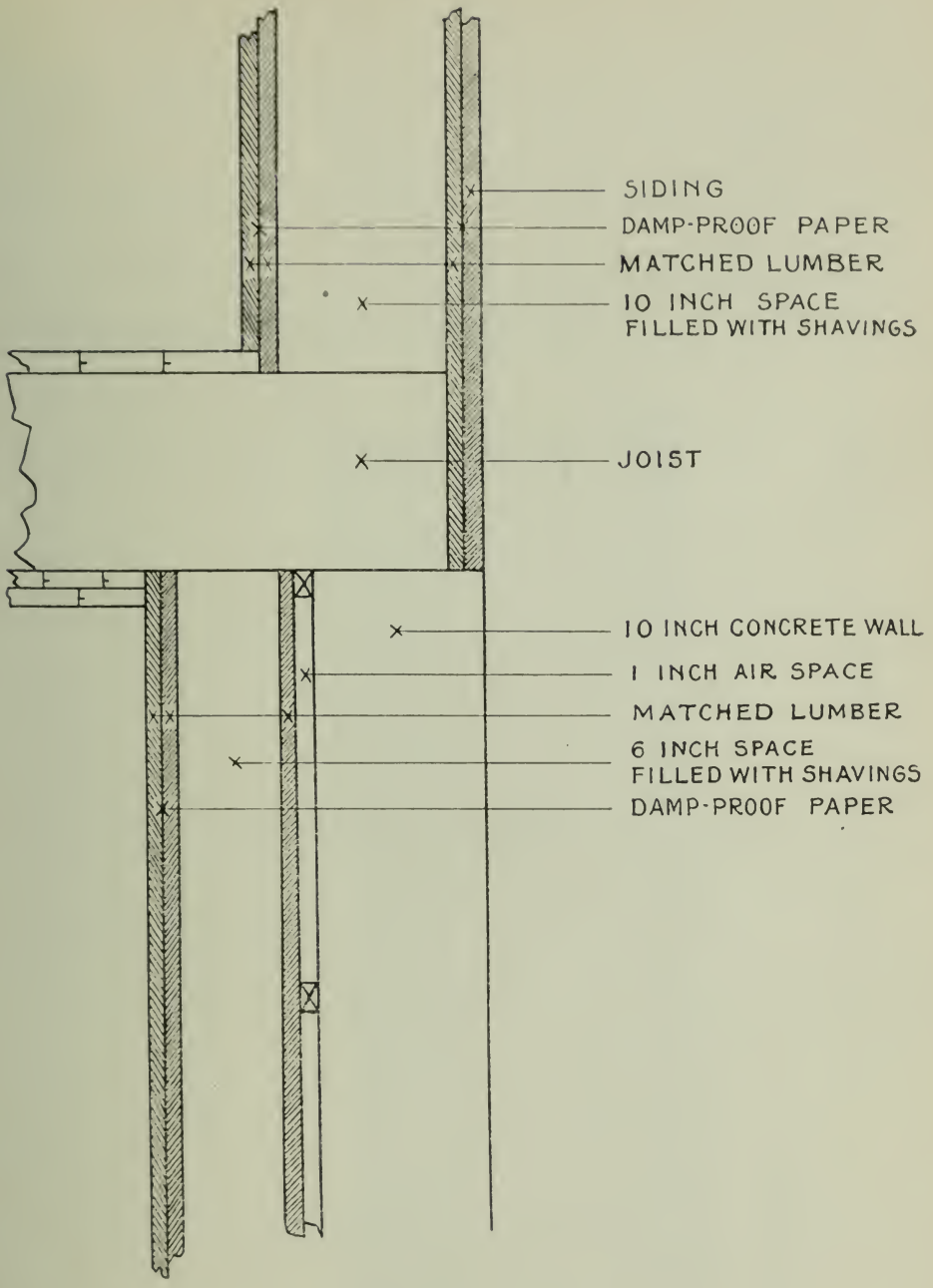

FIG. 2 ——— SECTION OF WALL AT CEILING OF BASEMENT.

ber with damp-proof paper between. For the upper storey, 2 x 4 inch studs covered on the outside with 1 course of matched lumber, 2 ply of damp-proof paper and either metallic or wood siding; a space of 10 inches filled with shavings, finished on the inside with 2 courses of matched lumber with 2 ply of damp-proof paper. This inside sheathing would require an additional row of 2 x 4 inch studs, which should be placed zigzag or 'staggered,' with the outside row. The ceilings will be sufficiently insulated with the spaces between the joists filled with shavings.

A very important precaution in the construction of the concrete wall is to give it a coat of pitch or other water-proofing on the outside, especially below the surface of the ground.

A section of the wall and ceiling of this warehouse which we are trying to describe would have the following detail. (Fig. 2.)

The basement floor is an important detail of the construction and probably the most difficult part to insulate, because we have to contend with the moisture from the

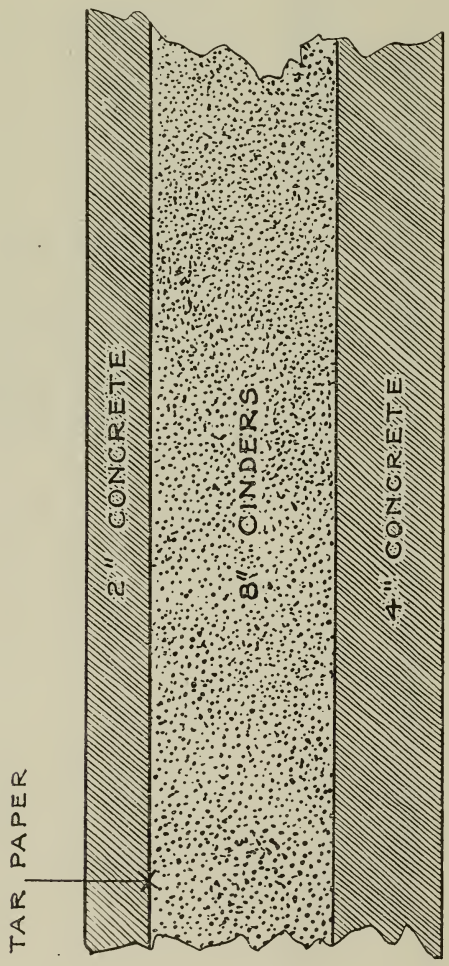

FIG. 3. SECTION OF FLOOR.

earth. Cold storage engineers are not agreed as to the best combination of materials for ground insulation. Wood in any form, is unsuitable, owing to the tendency to absorb moisture, which destroys its insulating value and promotes decay. Shavings, then, are out of the question. Impergnated sheet cork, laid between two layers of con-

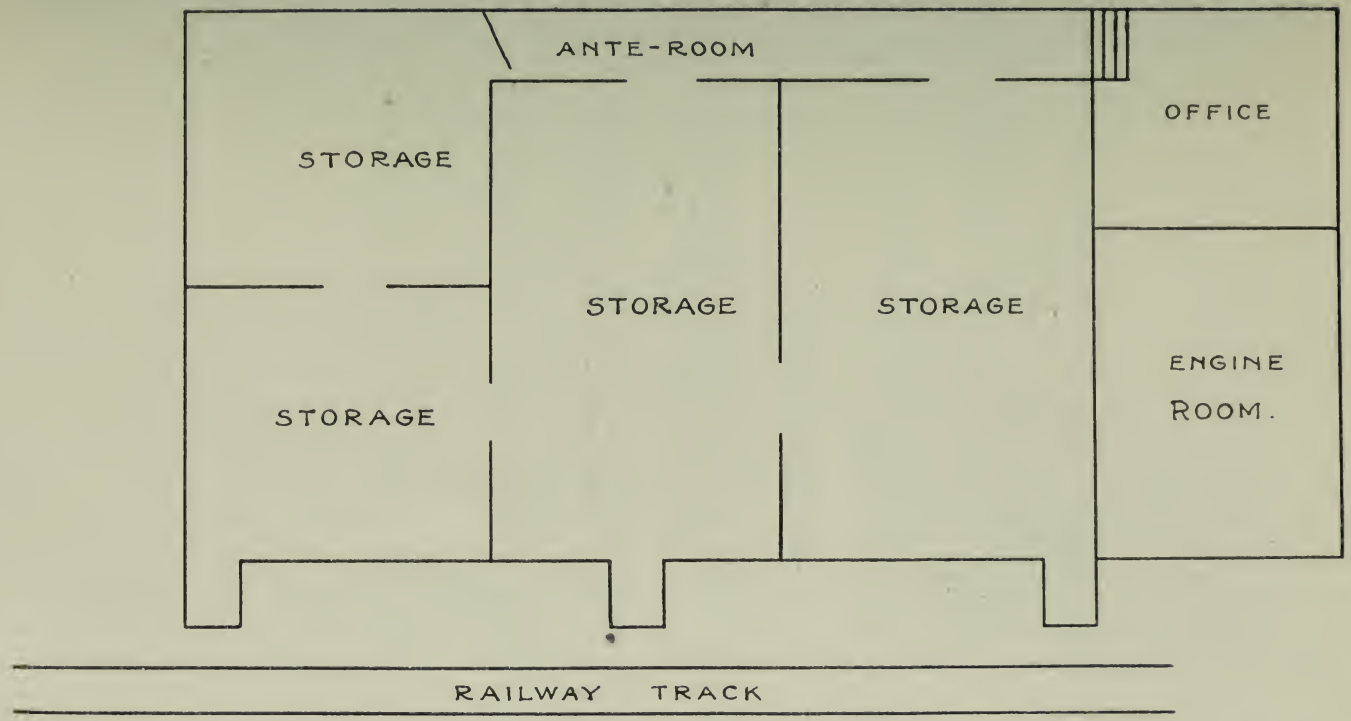

FIG. 4. SUGGESTED ARRANGEMENT FOR GROUND FLOOR.

crete, or asphalt and concrete, are being used in some of the more expensive plants. I have recommended for cheaper construction, such as we are considering, a combination as follows:—

First, a 4-inch layer of concrete, then 8 inches of clean dry coal cinders, well rolled or rammed, a layer of tar paper and a finishing surface of 2 inches of concrete. A concrete or hollow brick (square tile) can be substituted for about half the depth of cinders. The tar paper is put over the cinders to prevent the wet concrete from filling the air spaces in the cinders. This combination will be improved by coating the first layer of concrete with roofing pitch to keep the earth moisture from the cinders. It is the cinders which provide the insulation. Concrete is a poor insulator. Fig. 3 gives a detail of such a floor.

As for the arrangement of the rooms much will depend on circumstances. In most cases, the basement would be as well in one room, or two at the most. For the ground floor, which would be used for cooling small lots during the active shipping season, the division as shown in Fig. 4 is only a suggestion.

A building such as I have described should be erected and equipped with refrigerating machinery at a cost, exclusive of site, of from $1.50 to $2 per barrel of capacity, or a total of $12,000 to $15,000.

I shall not dwell any longer on this point, because I intend to have detailed working plans and specifications made before next season, and blue prints of these will be sent to any one who applies to me for them.

Ice Storages on Farms.

So far, we have been dealing with mechanical refrigeration and central storage and I propose to finish, in a very few words, with a suggestion concerning small iced cooling rooms for the use of individual growers and to be located in or near the orchard. (Fig. 5).

I believe that a small room where berries and tender fruits could be cooled, held over Sunday, &c., would be a very useful adjunct to many fruit farms. I would not advocate a low temperature for such rooms, possibly not lower than 50 degrees, because of the damage which would result from 'sweating' when the fruit was removed for shipping if lower temperatures were employed. At a temperature of 50, it would be practicable to have a cement concrete floor and to get some cooling from that source, which is a great advantage. The walls should have one course of matched lumber and siding on the outside, with damp-proof paper between and double boarding and paper on the inside, with a space of 12 inches between the inside and outside sheathing to be filled with shavings. About one-third of the building should be set aside for the ice chamber, with a partition between the ice chamber and cooling room, having same insulation as the outside walls. An additional course of matched lumber on the inside, making a one-inch air space, is advisable for the ice chamber. The air-space in this case is to prevent moisture from the ice penetrating the insulation. The floor of the ice chamber should be constructed in the same manner as the floor in the basement of the cold storage, (see Fig. 4) with a slope of 1 inch in 4 feet to a gutter at one side to provide drainage from the melting ice. The drainage outlet must be trapped to prevent the passage of air. The floor of the ice chamber should be covered with a wooden grating on which the ice will rest. No covering or packing material is used on or around the ice in such a chamber. Provision is made by means of openings in the partition between the ice chamber and the cooling room, at the ceiling and near the floor, for the circulation of air through the cooling room and over the ice. As the air is chilled, it deposits some of its moisture on the surface of the ice, thus making a fairly dry storage. Neither the ice chamber nor the cooling room should be ventilated. The air is changed sufficiently by the occasional opening

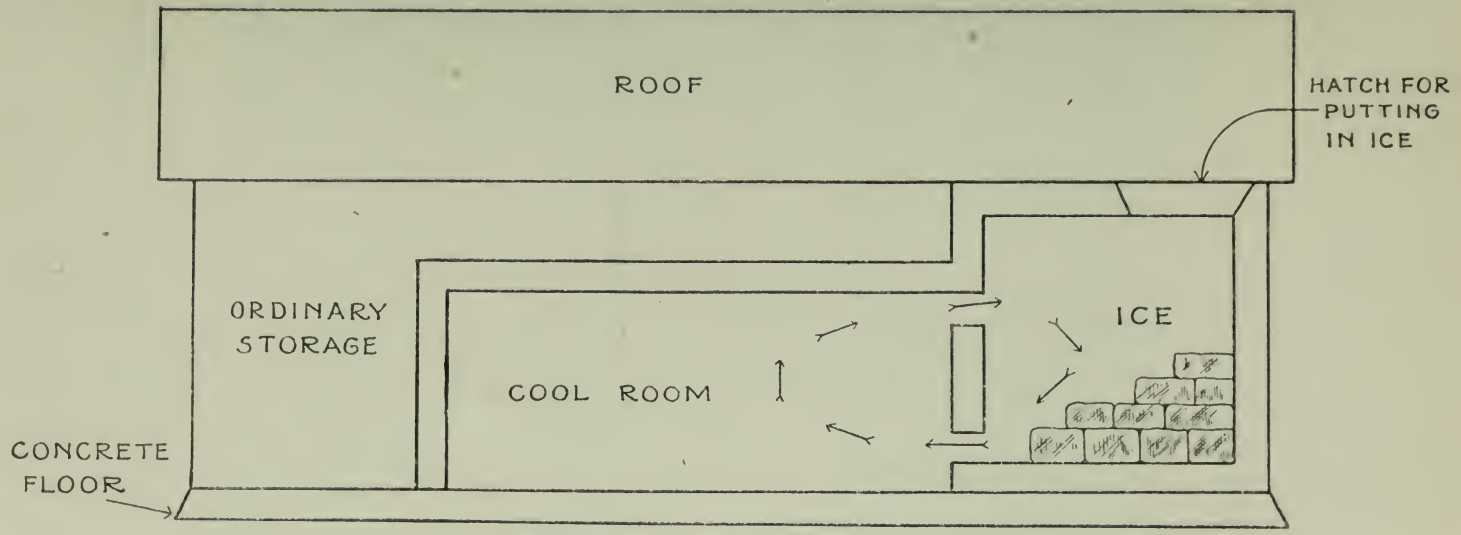

FIG. 5. SECTION.

of the door. Ventilation means the introduction of warm moisture-laden air, which causes dampness. The circulation over the ice tends to keep the air purified.

It is permissible to have small windows in the cooling room, but they should be located at the ceiling and have at least double sash, each double glazed. There should be an ante room which can be used for storing empties, tools, &c.

Fruit growers will be able to determine individually whether one of these cooling rooms would be of use to them or not.

THE COLD STORAGE OF EGGS.

Cold storage has, during recent years, almost entirely superseded other methods for the preservation of eggs in large quantities. The knowledge gained by experience and the improved equipment of cold storage warehouses have combined to eliminate certain imperfections which were at one time thought to b inseparable from this method of preservation. These defects are now properly attributed to bad management of the egg rooms, unsuitable conditions of storage, or to the fact that the eggs were too old when placed in store. The age of an egg in respect to condition, is determined as much by the temperature to which it has been exposed as it is by the number of days that may have elapsed since it was laid. Eggs for long keeping in cold storage should be gathered during the months of April, May and possibly the early part of June. When the weather becomes warm, the eggs deteriorate so quickly that it is difficult to secure them in good condition. All eggs for storage should be marketed within a few days after they are laid, and placed in cold storage as quickly as possib'e.

Eggs which are allowed to lie around a country store for weeks, exposed to heat and injurious odours, are not suitable for cold storage. It is important that eggs for storage should be clean.

The cases and fillers, it is needless to say, should be new and made of odourless material. Many eggs are tainted by musty fillers, or fillers which become musty in store.

Any person who uses second-hand cases or old fillers is liable to meet with very much disappointment and financial loss. Care should be taken to see that any material which is used as a cushion for the bottom and top layers of eggs, should be thoroughly dry and free from any signs of mould or 'mustiness.' For that reason, new excelsior is probably the best material to use for that purpose.

One of the defects of cold storage eggs in the past has been a tendency to develop mustiness of flavour, due to the growth of mould or fungus on the shell. Two conditions which promote the growth of mould are moisture and high temperature. It follows, therefore, that the lower the storage temperature is, and the drier the air in the room is kept, the less will be the trouble from mould, other things being equal. Of course, there is a practical limit to the reduction of the relative humidity, because if carried too far, it will cause excessive shrinkage of the eggs. It is now generally recommended that 75 to 85 per cent of relative humidity is about right at a temperature of 29 to 30 degrees. Where the air circulation system is used, the humidity is controlled, to some extent, by passing the air over expansion coils which are kept continually wet with calcium chloride brine. If this is not sufficient, calcium chloride can be exposed in trays or racks in different parts of the room and for the purpose of absorbing the moisture, the affinity of this salt for water being very great. Some German authorities claim that the calcium chloride has a germicidal effect also, and that the air of the room passing over surfaces wetted with calcium chloride brine, is more or less disinfected.

A psychrometer should be provided for determining the relative humidity. The sling psychrometer is largely used in the United States. This consists of two accurate thermometers firmly fixed to a frame, which is attached to a handle with a swivel so

that it can be whirled in the air. The bulb of one thermometer, which should project about one inch below the frame, is covered with a piece of muslin, and before whirling, this bulb is moistened with water at the same temperature as the storage room. After whirling for about half a minute, the readings should be quickly taken. The evaporation of moisture from the muslin covered bulb reduces the temperature on that thermometer, and the drier the room is the more rapid will be the evaporation, and hence the greater the difference in the readings of the two thermometers. Tables are provided for calculating the relative humidity from the difference in the two readings. Another form of the wet and dry bulb thermometer is provided with a device for keeping the muslin constantly wet. These instruments should be fanned vigorously for a half minute before taking the reading.

A considerable change of opinion has taken place in regard to the minimum temperature for egg storage during recent years. At one time, 40 degrees was considered to be low enough, but the temperature has been gradually reduced, until now the most experienced egg men hold the temperature as low as possible without freezing the eggs. The critical temperature for perfectly fresh eggs is about 27 to 28 degrees, and 29 to 30 is as low as it is practicable to keep the temperature in the egg rooms. Very perfect equipment and exceedingly good insulation are required to maintain a temperature of 29 to 30 degrees without having some part of the room too cold. The indirect or air circulation system is generally approved for the equipment of egg storage rooms, and it is needless to argue that if the insulation is very efficient a smaller amount of refrigeration will be required to maintain the temperature of the room at the desired point, and there will be less difference between the average temperature of the rooms and that of the air at the point where the circulation enters.

It is an advantage also to have the inlets for cold air well distributed, so as to reduce the flow of air at any given point.

In piling the egg cases in a storage room, it is necessary to put dunnage between the different tiers so as to make provision for a free circulation of air among the cases. When eggs are kept at 29 or 30 degrees, it does not seem to be necessary to turn the cases from time to time, as it is when the temperature is higher. The low temperature stiffens the white of the egg to such an extent that the yolk is prevented from floating and becoming attached to the shell. In connection with this point, it is also advised that the eggs should be placed in the fillers with the point down, because it is obvious that the yolk in rising will not come in contact with the shell as quickly with the big end up as it would if the point were up. It is very often supposed that the yolk settles in the egg, but being lighter than the white of the egg, the contrary is what occurs.

Difficulty is usually experienced in removing eggs from low temperatures into the ordinary atmosphere, without injury, especially in climates where the relative humidity is high. The cold egg collects moisture from the air. One plan of avoiding the condensation of moisture is to remove the eggs by successive stages through rooms of different temperature until the outside temperature is approached. Another plan for handling small quantities of eggs is to bring them into a moderate temperature room a few hours before they are to be taken away from the warehouse, and there they should be covered with a tarpaulin or canvass to prevent the circulation of air in and around them, while they are being warmed to the temperature of the air in the room.

Too much care cannot be given to egg storage rooms to have them thoroughly disinfected every year. As soon as they become empty they should be thoroughly dried by ventilation and heating, if necessary, and then given a good coat of whitewash. For the purpose of thorough disinfection, a scrubbing of the interior surfaces with a solution of 1 part bi-chloride of mercury (corrosive sublimate) to 1000 parts of water, before whitewashing, will thoroughly destroy all spores of mould or other germs.

THE COLD STORAGE OF FURS AND WOOLLENS.

All goods subject to attacks by moths are absolutely protected from such injury if kept in a temperature under 40 degrees. In large centres of population a profitable trade is being developed in the storage of this class of goods, which includes fur in all forms, woollen clothing, blankets, carpets, rugs, drapery, &c. The cold storage of furs also prevents the deterioration which follows their exposure to a hot, dry atmosphere. The softness, therefore the durability, of the skin, and the glossiness of the fur are preserved by low temperatures.

Garments in cold storage are usually suspended on forms without covering, but securely tagged for identification. A very good arrangement for the storage of garments would be to have a series of lockers of suitable size, constructed of heavy wire netting or gratings, which could be rented to customers at a fixed rate.

No attention is necessary during the period of storage, but the warehouseman, in his own interest, should make a careful inspection when the goods are received, and note on the receipt any defect or injury which may be apparent at that time. All goods should be well shaken and brushed before being placed in storage, and all traces of 'moth balls' or other evil smelling substances carefully removed, in order to avoid risk of injury or taint of food products in the same warehouse. A special room should be set aside for this class of custom, if the quantity of goods received will warrant it.

THE COLD STORAGE ACT.

6-7 EDWARD VII., CHAP. 6.

An Act to encourage the establishment of Cold Storage Warehouses for the preservation of perishable Food Products.

(Assented to 22nd March, 1907.)

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. This Act may be cited as *The Cold Storage Act.*

2. The Governor in Council may enter into contracts with any persons for the construction, equipment and maintenance in good and efficient working order, of public cold storage warehouses equipped with mechanical refrigeration, in Canada, and suitable for the preservation of all food products.

3. The location, plans and specification of every such warehouse, its equipment, and the amount to be expended thereon, shall be subject to the approval of the Governor in Council.

4. The Governor in Council may, out of any moneys appropriated by Parliament for the purpose, grant towards the construction and equipment of any such warehouse a subsidy not exceeding in the whole thirty per cent of the amount expended or approved of in such construction and equipment, and payable in instalments as follows: upon the warehouse being completed and cold storage at suitable temperatures being provided therein, all to the satisfaction of the Minister of Agriculture, a sum not exceeding fifteen per cent of the amount so expended; and at the end of the first year thereafter seven per cent of the said amount, at the end of the second year thereafter four per cent of the said amount, and at the end of each of the two next succeeding years two per cent of the said amount: provided the warehouse is maintained and operated to the satisfaction of the Minister of Agriculture.

5. The Minister of Agriculture may refuse to pay any part of the said subsidy if, in his opinion, the operation of the warehouse has not been of such a character as to provide for the proper preservation of such products as may be stored therein.

6. The Minister of Agriculture may order, and cause to be maintained, an inspection and supervision of the sanitary conditions, maintenance and operation of such warehouses, and may regulate and control the temperatures to be maintained therein in accordance with the regulations to be made as hereinafter provided.

7. The rates and tolls to be charged for storage in such warehouses shall be subject to the approval of the Governor in Council.

8. For the effective carrying out of the provisions of this Act the Minister of Agriculture may appoint inspectors, who shall have access to all parts of such warehouses at all times

9. The Governor in Council may make such regulations as he considers necessary in order to secure the efficient enforcement and operation of this Act; and he may by such regulations impose penalties not exceeding fifty dollars on any person offending against them; and the regulations so made shall be in force from the date of their publication in *The Canada Gazette,* or from such other date as is specified in the proclamation in that behalf.

10. Chapter 7 of the statutes of 1897, intituled *An Act respecting Cold Storage on Steamships from Canada to the United Kingdom and in certain cities in Canada,* is repealed.

8-9 EDWARD VII., CHAP. 8.

An Act to amend the Cold Storage Act.

(Assented to 19th May, 1909.)

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. Section 2 of *The Cold Storage Act,* chapter 6 of the statutes of 1907, is amended by striking out the last three words thereof and substituting therefor the words "any food product."

P. C. 437.

PRIVY COUNCIL, CANADA.

AT THE GOVERNMENT HOUSE AT OTTAWA.

FRIDAY, the 11th day of March, 1910

PRESENT:

His Excellency in Council.

His Excellency, by and with the advice of the King's Privy Council for Canada, is pleased to Order that the Regulations established by the Order in Council of the 3rd May, 1907, in virtue of the provisions of the Cold Storage Act, shall be and the same are hereby rescinded, and the following Regulations substituted therefor;

His Excellency is further pleased to Order that this Order in Council shall come into force on and from the date of the publication thereof in the *Canada Gazette.*

(Sgd.) F. K. BENNETS,
Asst. Clerk of the Privy Council.

The Honourable
The Minister of Agriculture.

REGULATIONS.

1. The Minister of Agriculture may make appointments of inspectors and other persons for the enforcement of the Act.

2. No application shall be considered for any cold storage warehouses except those equipped with mechanical refrigeration including the gravity brine system, nor for any place where any such cold storage already exists or where the proposed cold storage would compete directly with other establishments of the same class.

3. Applications for a subsidy under the Act must be made in the following form which shall be known as Schedule A.

SCHEDULE A.

Application for a Cold Storage Subsidy.

To the Honourable
The Minister of Agriculture,
Ottawa.

SIR,—The undersigned hereby makes application, in triplicate, for a subsidy on a public cold storage warehouse to be erected at....., in the province of ....., according to the terms of the Cold Storage Act.

The following particulars refer to the proposed cold storage warehouse, namely:—

Particulars.

Size of building, in cubic feet .....

Total refrigerated space, in cubic feet .....

Capacity, in cubic feet, of space, if any, intended for the storage of fish, butter, meats or other goods at freezing temperatures .....

Capacity, in cubic feet, of space, if any, intended for the storage of cheese, eggs, fruit or other goods at temperatures above 30 degrees .....

Number of separate chambers.....

Kinds of material to be used in the construction of the building .....

.....

.....

.....

.....

Kind of insulation to be used .....

.....

.....

Kind of goods for which storage at suitable temperatures will be provided.....

.....

.....

System of mechanical refrigeration to be used.....

.....

Capacity of refrigerating machinery, in tons of refrigeration per 24 hours. .....

Source of available water supply .....

.....

Estimated cost of building, equipment and water supply, including site. . ..$....

Cost of site. . . . . ..$. . . . . ..

Will the whole building be used for the purpose of a public cold storage?. . . . . ..

If not, what proportion will be set aside for public use?. . . . . ..

. . . . . .

. . . .

. . . .

. . . .

. . . .

. . . .19....

4. Application for a cold storage subsidy shall be made in triplicate on forms supplied by the Department of Agriculture, and the following information, also in triplicate, shall be submitted with each application:

(*a*) A plan of the warehouse, showing details of the construction.

(*b*) A specification of the insulation, with detailed drawings.

(*c*) A specification of the refrigerating machinery.

(*d*) A sketch showing the location of the proposed warehouse in relation to railways and wharfs.

(*e*) A copy of the rates which it is proposed to charge for storage.

(*f*) The full names of the president and the secretary of a limited liability company, or the full names of all the members of an ordinary partnership, must accompany the application in order to be included in the contract.

(*g*) The authorized capital; the subscribed capital; a list of the subscribers, and the amount subscribed by each, if the applicant is a limited liability company.

5. The rates for storage as originally approved by the Governor in Council shall not be raised without further approval by the same authority.

6. Nothing in these regulations shall prevent owners of subsidized cold storage warehouses from entering into special contracts with customers for the maintenance of temperatures other than those herein specified.

7. The first instalment of the subsidy shall not be paid until the applicant shall have presented proper vouchers for the cost of building, equipment, site and other expenditures.

8. The owners of cold storage warehouses to which the subsidy or any part thereof has been paid, may be required to make an annual report to the Minister of Agriculture in such form as may be prescribed.

FORM OF CONTRACT.

When an application for a cold storage subsidy has been approved by the Governor-in-Council, a contract will be entered into with the applicant in the following terms.

Agreement made in duplicate this day of A.D. one thousand nine hundred and

BETWEEN

His Majesty King Edward the Seventh, represented by the Honourable Sydney Fisher, His Majesty's Minister of Agriculture of Canada, hereinafter called the Minister, of the first part;

AND

Whereas the contractor has agreed to build a public cold storage warehouse at in the Province of and has applied for a subsidy under the Cold Storage Act;

And whereas the location and plans and specifications of the said warehouse were approved by order of His Excellency the Governor General in Council bearing date the day of , A.D.

Witnesseth that in consideration of the covenants and agreements on the part of His Majesty hereinafter contained, the contractor covenants and agrees with His Majesty as follows:—

1. That all covenants and agreements herein contained shall be binding on and extend to the executors and administrators of the contractor and shall extend to and be binding upon the successors of His Majesty, and wherever in this agreement the contractor is referred to such reference shall include his executors and administrators.

2. That the contractor shall build, construct and erect a public cold storage warehouse at , in the Province of

in and upon a site to be approved by the Minister, the said warehouse to be equipped with mechanical refrigeration and suitable for the preservation of all food products.

3. That the said warehouse shall be built in the manner required by and in all respects in strict conformity with the specifications and with the plans approved by His Excellency the Governor General in Council, under date the day of , A.D. , and of record in the Department of Agriculture, and such specifications and plans are hereby declared to be a part of this agreement.

4. That the several parts of this agreement shall be taken together to explain each other and if it be found that anything has been omitted or mis-stated which is necessary for the proper performance and completion of the said warehouse either in the said plans or in the said specifications, the explanation and interpretation given by the Minister shall be received and shall be finally binding and conclusive upon the contractor, and the contractor shall execute the same as though it had been properly described.

5. That the decision of the Minister or such person or persons as he shall thereto from time to time designate, on all questions in dispute with regard to work or material or as to the meaning or intention of this agreement and the plans and specifications, shall be final.

6. That during the construction, maintenance and operation of the said warehouse every facility shall be given to the Minister and to such other person or persons as he may from time to time designate to inspect every portion of the said warehouse and the materials to be used in the construction thereof, and access to all parts of such warehouse shall at all times be given to the said Minister and to such person or persons as may be designated by the Minister as aforesaid.

7. That the said contractor shall maintain and operate the said warehouse in accordance with such regulations as may be made from time to time by the Governor in Council, and the rates and terms to be charged for storage in such warehouse shall be subject to the approval of the Governor in Council.

8. That the Minister shall pay the contractor a subsidy not exceeding in the whole thirty per cent of the amount expended and approved of in the construction and equipment of the said warehouse, payable in instalments as follows:—

Upon the warehouse being completed and cold storage at suitable temperatures being provided therein, the whole to the satisfaction of the Minister, whose decision in case of dispute shall be final, a sum not exceeding fifteen per cent of the amount so expended and approved of; at the end of the first year thereafter, seven per cent of the said amount; at the end of the second year thereafter, four per cent of the said amount; and at the end of each of the two next succeeding years, two per cent of the said amount; provided always that the warehouse is maintained and operated to the satisfaction of the Minister; that the Minister may refuse to pay any part of the said subsidy if in his opinion the operation of the warehouse has not been of such a character as to provide for the proper preservation of such produce as may be stored therein, and that the whole amount of the subsidy payable hereunder shall not exceed the sum of

9. That the Minister may require the contractor to submit such vouchers and verify the cost of construction of the said warehouse in such manner as the Minister may from time to time direct, and that the Minister's decision with respect to the cost of the construction of the said warehouse, for the purpose of fixing the amount of the said subsidy, shall be final and conclusive.

10. The said warehouse shall be built and completed to the satisfaction of the Minister not later than the day of and shall thereafter be maintained and operated continuously to entitle the contractor to any portion or portions of the said subsidy, and time shall be considered as of the essence of this agreement.

11. If the said warehouse should be burnt or otherwise injured or destroyed before all the payments of the said subsidy have been made, then and in such case, if the con-

tractor repairs or rebuilds the said warehouse within such time as may be fixed by the Minister in accordance with the said plans and specifications and operates and maintains the said warehouse as hereinbefore provided and otherwise complies with all the covenants and provisions of this agreement, the whole to the satisfaction of the said Minister, the contractor shall be paid the unpaid portion or portions of the said subsidy upon the same terms and in the same manner as if the said warehouse had not been injured or destroyed.

12. The contractor shall not assign this contract without the consent in writing of the Minister.

13. This contract is, pursuant to the Statute in that behalf, made subject to the express condition that no member of the House of Commons of Canada shall be admitted to any share or part of such contract or to any benefit to arise therefrom.

In witness whereof the Minister hath hereunto affixed and set his hand and the seal of the Department of Agriculture and the contractor has signed these presents on the day and year first above written.

Signed, sealed and delivered in the presence of }