

souring, and that there is a growing demand for such butter. However, the work is in an experimental stage as yet, and we do not feel like saying too much about it at present.

H. H. DEAN.

Ontario Agricultural College.

Quality and Quantity of Butter.

Prof G. L. McKay, before Western Ontario Dairymen's Association.

MAGNITUDE OF THE UNITED STATES DAIRY INDUSTRY.

In discussing the quality and quantity of butter, I realize that I have two important items to deal with. Very few have any conception of the magnitude of the dairy industry of the United States. The value of the dairy products is about \$700,000,000. The total value of the output of butter alone is nearly \$300,000,000, which is a little more than 5 per cent. of all our agricultural products. Butter, considered as a crop, is exceeded in value only by corn, wheat, hay, forage and cotton. More than half this amount is produced in seven States, while general agriculture is carried on in practically all States. The annual value of the dairy and egg production of my State (Iowa) is greater than all the gold and silver produced in the United States and Alaska. The consumption of butter is constantly on the increase. Ninety-four per cent. of our butter is consumed at home, leaving only 6 per cent. for export. With our constantly increasing population, it is only a matter of time, if the quality is kept up to the standard of extras, until we will be compelled to import to supply local demand, unless we greatly increase our output.

QUALITY BEFORE QUANTITY.

The greatest danger menacing the dairy industry to-day does not come from oleomargarine, but from the ranks of the creamerymen themselves—those who have placed quantity above quality. Deceit and fraud have never yet succeeded in building up an honest industry. Many of my audience, no doubt, remember the time when cheese at Little Falls and Utica markets sold for a premium of 1c. to 1c. per pound above the Canadian cheese. To-day the Canadian cheese have a reputation in the English market that cannot be wrested from them as long as justice and right can control their output. This great change was brought about by some selfish scheming individuals in the United States, who placed on the market skim-milk cheese and filled cheese and branded them as full-cream cheese. This resulted in English merchants regarding all cheese from the United States with suspicion. This was a case where the innocent had to suffer through no fault of their own.

We find in the West and Central West that the whole system of buttermaking has been practically changed in the last four or five years. A few individuals have been seized with the desire to control the great industry of the country. The result is, the quality of butter has deteriorated so much that it is seriously affecting the consumption of butter. There never has been a time when good finished products could be made out of poor, decomposed raw materials, and the same is just as true in buttermaking as in any line of business. The sooner the milk or cream is manufactured into butter or cheese, the better will be the quality of the finished product every time.

What gives butter its selling value? It is not the body, or always the appearance, but it is flavor. This quality causes butter to sell higher than lard, tallow, or any of the other fats.

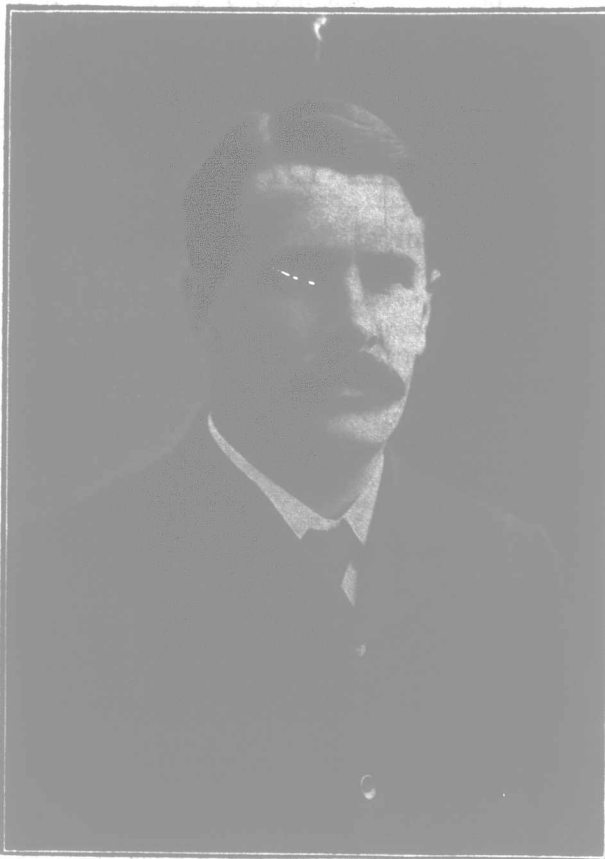
PASTEURIZATION LITTLE BENEFIT TO OVERRIPE CREAM.

Where cleanliness and care are observed, the Lord Almighty seems to have placed in milk all the necessary ingredients that go to make up good flavor in butter. Where cream is kept in an unsanitary place from three to six days, as is sometimes done by farmers who ship to central plants, the flavor of the butter is seriously injured, and cannot be fully reclaimed by any method. A great deal has been written about pasteurization of such cream. When scoring butter, and observing it in different places, I have come to the conclusion that pasteurization is of very little benefit, if any, to old, stale, overripe cream. It is true that high heating will drive off some undesirable, volatile gases, but at the same time there is danger of producing other undesirable flavors in such old cream. I have a tub of butter in my laboratory that was sent in by one of our large central plants to be inspected. The sender stated that they had lost thousands of dollars during the past summer, owing to the peculiar flavor the butter possessed. This flavor is called a metallic flavor. The writer stated that they had never been troubled with this kind of flavor until they began pasteurizing old cream. I have information from another reliable party, who operated a central plant, confirming the above statement from his own experience. Some people have an erroneous idea that pasteurizing is a panacea for all defects in cream. Pasteurization does not destroy the flavor that is already present in decomposed cream, but it does largely destroy the germs that produce this flavor. This reminds me

of the colored man talking with his lawyer, who was consulting him about the crime he had committed. The lawyer remarked: "Why, they cannot put you in jail for that." But the colored man said: "My Lord, man, I am already in jail." When this flavor is already in the cream it cannot be removed by pasteurization. Every loss that is sustained in manufacturing this kind of cream is a great injury to the dairy business.

DENMARK PASTEURIZES GOOD CREAM.

Denmark has made a great success with pasteurization because they have followed the method of pasteurizing only good cream. Their system is practically the whole-milk system. They skim milk that contains a uniform amount of fat from day to day, pasteurize the same when it is sweet, cool to a certain temperature, and use a certain amount of starter. The result is a uniform product, which is much desired by the English merchant. It is not so much the superiority in qual-



Thos. Ballantyne, Stratford, Ont.

President Western Ontario Dairymen's Association.

ity of the Danish butter as it is its uniformity, that gives it the standing it has in the English market. They were beaten at the Paris Exposition by American butter, made from raw cream, in the competition for the grand prize. I believe the reason why pasteurization has taken such a firm hold in Denmark is because the cows are kept in the barn almost the entire year. The result is that the majority of bacteria that get into their milk come from the stable, and belong to the putrefactive group.

By pasteurizing to extreme high temperatures, the same as they use, these germs are destroyed before they produce serious defects. Then, by using a good commercial starter, they are able to control the ripening of their cream and produce a uniform article of butter.

PRIZES TO MILK HAULERS FOR BEST MILK.

We have one large, full-milk creamery in our State where the maker, who is an exceedingly bright fellow, offered prizes to the milk-haulers who brought in the best grade of milk. The result was a rivalry of patrons on the different routes, which proved so beneficial to the creamery that this maker won first place, twice, at the St. Louis Exposition World's Fair, on his butter. He was finally induced to go to another creamery, with a raise of \$25 per month. The maker who followed him was also able to keep up the same high quality of butter, owing to the excellent milk furnished by these educated patrons. I refer to the Farmers' Co-operative Creamery at Arlington, Iowa. So we find the flavor of butter depends to a very large extent on the kind of milk or cream furnished by the patrons. Of course, it is possible for a poor maker to spoil the best kind of milk or cream.

CONTROLLING THE MOISTURE CONTENT.

Judging from the number of letters I receive on the subject of churn overrun, the question of quantity seems to be the important question with creamerymen to-day. I have been severely censured, particularly in the East, for issuing a bulletin on the methods of controlling moisture in butter. I am a firm believer that every butter-maker should be thoroughly posted on all the secrets pertaining to the butter business. A gun is a very useful article when rightly used, but in

the hands of an ignorant or a dishonest person, it becomes a menace to public welfare; so is the water content of butter. We have a number of large creameries that have carried the moisture business to such an extent that they have seriously injured the quality of their butter. The maker who gets 30 or 35 per cent. overrun is perpetrating a fraud on the public by selling a surplus of moisture for butter, or more water than the law permits. Now, on the other hand, I do not advocate any extreme dry butter, as I believe butter that contains 14 or 15 per cent. water will usually possess more flavor and show a better color than butter that contains 7 or 8 per cent. Butter is intended to spread on bread, so it must necessarily be plastic.

A 14-PER-CENT. WATER CONTENT ADVISED.

The Danish butter has been held up to the rest of the world as model butter. We find, for a number of years back, that they have been constantly increasing the moisture content of their butter; so much so that the English merchants have complained lately about it. When I visited the English markets in 1901 I heard no complaint against the Danish butter in this particular. In 1895 we find that the average water content of Danish butter was 13.70; in 1896 we notice a slight decrease, 13.68; in 1897 the average was 13.79, a slight increase; and in 1898 it was 13.93. In 1899 we find it is 14.06, and in 1900 it was 14.09; in 1902 it was 14.52. So we find that up to this date there has not been any complaint against Danish butter for excessive moisture content. All countries seem to have fixed about the same standard for water content, namely, 16 per cent. as a maximum. Now, my advice to makers would be to endeavor to incorporate 14 or 14½ per cent. water. A 14-per-cent. water content would give you an overrun of about 21 per cent, and allow you a little for waste. You can add about one-fifth of the water content of salt, or, in other words, the water in butter will take up one-fifth of its bulk in a saturated solution, or butter containing 15 per cent. water will stand 3 per cent. salt in the finished product. Three per cent. salt suits the average American market well. This much salt can be incorporated without the butter being gritty or seeming oversalted to the taste. A medium-high-salted butter is less frequently attacked by mold, as salt is an antiseptic.

HIGH SALTING SEEMS UNDESIRABLE FOR STORAGE BUTTER.

It would seem, from investigations that are being pursued by the Dairy Departments at Washington, D. C., and at Ames, Iowa, State College, that the high salting of butter is not desirable for storage purposes. Notwithstanding the fact that millions and millions of dollars are invested annually in storage butter, there is practically no information available on the making of butter for storage purposes and the best temperatures for keeping it in cold storage. I believe, from the work that we are pursuing in connection with the Department of Agriculture, of Washington, D. C., that we will be in a position to give out definite information on this subject before the next storage season. We found, from experiments carried on at Ames a few years ago, that butter salted lightly had a tendency, after standing a while in cold storage, to show a cheesy flavor, while butter salted heavily showed a fishy flavor. These experiments were carried on where ice was used for refrigerating purposes, hence the temperatures were not so low as when artificial refrigeration was used. A few weeks ago I had the privilege of scoring some 206 samples of experimental butter. The different tests had been packed from the same churning, so any defects occurring were due to after considerations. In every case where butter had been kept 10 degrees below zero the light-salted butter showed up about as fresh and sweet as the day it was made, while the high-salted butter has a slight fishy flavor. When butter was kept at 10 degrees below zero, it scored from 3 to 4 points higher than that kept at 32 above. In fact, in some cases we find a difference of 6 points.

The question of air spaces being left in packages is receiving special attention in our experiments, and indications are that it has a serious bearing on the keeping quality of butter.

FACTORS IN CONTROLLING OVERRUN.

The factors that control the water content of butter are temperature of churning, thickness of cream, amount of cream churned at a time, condition of churning and working of butter in water. A thick cream will give a higher per cent. of overrun than a thin cream, under normal conditions; or, in other words, a cream containing 40 or 45 per cent. fat will give you a larger overrun than a 20 or 25 per cent. cream, unless you use some other method of changing the natural conditions of the latter churning. The reason why a thick cream will give you a greater overrun is undoubtedly due to the formation of the butter granules. In the thick cream the granules gather irregular in size and somewhat oblong in shape, and the fat is not driven together so firmly as in a thin cream. It has been thoroughly demonstrated in