2. Put the zinc in the acid and let stand till effervescence ceases. This is called "cutting the acid."

3. Procure a "soldering iron" which is really made of copper. Heat the iron, and "tin" the point of it. This is done by dipping the hot iron in the cut acid, and rubbing it with some solder. The iron, of course, must be clean and smooth before this is done (use a file if necessary). Another way of tinning is to rub the point of the smooth, clean iron in salammoniac and then touch the solder to it.

4. Clean the place to be soldered. This may be done by scraping, filing, or brushing with a tinsmith's wire brush.

5. Put a little of the cut acid on the place to be soldered, get some solder on the hot iron and rub the iron on the place where soldering is required. Considerable heat is necessary, and if the first trial doesn't give sufficient heat try again. W. H. D.

THE DAIRY.

Protein and Dairy Feeds.

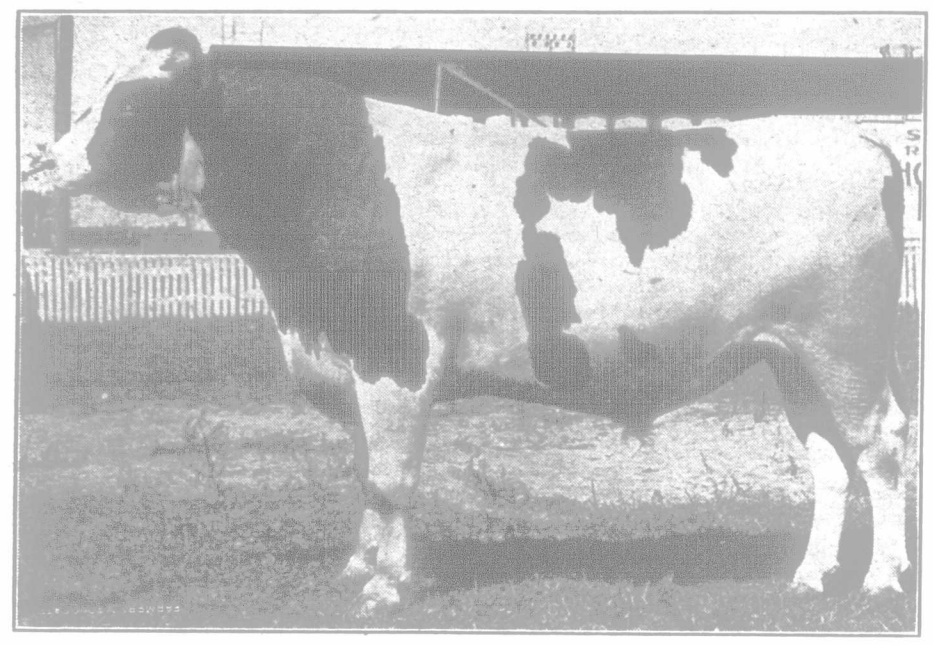
Notwithstanding the fact that dairy cows have been kept for hundreds of years and that milk has, during all this time, occupied a very prominent place in the human diet, modern dairying shows some very radical changes from the practices of the early days. In Norway, we read, it used to be the practice to winter the cows on roughage made up of straw, leaves, moss and horse dung. In the summer the cattle were turned out on the mountain pastures and gave an annual milk yield of from 1,600 to 1,800 lbs., from which 25 or 50 lbs. of butter would be secured. Dairymen have, in recent times, taken advantage of the great basic fact of maternity in the life of the cow and through skill in feeding, assisted by the discoveries of science, have developed strains of heavy-yielding animals in each of the pure breeds, which are the marvel of all. The dairy cow has thus risen from a rather obscure place in the farm economy to one of paramount importance, particularly where there is a tendency for hand labor and feed to advance in price. Under such conditions the dairy cow proves her superior economy over other classes of stock and displaces the strictly meat-producing animals from the centre of the field. No farm animal can make such use of the great range of feeds grown on the farm, nor turn more quickly into money, the products of the fields.

With this recognition of the dairy cow as a producer of human food, came a feeling that dairymen should study the needs of the cow's body in order to more intelligently provide the proper degree and quality of nourishment. Experience has taught the older dairymen that certain feeds are very much more valuable for milk production and that certain roughages need fewer supplementary feeds of a concentrated nature than others. These men do not pretend to know the difference between proteins and carbohydrates, or what part each plays in the animal system. Experience, however, is a hard taskmaster, and the younger men are beginning to ask whether there are any short cuts. Short cuts to experience have never yet been found, but sometimes previous knowledge enables one to gain experience more quickly. Because, therefore, protein is of such importance in the economy of the cow, let us see what has been found out regarding these highly nitrogenous substances, so important for growth and milk production.

Good dairy cows do not readily become fat or take on flesh during a lactation period. In fact, only about 47 per cent. of the cow's food is used for the support of her body, the remaining parts being used in converting food into milk and in the composition of the milk itself. About 29 per cent. of the cow's milk is used for this latter purpose. Eckles has shown that of 2,218 lbs. of dry matter appearing in the total yearly production of a cow giving 18,405 lbs. milk, 24.8% is protein substance. We have some idea of the fat that is present in milk, since it is so commonly separated as cream. The protein substance will, perhaps, be appreciated more readily than if we say that it amounted to 552 lbs. in 18,405 lbs. milk, whereas the fat amounted to 618 lbs. In addition to these substances there were 920 lbs. milk sugar, which is just as nutritious as cane sugar, and 120 lbs. of mineral matter. Moreover, when making up rations for dairy cows, scientific feeders commonly speak of "narrow" rations, and practical feeders of long experience well know that roughages such as clover and alfalfa hay and concentrates such as cottonseed meal are more valuable than many other feeds for milk production. The reason is that these feeds supply protein very economically, and it is important that a liberal protein supply be in the ration. The higher the proportion of protein in the ration the "narrower" it is said to be. Commonly, cows in milk do best where the nutritive ratio is about 1 to 6, that is, one part of crude protein which is digestible, to 6 parts of carbohydrates and fats combined. The ration is then said to be "balanced," because it furnishes the different nutrients in proper proportion for milk production.

What is protein? In order to understand this one must remember that nitrogen is a very important plant food. Every farmer realizes how important and beneficial to growing plants nitrogenous fertilizers are. The nitrogen enters the plant for the most part through the roots and is joined with other minerals, starches and sugars to form very complex compounds called crude proteins. This is a general term including all the forms of nitrogenous matter in the plant. But only about 16 per cent. of these proteins is pure nitrogen; the remainder is carbon, hydrogen, oxygen, sulphur and sometimes phosphorus. Crude protein is made up of protein and amids. The latter are like blocks with which to build proteins, since they are soluble in the plant juices and can be carried to any place in the plant that they are needed. In this respect they are unlike proteins which are not always soluble and are more highly complex. When proteins break up, amids are again formed. Proteins are essential to life since they form the basis of all the protoplasm in the body cells, but all protein is not alike; in fact, there are thousands of different kinds. There are, for instance, 18 different kinds of acids which are common to proteins. Sometimes, as in the white of egg, all are present, and others, of lower feeding value, lack one or more of these acids. If the thousands of words in the English language are made up of only 26 letters, it is easy to imagine the numberless possible combinations of these 18 acids to form proteins.

The woody parts of plants possess little protein; most of it is found at the point of growth, as in seeds and leaves. Naturally then the seeds of plants when ground or fed whole possess a richness for animal feeds not to be expected of the stems or stalks. Similarly, plants like alfalfa, which have numerous leaves, are richer in protein than other plants whose leaf area is not so great. Besides having a natural advantage in this regard from the fact that it is a legume and can gather nitrogen from the air with the help of bacteria, well-cured alfalfa is preserved more nearly in a natural state and the rich protein substances more abundant in it.



Avondale Segis Pontiac Korndyke.

First prize two-year-old and champion Holstein bull at the Central Canada Exhibition, Ottawa, 1918. Owned by Cummings & Gooselin, Cummings Bridge, Ont.

In consequence of the fact that all life changes in the plant are made through its protein compounds, this matter has much interest for the feeder of dairy cattle. All of the acids mentioned above are required for the formation of protein tissues, such as muscles, tendons, etc., and if some feeds lack certain of these acids, the feeder should combine them with feeds that will supply the deficiency. Experience teaches the feeder what feeds completely supply the needs of the animal body. It is well known, for example, that skim-milk is a good food and quite nitrogenous. Since the milk proteins resemble those of the body more than do those of corn, it is not surprising to know that 66.2 per cent. of the nitrogen in skim-milk was retained for growth in the body of pigs as compared with 23 per cent. of the nitrogen in corn and 17 per cent. of the nitrogen in linseed meal. Linseed meal and corn combined, however, are much better than corn alone, indicating that both are not deficient in the same acids. These instances are given, not to imply that a feeder need be a graduate student in chemistry to feed successfully, but to show that since proteins are so important in dairy feeding operations, the feeder should watch carefully to see that the feeds provided supply all that is wanted in order to get full value in the milk pail for all that is spent for concentrates and protein-rich feeds.

It is not always the fault of the market if the herd of dairy cows does not pay. The milk may be going through a channel which returns less than the butter-fat can be sold for in another way, and the full value of the skim-milk may not be secured. The latter product alone is worth in the neighborhood of fifty cents per hundred pounds. a

Farm Butter-Making.

Although the creamery has become a factor of great importance in the dairy development of the country, still according to the 1917 report of the Dominion Dairy and Cold Storage Commissioner, 150,000,000 pounds of butter, or 67 per cent. of the total was made on farms. The greater part of this was produced on farms where fewer than ten cows are kept. The quality of farm-made butter varies from the poorest to the best. The average quality, however, is far below that made in the creameries. This is due largely to the fact that little attention is given to having proper utensils and facilities, on account of the small amount of cream available on most farms. Lack of interest and of knowledge as to the proper methods also affects the quality of the product. When proper facilities are provided and the right methods are followed, the quality of butter made on the farm may easily be superior to that made in the average creamery. To do this, it is necessary to have sufficient cream to make it possible to churn at least twice and preferably three times each week.

It is very desirable, but, of course, not absolutely necessary, to have a separate room arranged for butter making. Sometimes a basement room, if it is well ventilated and lighted, can be utilized with advantage. A concrete floor provided with a drain saves a great deal of labor in cleaning apparatus. Some means of cooling, either ice or an abundance of very cold water, is indispensable.

What is Good Butter?

Butter that has the qualities which make it satisfactory to the consumer always sells readily. While there is some variation in individual taste, the general market demands the same quality everywhere. The following is the common score card for judging butter:

Flavor	45
Body	25
Color	15
Salt	10
Package	5
	100

The proper flavor is hard to describe, but may be said to be a pure butter taste and odor. It should be entirely free from any other taste, such as might be described as rancid, stale or strong. The flavor of the butter, whether it be good or bad, in at least nine cases out of ten, is produced during the souring, or ripening of the cream. There are a few exceptions to this rule. A few feeds, such as onions, turnips, or new rye pasture, will give a taste to butter. In a few cases, butter made from the milk of a cow near the end of her milking period has a slightly objectionable taste.

Body, color, salt and package may be said to depend upon mechanical conditions. They are entirely under the control of the buttermaker, provided suitable facilities are at hand. Faults in these qualities are not to be attributed to the feed, breed or season of the year.

The body should be waxy and firm, but not brittle or salvy. It should not stick to the knife when cut, neither should it crumble. Proper body results from having the churning temperature right, stopping the churning at the right stage, and working the butter the proper amount.

The color should be that of butter produced by cows on pasture. During the season when dry feed is used, a sufficient amount of vegetable coloring should be added to the cream to give the proper shade of yellow. The most common defects in color are having it too high, or too low, or having a streaky or uneven color known as mottles. The latter condition is due to uneven distribution of the salt, a result of insufficient working.

The salt should be sufficient, so that a person eating the butter does not notice either a deficiency or an excess. In addition to too heavy or too light salting, the most common fault is gritty or undissolved salt.

The amount of water left in butter is somewhat variable. The usual rule is to estimate that a given number of pounds of butter-fat will give one-sixth more pounds of butter.

Separation of Cream.

In certain localities, it is the practice to churn the whole milk, but this results in an unnecessary loss of butter-fat in the buttermilk. Until recent years, cream has been secured entirely by allowing it to rise to the top of the milk. Since the introduction of the cream separator, about 1885, the separator method has become more and more general.

The most efficient gravity method consists in using a narrow deep can in ice water, or very cold spring or well water, and skimming the cream at the end of 12 or 15 hours. A widely used, but very inefficient way of securing cream is the shallow-pan system, which consists in placing the milk in pans and crocks not over four inches deep, and keeping it at a moderate temperature. The cream is then skimmed from the surface at the end of 24 or 36 hours. By use of the deep-setting method it is possible to recover about 90 per cent. of the cream. By the shallow-pan method from 75 to 80 per cent. is recovered.

The centrifugal cream separator is now practical where five or more cows are kept, although it is often used for even a smaller number. The separator makes it possible to recover about 98 per cent. of the butter-fat, and to obtain the cream in a condition that makes it possible to produce the highest grade of butter. It also results in a considerable saving of labor, and the skim-milk is the best possible condition for feeding to calves.

Ripening of Cream.

This subject requires considerable attention since the market value of the butter is largely controlled by