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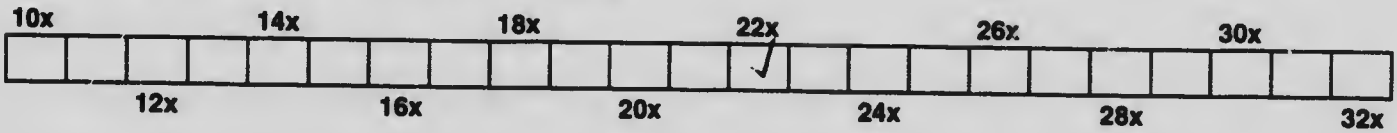

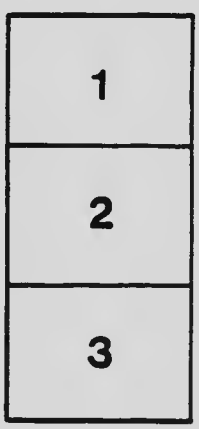

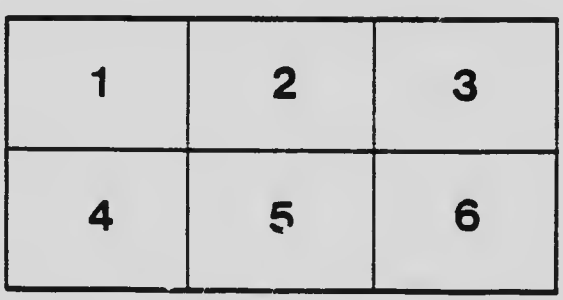

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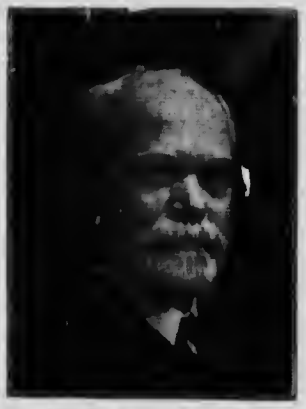
INDEX

OUTSTANDING FACTS IN THE DAIRY BUSINESS

By EUGENE DAVENPORT

Dean and Director, University of Illinois College of Agriculture and Agricultural Experiment Station



EUGENE DAVENPORT

WHETHER as milk—raw, malted, powdered, or condensed; whether as cream—plain, whipped or iced; whether as butter, alone or in combination with other oils; whether as cheese in its many brands and varieties; whether as buttermilk; as kumiss, or as confection, the call for dairy products is one of the most insistent, universal, and exacting of all the demands of trade. An infant necessity, a standard food, a common luxury, is the milk of the dairy cow.

THE MAGNITUDE OF THE BUSINESS

To serve the dairy demands of the people of the United States requires the milk of more than twenty-one millions of cows. This is one-third of all our cattle, one-tenth of all domestic animals other than poultry, and almost exactly one cow to each family.

These cows are worth in round numbers some seven or eight hundred millions of dollars, or more than all the railroads of a state like Illinois. Standing side by side, with three feet of space for each animal, they would reach almost half way around the world. They are milked each morning and evening by more than five millions of people, and the daily labor involved in milking alone is equal to twelve hundred years of individual labor at eight hours per day.

These cows eat, every twenty-four hours, two hundred thousand tons of feed or enough to load a solid wagon train reaching from Chicago to Denver. In a year they consume feed approximately equal to their own value; more than equal to that of the wheat crop, and but slightly less than that of all the hay and forage produced in the United States. In short, the cost of what we feed our cows is practically one-eighth of all we produce out of the land, not only in grain and forage, but in cotton, fruits, and vegetables as well.

However, these cows produce an enormous amount of human food, for their annual yield of milk is more than thirty millions of tons—enough to load a wagon train reaching seven times around the earth. If this milk were made into butter and if by careless methods one per cent of the fat were left in the milk, the loss to the dairyman, after making

liberal allowances for the feeding value of the unrecovered fat, would be not less than six millions of dollars annually—a striking instance of the meaning of inconspicuous margins.

THE COW AS A PRODUCER

A good cow will produce, according to Carlyle and Woll, about one pound of milk for every pound of dry matter of feed consumed. Such a cow can reproduce her own weight in milk every month of the year and in doing so will manufacture six to ten times as much nitrogenous substance as will the fattening steer of corresponding excellence. Besides this she will produce nearly as much fat, as well as an equal amount of sugar, for which the steer has no equivalent.

According to Eckles a superior cow can double her own body weight in the dry matter of her milk within a year—equalling in total food value the entire carcasses of four twelve-hundred-and-fifty-pound steers. Of course this is accomplished at heavy expense for labor and in a form of output that is at once extremely bulky and unusually perishable, wherein lie the chief problems of the dairy business.

Many unthinking men, living by habit rather than by reason, are still trying to keep cows after the fashion of the pioneers, but the inevitable result is failure, for conditions have changed. A cow costs a good sum of money these days, nearly a hundred dollars if she is a good one, and no other kind is profitable on high-priced land. She eats expensive feed, is attended by expensive labor, and works in costly surroundings. She is, or ought to be, tuberculin-tested. The utensils must be kept sterilized and free from infection either by water used in washing or by diseased attendants.

All this costs money, and the dairyman who hopes to succeed must get his methods, not by tradition, but by reading, by study, and by discussion with those who are successful. In short, dairying has become a business, and whoever forgets this fact or fails to study the enterprise as any other business is studied these days is pretty certain in the end "to come out at the little end of the horn," as the old adage has it.

A good cow can produce her own value every year, but every cow—good, bad or indifferent—is a good eater, and many a bossy is petted and fondled and tolerated who eats her head off every year without saying a word about it. Now dairying is not a matter of sentiment but of business. The values involved are large; the consumption is heavy; the labor is excessive; the risks are many; the public is exacting, intelligent, and critical, and only the best of modern business methods will insure a continuance of patronage or a balance on the right side of the ledger.

THE FOOD VALUE OF MILK

Everybody uses milk and its products, not occasionally but every day of the year. This means that it is by nature a standard and staple food as well as an indispensable article of diet for invalids and small

children. Moreover, if economically made and handled it is relatively cheap, for quite contrary to popular opinion milk at ten cents a quart is cheaper food than lean meat at twenty-five or even at twenty cents a pound. Furthermore, butter is the only animal fat that everybody likes and that is entirely consumed.

THE NECESSITY OF SANITARY METHODS

Communicable diseases are germ diseases and the mouth is the great avenue for infection. All germs will thrive and multiply in milk if they once gain entrance, and the opportunities for contamination are many and direct: any of the dairy workers are diseased or careless. Therefore the business is too hazardous to the public to be entrusted to the hands of any but clean-living, high-minded men who realize the full meaning of contamination and who regard the welfare of their customers as they would that of their own family. Only superior men and women have any moral right in the dairy business.

Anybody can milk a cow well enough to feed pigs, but the standards of the kitchen must be those of the dairy if the milk is to be fit for human consumption or even safe for babies and others of delicate health.

APPEARANCE A FACTOR IN SUCCESS

Milk and its products must not only be clean, but they must look clean if the customer is to have satisfaction and if the trade is to be kept and developed. Any family can almost wholly dispense with dairy products if those on the market are unsatisfactory, by which we infer that there is a demand capable of indefinite expansion or of great contraction. While nothing equals real quality in stimulating trade, yet attractiveness in package and display serves this business as letters of introduction serve individuals.

The consumer can wash some of his foods, peel some, and cook others, but he must take his milk, cream, or butter as he finds it. He cannot clean it nor cook it, and there is no satisfaction in inquiring into its pedigree unless he can do it with confidence. Here is the key to enlarged consumption, for if it is clear from the package that the producer has taken pride in his product, the presumption is that it is both clean and safe. It is, therefore, appetizing.

QUALITY IN THE PRODUCT

"Safety First" is a good motto for the dairyman, but if he is really to serve the consumer and hold his trade he must put a certain something into the product that cannot be described but that the customer, once realizing, will always demand. The difference between goods with quality and those without it is a difference neither perceived nor appreciated by the inferior workman, but it is a very real thing to the discriminating customer and that is what he is willing to pay for. The practical loss of the cheese-eating habit with the present generation is a monument to the attempt a half century ago to make butter and cheese

out of the same milk. Hereby hangs a tale with a lesson to the dairyman, and the lesson is that the greatest enemy of good butter is not butterine but poor butter.

STANDARDS

With all his knowledge he must have some kind of yardstick as a measure of success at every step. A definite objective in quantity, quality, and appearance is the only salvation from that indifferent success which is even worse than failure. In order to have good standards, the workman must be quick to see when another's methods are better than his own, and he must understand that standards are altered as knowledge increases and as conditions change. What was "good enough" five years ago will not pass today, and the highest standard is none too high for a leader, provided only it is a real working standard and not a fad.

SOME ADVANTAGES OF THE BUSINESS

Among the many advantages of the dairy business a few stand clearly out as follows:

1. It is highly profitable when well conducted because it markets the crops of the farm in the most valuable form, and because it is a business which is capable of almost indefinite development.

2. It is good for the farm because crops are fed at home and because the demand for protein feed brings much nitrogen to the land.

3. Butter is absolutely destitute of fertilizing value, and if the milk be fed almost no fertility leaves the farm.

4. One of the disadvantages of most farming is the irregular income, weeks and even months passing with no cash receipts. The dairy checks, however, are not only frequent but regular throughout the year—an advantage appreciated only by those who have kept cows and had the experience of a steady income.

5. It is good for the family to be engaged in producing a high grade produce which is consumed at a distance and which helps to hold up constantly advancing standards. The farmer lives much alone and is likely to be a "law unto himself." If he has "done well," even by a lucky strike, he is likely to claim the credit himself and to persist in what has once succeeded. His children follow after him, stepping blindly in his footsteps, or else break away because of an instinctive desire to come into touch with a larger number of people. Nothing so much rationalizes the whole family as dealing intimately with the great world of business outside.

All in all the dairy business is one that commends itself to the best of thinking men as an important means of service, worthy the exercise of the highest faculties and certain to give prompt and full returns for whatever of capital, knowledge and thought may be put into the industry.

HOW A DAIRYMAN MADE GOOD

By Prof. C. W. BURKETT
Editor of *American Agriculturist*

ELEVEN years ago Bert Smith and his family moved on to a farm in Delaware County, Ohio, which had been rented, cash rent, for 18 years. About 30 acres of the farm is bottom land and the rest, 180 acres, is up-land. The land had been run to death. Its best yield at the time Mr. Smith took possession was eight bushels of wheat and 25 bushels of corn, and these yields were on the low land. The farm was a good example of what grain and no livestock will make of land. Today it is one of the remarkable farmsteads of the country. Dairying made it famous. Mr. Smith did not have a bank account when he started on this farm. What he has accomplished has been done from cows—fields made fertile, improvements made permanent and family made independent.

The start was made with 20 western heifers bred to freshen the first fall. The heifers calved all right and yielded some milk. But what a surprise they did bring. The weekly profits by actual figures amounted to only 11 cents. Not much outlook for dairy success, especially when all farm and living expenses must be secured from the farm itself. The way things were going caused much anxiety in the Smith home. The family talked matters over and decided they had the wrong kind of cows. Consequently, the next spring every cow was sold; such cows were worse than none. Better have one good cow that will give a large yield of milk than to care for a half-dozen to yield no more. A cow and a calf were now purchased. Others were picked up in the neighborhood as opportunity offered. During the next two years this plan was followed with success. Some proved to be very good cows; others were poor. But each cow had to prove her worth from her milk record and if that record was below the standard she was sold to the butcher.

The Smiths were now getting their bearings; they saw there was money in the right kind of cows. Their experience in buying showed the value and the merit in good blood. So they aspired to pure-bred stock. Shortly two cows were purchased and the price was $40 each. One gave birth to twin bull calves both of which were sold for $50 apiece. Grade bull calves were worth next to nothing. The Smiths now bought 14 registered cows. Each was a high producer and yielded a good profit. Light was appearing at last. As the registered stock increased the grade cows were sold, only the best being retained. At the present time the herd consists of 100 head, young and old, and all pure-bred and registered.

Not only was it necessary to build up the dairy herd, but also to improve the farm. With good cows it is necessary to have an abundance of feed, and the right kind of feed. They tried clover, but the early crops were failures. They grew soy beans, and partially succeeded with these, but as they matured late and offered such great difficulty in curing, this

crop has been abandoned. They soon decided that a silo was necessary and one was built. Silage proved a great help. *A limestone field* was selected for alfalfa. The land was heavily manured from the cow stable and the alfalfa grew successfully. They now get three or four cuttings a year, yielding around 4½ tons an acre. The effect of alfalfa on the soil in growing corn has been remarkable. Manure and alfalfa sod have increased corn yields up to 75 bushels an acre.

Oats are grown for oat straw for feed and bedding, and the grain for dairy rations. Silage, alfalfa and oat straw comprise the rough feed. Their experience shows that alfalfa is the hay supreme for dairy cows, but they found that cows tire if fed continually on alfalfa hay, so they frequently substitute oat straw for alfalfa. Each cow is fed regularly all the silage she will clean up. In summer months the cows are pastured from July to September. When the pastures are short the cows are fed 10 pounds of silage once a day. The main grain feed is ground oats and linseed meal. Mr. Smith claims that oats mixed with about one-fourth corn and ground, fed with silage and alfalfa hay, will produce more milk, dollar for dollar, than any other feed provided the oats are worth less than 40 cents a bushel.

They like wheat bran, but the price in recent years makes this a prohibitive feed. When oats are not available, dry distillers grains, or other commercial feed is used. They find that cows do equally well on the distillers grains as on oats, but they think milk is not produced as economically. Mr. Smith speaks in high terms of cottonseed meal and says they feed it regularly. For a cow in full flow of milk giving about 30 pounds daily, six pounds of ground oats, two pounds of linseed meal and 1½ pounds of cottonseed meal give very satisfactory results.

When the Smiths took over the farm the barn was in a dilapidated condition. Every post was rotten at the base and had to be cut off and put on a concrete pillar. The roof leaked and soon was replaced. The house was in bad condition, and it also had to be remodeled and re-roofed. As the herd increased the old barn became too small and an addition was built. Wooden floors were replaced with concrete throughout the stable. A 16 by 40 foot building was erected, which is used for no other purpose than for stabling calves. Another building they built, 26 by 40 feet, was converted into box-stalls for the young cattle.

Just recently a building 30 by 50 feet was completed for binders, haying machines and other farm machinery. In the driveway is a set of wagon scales. Overhead harrows, corn plow and lighter tools are stored. For power they first purchased a three horse power gasoline engine. This was too small and a seven horse power engine was secured. This engine proved too small for heavy work and too big for light work, so a 14 horse power was secured, with smaller engine for the lighter work. The milk-room was now overhauled and a boiler installed for hot water and steam. This enables them to produce sanitary, clean milk. A small engine pumps water to aerate the milk, the waste water being forced into a trough for

the cattle. By this arrangement it either costs nothing to aerate the milk or else it costs nothing to pump water for the cows. The water can be pumped direct into the boiler, and the steam run back into the cream-room, to sterilize milk utensils. During cold weather a jet of steam is turned in with the water as it is pumped, and it is thus warmed.

The first silo was 12 by 28 feet. That was built in 1904. It was soon found to be too small, so in 1906 another 12 by 28 silo was erected. But more silage was needed. In 1910 a 10 by 30 silo was erected. They now have two 14 by 30 foot silos. The old house stood on low ground, and at certain seasons was damp. There seemed to be only one good plan—move the house back on the hills. The house contained 11 rooms, was made of heavy timbers and had a slate roof. Back 300 yards and up a steep hill was an ideal spot for a farmhouse. So to this spot the house was moved offering one of the finest views to be had. You can see up or down the valley for miles. A 300-barrel cistern was built, and in the cellar was installed a large pneumatic tank for water and a small engine to pump up the pressure. The water is forced into the kitchen where it is heated. Upstairs is a bath-room and toilet. The buildings everywhere on the farm are painted snow white. They are complete and provided with all modern conveniences.

From a practical standpoint, this is one of the best equipped dairy farms in the country. It has taken years to finish the work, but when you consider the condition of the farm when purchased, that the owners started in with nothing but faith and enthusiasm, and that in a few years they remade the farm, equipped it with up-to-date appliances in every respect, made over all the buildings, rescued the land, made fertile the fields, bred up and developed a magnificent herd of cattle, and did all this right out of the profits of the farm, you realize what enterprise can accomplish when the dairy cow is the servant by which the work is done.

FARM BUILDINGS ERECTED BY BERT SMITH ON HIS FARM IN DELAWARE COUNTY, OHIO

THE FARM THAT WON'T WEAR OUT

By ALFRED VIVIAN

Dean of College of Agriculture and Domestic Science
Ohio State University

ALFRED VIVIAN

"YOU have a very fine farm," said the visitor, who had just completed a tour of Mr. Brown's farm, which is located in one of the most beautiful valleys of the country. "Such a farm should have a very attractive name."

"The fact is," Mr. Brown replied, "I have never been able to decide upon a name which satisfied me, but in my own mind I always think of it as 'The Farm that Won't Wear Out.'

"A pretty conceit," said the visitor, "but do you really feel that you have solved the problem of preventing the soil from wearing out?"

"Let me explain my theory and tell you what I have done, and then you can judge for yourself. In the first place, this is strictly a dairy farm and all the crops raised on it are utilized on the farm. I sell nothing but milk and my surplus cattle and pigs, so I recover in the stable manure a large part of the fertility which the crops remove from the soil. Let us assume that we have 160 acres under cultivation in a rotation which is commonly used in some dairy sections, namely, corn (for silage), oats, clover and timothy (for pasture). We will also assume yields much below those which I obtain, as follows: corn silage, 10 tons an acre; oats, 50 bushels; clover hay, two tons; and pasturage from the timothy equivalent to 1½ tons of hay.

"If the oat straw is used for bedding, and the manure produced from the feeds is properly cared for, the loss of potash will be so slight that it may be ignored, especially if the soil of the farm contains a fair amount of clay. In the case of nitrogen and phosphoric acid, however, we must assume that 25% of each will be lost in feeding, as that amount will be retained by the animal largely for use in milk production. But some of this loss is offset by the fact that the clover obtains part of its nitrogen from the air. I have arranged these facts in a table for more convenient study. Will you look at it?"

"This calculation shows that the manure and the clover will easily take care of the nitrogen problem. There is, however, a decided loss of phosphoric acid, so it is absolutely necessary to purchase this material in some commercial form if the fertility of the soil is to be maintained, and as nearly all of our soils are naturally deficient in phosphoric acid,

it is advisable to apply more of it than is required merely to replace that lost by feeding the crops. The best way to do this on the dairy farm is to buy acid phosphate or ground phosphate rock (floats) and add it to the manure at the rate of at least one pound a day for each thousand pound animal."

PLANT FOOD IN CROPS GROWN ON 160 ACRES

4 Year Rotation: Corn, Oats, Clover, Pasture.

	Nitrogen Pounds	Phosphoric Acid Pounds
400 tons silage	2240	880
2000 bu. oats	1056	441
80 tons clover hay	3312	896
60 tons timothy hay	1164	600
	7772	2817
Lost in feeding	1943	704
Possible fixation by clover	2484	
Gain or loss	+541	—704

"But do you not replace some of the lost phosphoric acid in the concentrated feeds you buy?" asked the visitor, who was intensely interested in this discussion.

"That is a good point," answered Mr. Brown. "The fact is that the crops given in the table will not make a balanced ration for a dairy cow

LEFT HAND SHOCK (NO MANURE) 38 BUSHELS OF CORN TO THE ACRE. RIGHT HAND SHOCK (STABLE MANURE) 59 BUSHELS TO THE ACRE. WHEN ACID PHOSPHATE WAS USED WITH STABLE MANURE 68 BUSHELS OF CORN WERE PRODUCED PER ACRE

To obtain the best results from these feeds we must purchase concentrates equivalent in protein to at least 15 tons of cottonseed meal. Here is another table showing the results of balancing the ration:"

	Nitrogen	Phosphoric Acid	Potash
15 tons Cottonseed Meal (corrected for loss in feeding)	1553	675	327
Gain or loss from farm crops	+541	—704	
Net gain or loss	+2094	—29	+327

"That is a very interesting table," said the visitor, "and it seems clear that in balancing the ration you have materially increased the gain of nitrogen and have added a little potash, but your farm still shows a slight loss of phosphoric acid. Now 29 pounds is such a small amount that you can surely ignore it, and assume that that much is made available each year from the insoluble phosphate of the soil."

"So I used to think," replied Mr. Brown, "and I used to follow that plan, but I have learned that it is necessary to keep a proper balance of plant food in the soil. By the use of concentrates and legumes I destroyed the balance of my soil by adding nitrogen out of proportion to the phosphoric acid, with the result that I had a very large growth of straw and stalk, but the grain did not fill properly and the corn produced very poor ears. Since using the phosphate that fault has been corrected, and I have a large growth of roughage carrying plenty of plump grain.

"This valley was originally one of the richest in the middle west, and tradition says that this farm once produced 100 bushels of corn to the acre. When I took it, the average yield was below 30 bushels of corn to the acre, and the first year, which was a good corn year, I obtained only five tons of silage from the acre. In ten years I have increased the yield to nearly 20 tons of silage and 85 bushels of corn, and it has all been done by carefully saving the manure and reinforcing it with acid phosphate. I hope to increase the yield still more in the years to come, and see no reason why I should not eventually produce 100 bushels of corn to the acre."

"You say you use acid phosphate, but I understand that some people advocate floats for use with manure."

"I am not disposed to quarrel with any one about which phosphate material to use with manure," continued Mr. Brown. "Either floats or acid phosphate will give profitable results. I use acid phosphate because the experiments comparing these materials, which have been running for 20 years at the Ohio station, show a higher net profit from the use of acid phosphate with manure, and I am after the greatest profit I can obtain. Here are the results of those experiments:"

VALUE OF INCREASE PER TON OF MANURE

	Total Value	Cost of Treatment	Net Value per ton
Stable manure alone	$3.22		$3.22
Stable manure and floats	4.74	.18	4.56
Stable manure and acid phosphate	5.10	.30	4.80

"This table shows that while the acid phosphate costs nearly twice as much as the floats the net profit from its use was greater. In this experiment 40 pounds of either floats or acid phosphate were used with each ton of manure, which is equivalent to the amount I use, namely, one pound per day for each thousand pound animal."

FULLY ONE-HALF OF THE FERTILIZING VALUE OF THE MANURE IS LOST WHEN EXPOSED IN THIS WAY

"Do you think, then, that all dairy farms are maintaining the fertility of their soils?" asked the visitor.

"By no means," Mr. Brown replied. "Some of the worst run down farms in the country have been used for dairying ever since they were first put under the plow. The dairyman who does not take care of the manure produced on his farm will deplete the fertility of his soil as rapidly as the all-grain farmer. Too few farmers appreciate the fact that manure is a perishable material, and that more than half its value is in the liquid part which is easily washed away by the rains. A series of experiments at the New Jersey station showed that an exposure of less than three months in the barn yard caused an average loss of 51% of the nitrogen of the manure, 51% of the phosphoric acid and 61% of the potash. Fully half the organic matter is destroyed in the same length of time. With losses anything like these it is absolutely impossible to keep up the fertility without purchasing large quantities of expensive fertilizer — which is absurd on a well managed dairy farm.

"The principal source of loss in cow manure is in the liquid which runs away. If the manure is kept on a water-tight floor until it is hauled to the field the loss in value will be very slight. The quicker the manure can be spread on the field the better. I haul the manure directly from the barn to the field whenever the conditions permit. Between times I store the manure in a shed with a cemented floor lo-

PROTECTING THE MANURE IN THIS SHED WAS RESPONSIBLE FOR INCREASING THE CORN YIELD FROM LESS THAN 30 BUSHELS TO MORE THAN 85 BUSHELS PER ACRE

cated a short distance from the stable. I like to have the manure pit covered because otherwise the manure becomes too sloppy to handle in wet weather. The pit or shed is emptied whenever there is a field in condition to receive the manure. Really, any arrangement which provides a tight floor and a cover to keep off most of the rain is all that is necessary in order to protect cow manure for as long a time as any one has any business to store it.

"What I have told you is how to maintain the supply of plant food in the soil, but there are certain other fundamentals which must be observed if the best results are to be obtained. This farm has every acre thoroughly tile-drained. I know that this is absolutely necessary for this farm, and I am coming to believe that it is needed on all clay soils no matter what the lay of the land may be. Trying to farm land which is not properly drained has led to more discouragement than any other one thing in agriculture. There is no place where money can be more profitably expended than in thoroughly tiling the farm."

"What do you think about the use of lime?"

"Did you notice that field of clover on the high land in the northeast corner of the farm? Well, when I first bought the farm that field was a puzzle to me. No matter how much manure I put on it I could not get clover to grow, and the other crops were unsatisfactory. The field was sour and overrun with sorrel. I put two tons of ground limestone to the acre on that part of the farm, and since then I have had such crops as you saw today. It would be hard to say which is the more important—drainage or limestone. Both are necessary in any soil to make it a sanitary home for the growing crop. Especially is limestone necessary for the growth of clover, alfalfa and other legumes, and the dairy farmer who does not grow legumes is on the short, straight road to ruin."

LIMING SOILS

Ascertain first whether lime is needed. If it is, apply it judiciously, and never depend upon lime alone to maintain the fertility of the soil, for all the ingredients which plants need must be present in the soil to insure profitable production of crops.

The frequency with which liming should be practiced depends, among other things, upon the character of the soil and the rate of application, the number of years involved in the rotation practiced, the plants grown and their order of succession. As a general rule, it may be stated that from ½ to 1½ tons of lime per acre every five or six years is sufficient. Applications of 2 or 3 tons may, however, be advisable in cases of very acid soils which are to be seeded down and are to remain in grass for several years. The practice of applying small amounts of lime at somewhat frequent intervals is being generally accepted as preferable to the use of large amounts at rare intervals.

—*U. S. Department of Agriculture.*

YEAR-ROUND FEEDING OF DAIRY COWS

By C. H. ECKLES

Professor of Dairy Husbandry
University of Missouri

C. H. ECKLES

NO AMOUNT of feed or skill in handling will make a profitable cow out of one that does not inherit a strong tendency to give milk. This is why success with dairy cows depends so largely upon selection of the individual animal by keeping records of milk and fat production. On the other hand no matter how good a producer a dairy cow may be by inheritance she cannot give results without the proper feed and management.

Every owner of a cow welcomes the time when the animal can be turned out to pasture because each cow is expected to give the best results of the year on grass. Immature grass, such as we have in early spring, contains a large amount of water and a small amount of dry matter. It is almost impossible for a heavy milking cow to eat enough of such feed to supply the necessary amount of nutrients.

Grain Feeding While on Pasture.—A cow will produce more milk if fed grain while on pasture. If a large yield is of more importance than economy of production, grain should certainly be fed. The cow that gives a small quantity of milk will produce but little more, if fed grain while on pasture. However, with the heavy producing cow the case is quite different and it is necessary that she be fed grain or she will not continue on the high level of production long. A Jersey cow that is giving as much as 20 pounds or 10 quarts a day, or a Holstein or Shorthorn giving 25 pounds or more daily should be given some grain. Our practice in regard to feeding on pasture is about as follows:

Jersey cow producing—

20 pounds milk daily	3 pounds grain
25 pounds milk daily	4 pounds grain
30 pounds milk daily	6 pounds grain
35 pounds milk daily	8 pounds grain
40 pounds milk daily	10 pounds grain

Holstein, Shorthorn or Ayrshire producing—

25 pounds milk daily	3 pounds grain
30 pounds milk daily	5 pounds grain
35 pounds milk daily	7 pounds grain
40 pounds milk daily	9 pounds grain
50 pounds milk daily	10 pounds grain

It must be kept in mind that this applies only when pastures are abundant.

Providing for Periods of Short Pasture.—As long as fresh pasture

grasses are abundant, the ordinary cow is about as well provided for as she can be to produce milk economically. Unfortunately the season of abundant pasture is often short. In many localities, a dry period, often of several weeks, occurs during the middle or latter part of the summer and the pastures become short and insufficient to maintain a full flow of milk. This season is often the critical time of the year for the dairy cow. Probably as much loss occurs one year with another by lack of feed at this time as occurs from improper feeding during the winter.

It is possible to hold up the milk flow by heavy grain feeding, but this is expensive. Provision should always be made to have green crops on hand that may be cut and fed when needed or to have silage available.

The Summer Silo.—The advantages of the silo for winter feeding are now generally known to dairy farmers. The next stage in silo development is now beginning. This is the use of silage for summer feeding. Over a large section of the United States there is a period sometime during the summer when pastures are short, young cattle are checked in growth and cows drop in milk. This is the time to open the summer silo. The practical thing to do is to have two silos, one for winter feeding and one smaller in diameter for summer feeding. Farmers who were fortunate enough to have summer silos during the past few years are confident that sooner or later most farmers will have summer silos.

Amount of Feed.—The first condition given as typical of the summer feeding is an abundance of palatable food, and on this point is made one of the most common mistakes in feeding cows. In producing milk, the cow may be looked upon in a way as a milk producing machine which we supply with a certain amount of raw material in the form of feed, and this raw material is manufactured into milk. The same rule holds in running the milk manufacturing plant as would hold in the running of any other manufacturing plant; it is run most economically near its full capacity. Every one who feeds animals should thoroughly comprehend that, first of all, the animal must use a certain proportion of its food to maintain the body. This is the first requirement of the animal and it is the first use to which it puts its food.

In the case of an ordinary dairy cow the amount required to maintain the body is about 60% of the ration. In the case of a heavier producing animal the proportion of the ration used for this purpose is less. It should be clear that, after going to the expense of giving the animal the necessary amount to keep her alive, it is the poorest economy to refuse to furnish the other 40 or 50% which she would utilize exclusively for milk production.

The only way to feed a cow economically is to feed her liberally so she has the raw material to make into milk. Then if she does not deliver the goods she should be sent to the butcher. The farmer sometimes reasons that with high priced feeds it does not pay to feed well. It certainly does not pay under such conditions to feed inferior cows liberally but such conditions make it all the more necessary to feed the good cow enough to use all her milk producing ability.

Overfeeding.—In some herds light milkers are overfed. If a cow is already receiving sufficient feed for all the milk she is producing it will do no good to give her more feed. It does not pay to give a cow producing 20 pounds daily the same amount of grain as one producing 40 or 50 pounds. If this is done the low milker is overfed and will give just as much milk if given less grain.

Amount of Grain and Roughness to Feed.—The only economical way is to feed cows according to the amount of milk produced. There certainly is anything but good judgment behind the common practice in many herds of feeding all the animals the same amount of grain. Under such conditions the high producing cows are underfed and the low milkers receive too much.

The cow should be fed practically all the roughness she will eat up clean. The difference in rations fed to different animals should be mostly in the grain. The following may serve as a general feeding guide:

1. Feed all the roughness they will eat up clean at all times.
2. Feed one pound of grain a day for each pound of butter-fat produced a week, or one pound grain for each three pounds of 5% milk or 4 pounds of 3.5% milk.
3. Feed all the cows will take without gaining in weight.

The Balanced Ration.—The ordinary pasture grasses, especially blue grass, when in the growing state, contain the proper proportion of nutrients to enable a dairy cow to produce the maximum amount of milk of which she is capable. The winter ration, on the other hand, is liable to have these nutrients out of proportion. This is one point wherein common practice falls far short of continuing the summer conditions throughout the winter. The feeding of a ration not properly balanced is one of the most common mistakes made on the average farm.

All properly balanced rations must contain protein, carbohydrates and fat, and no amount of carbohydrates or fat can take the place in the body of protein. Since these three kinds of solids must be present in order to form milk, it is necessary to furnish them in the feed in sufficient quantities and in about the right proportion, so there will be no loss. When this is done, the ration is properly balanced. If a cow be supplied with sufficient material in her feed to produce 30 pounds of milk a day, but on account of lacking protein produces but 15 pounds, it is useless to further increase the fat-producing material and expect the flow of milk to be increased. The surplus fat in the feed will not be put into the milk and make it unusually rich.

As an aid in properly balancing the rations, it is useful to divide our common feeds into two classes: Class 1, or those feeds which contain a large amount of fat producing material, carbohydrates and fat, but which are notably deficient in protein. In this class we have: corn, corn fodder, corn silage, timothy hay, oat straw, wheat straw, millet hay, [illegible]n hay.

Class 2 contains a much larger proportion of protein, the essential growth and milk producing elements, and smaller quantities of the fat making materials. It includes: clover hay, alfalfa hay, cowpea hay, bran, oats, cottonseed meal, gluten meal, linseed meal, soy beans.

A properly balanced ration will, therefore, include some of the feeds from each of these two lists. A ration of silage, timothy hay and corn is not a balanced ration. Neither is a ration of corn fodder, corn and oats. Both lack protein.

Legume Hays.—The cheapest source of protein is generally legume hays, including clover, alfalfa and cowpea hay. If an abundance of any one of these hays is on hand, the problem of making an economical balanced ration is very much simplified. The use of these hays makes it unnecessary to buy any large quantities of bran, oil meal or cotton-seed meal for ordinary dairy cows, and makes it possible that the principal grain used be corn, which usually is our cheapest grain. Even cowpea or alfalfa hay alone, with corn for grain, makes a fairly good ration for an ordinary dairy cow, and such a ration could be substituted with good results for that of timothy hay and corn fodder. If hay is to be sold it should be timothy hay and not clover or cowpea hay.

Succulent Feeds.—By the term succulent feed is meant feed having that property possessed by green grass. Such feed has a value outside of the actual nutrients it contains on account of its favorable effect upon the digestion of the animal. There are two methods in use for supplying this succulent feed during the winter season. One is the use of root crops and the other is the use of silage. In some parts of the world the use of root crops is almost universal, and is the solution of the problem. Where corn is grown the use of silage is more practical, however, than root crops.

WHAT CONCENTRATED FEEDS WEIGH

FEED	Weight of One Quart	Pound Measures
	Pounds	Quarts
Dried beet pulp	.55	1.8
Dried brewers' grains	.6	1.7
Corn and cob meal	1.4	.7
Corn and oat feed	.7	1.4
Corn bran	.5	2.0
Corn meal	1.5	.7
Corn, whole	1.7	.6
Cottonseed meal	1.5	.7
Cotton seed	1.	1.
Germ oil meal	1.4	.7
Gluten feed	1.3	.8
Gluten meal	1.7	.6
Hominy meal	1.1	.9
Kafir meal	1.6	.6
Linseed meal (new process)	.9	1.1
Linseed meal (old process)	1.1	.9
Malt sprouts	.6	1.7
Wheat bran	.5	2.0
Wheat, ground	1.7	.6
Wheat middlings (flour)	1.2	.8
Wheat middlings (standard)	1.9	.5
Wheat, whole	.8	1.3

RATIONS FOR DAIRY COWS

In the sample rations submitted below average conditions are considered. The quantity of grain may be increased or lessened in proportion to the milk yield. In general a cow should be fed one pound of grain for every three pounds of 5% milk yielded. If fed a bright legume hay and good silage and the milk averages around 3.3% to 3.5% butterfat give one pound of grain to four or five pounds of milk. The several rations given below are in use in different parts of the country. Some are for cows yielding a heavy milk flow, others for cows yielding only a moderate amount. The roughage allotment may be fed to a cow in any state of milk lactation, but the grain may be increased or decreased in proportion as the milk yield is large or small.

SOME SAMPLE DAIRY RATIONS

1.	
Corn silage	40 pounds
Clover hay	15 pounds
Ground corn	3 pounds
Cottonseed meal	1 pound

2	
Corn silage	40 pounds
Timothy hay	15 pounds
Ground corn	3 pounds
Cottonseed meal	3 pounds
Gluten meal	2 pounds

3	
Soy bean silage	36 pounds
Alfalfa hay	8 pounds
Corn meal	6 pounds

4	
Corn silage	36 pounds
Corn stover	6 pounds
Wheat bran	4 pounds
Dried brewers' grains	4 pounds

5	
Cowpea hay	17 pounds
Corn silage	36 pounds
Cottonseed meal	2 pounds

6	
Corn stover	5 pounds
Corn silage	36 pounds
Wheat bran	4 pounds
Dried brewers' grains	3 pounds
Cottonseed meal	2 pounds

7	
Mixed hay	5 pounds
Corn silage	30 pounds
Wheat bran	6 pounds

8	
Crimson clover hay	10 pounds
Cowpea hay	36 pounds
Corn and cob meal	6 pounds

9	
Mixed hay	5 pounds
Corn silage	36 pounds
Dried brewers' grains	5 pounds

10	
Corn stover	7 pounds
Corn silage	40 pounds
Wheat bran	4 pounds
Gluten meal	4 pounds
Cottonseed meal	2 pounds

11	
Alfalfa hay	15 pounds
Corn silage	35 pounds
Corn meal	2 pounds
Gluten meal	1 pound

12	
Fodder corn	20 pounds
Ground oats	5 pounds
Wheat bran	3 pounds
Linseed meal	2 pounds

13	
Corn silage	50 pounds
Mixed hay	7 pounds
Linseed meal	2 pounds
Bran	2 pounds
Gluten meal	1 pound

14	
Corn stover	5 pounds
Mixed hay	7 pounds
Linseed meal	2 pounds
Corn meal	5 pounds
Bran	6 pounds

15	
Corn silage	45 pounds
Wheat bran	4 pounds
Gluten meal	3 pounds
Corn meal	2 pounds
Linseed meal	1 pound

16	
Corn stover	15 pounds
Wheat bran	4 pounds
Gluten meal	4 pounds
Corn meal	1 pound
Linseed meal	2 pounds

17	
Corn silage	40 pounds
Timothy hay	5 pounds
Ground oats	5 pounds
Ground peas	6 pounds

18	
Corn silage or roots	25 pounds
Gluten	3 pounds
Brewers' grains	3 pounds
Malt sprouts	2 pounds

19	
Corn silage or roots	25 pounds
Blue grass hay	12 pounds
Wheat bran	4 pounds
Gluten meal	3 pounds

20	
Corn silage	35 pounds
Alfalfa hay	10 pounds
Cottonseed meal	4.5 pounds
Oats	4.5 pounds
Barley	4.5 pounds

21

Corn stover	12 pounds
Chopped wheat	6 pounds
Linseed meal	5 pounds

22

Corn silage	35 pounds
Cottonseed meal	3 pounds
Linseed meal	3 pounds
Wheat bran	2 pounds

23

Corn stover	15 pounds
Alfalfa hay	10 pounds
Ground soy beans	2 pounds
Corn and cob meal	3 pounds
Linseed meal	1 pound

24

Corn stover	15 pounds
Clover hay	10 pounds
Ground soy beans	3 pounds
Corn and cob meal	3 pounds
Linseed meal	2 pounds

25

Clover hay	6 pounds
Corn stover	10 pounds
Ground oats	10 pounds
Corn meal	2 pounds

26

Clover hay	6 pounds
Corn stover	10 pounds
Wheat bran	10 pounds
Corn meal	2 pounds

27

Timothy hay	12 pounds
Rye meal	3 pounds
Cottonseed meal	3 pounds
Dried beet pulp	4 pounds
Gluten	2 pounds

28

Timothy hay	12 pounds
Barley meal	4 pounds
Dried beet pulp	5 pounds
Gluten meal	4 pounds
Linseed meal	2 pounds

29

Corn silage	30 pounds
Alfalfa hay	10 pounds
Clover hay	10 pounds
Wheat bran	2 pounds
Corn meal	2 pounds

30

Corn silage	35 pounds
Hay	10 pounds
Wheat bran	3 pounds
Corn and cob meal	3 pounds
Cottonseed meal	2 pounds
Gluten meal	2 pounds

31

Clover hay	8 pounds
Timothy hay	7 pounds
Corn and cob meal	12 pounds
Wheat bran	8 pounds
Linseed meal	2 pounds

32

Corn silage or roots	25 pounds
Corn meal	8 pounds
Wheat bran	2 pounds
Oats	4 pounds
Linseed meal	2 pounds

33

Common hay	20 pounds
Wheat bran	2 pounds
Cottonseed meal	2 pounds
Hominy meal	2 pounds

34

Timothy hay	12 pounds
Wheat bran	1 pound
Middlings	1 pound
Corn meal	2 pounds
Cottonseed meal	3 pounds

35

Corn silage	40 pounds
Clover hay	3 pounds
Timothy hay	2 pounds
Corn and cob meal	8 pounds
Dried brewers' grains	12 pounds

36

Corn silage	30 pounds
Fodder corn	8 pounds
Corn meal	3 pounds
Wheat bran	3 pounds
Cottonseed meal	2 pounds

37

Corn fodder	25 pounds
Wheat bran	5 pounds
Corn meal	5 pounds
Cottonseed meal	3 pounds
Linseed meal	2 pounds

38

Corn fodder	10 pounds
Mixed hay	8 pounds
Wheat bran	3 pounds
Corn meal	2 pounds
Cottonseed meal	2 pounds
Gluten meal	3 pounds

39

Corn silage	30 pounds
Sorghum	12 pounds
Corn meal	1 pound
Cottonseed meal	3 pounds
Cotton seed	2 pounds

40

Corn silage	45 pounds
Corn and cob meal	2 pounds
Ground oats	3 pounds
Barley meal	3 pounds
Oat hay	5 pounds

41

Corn silage or roots	25 pounds
Clover hay	10 pounds
Timothy hay	5 pounds
Wheat middlings	8 pounds
Linseed meal	2 pounds

42

Oat and pea hay	12 pounds
Clover hay	12 pounds
Wheat middlings	4 pounds
Dairy feed	4 pounds

43

Corn silage	45 pounds
Sheaf oats	5 pounds
Corn fodder	5 pounds
Cottonseed meal	3 pounds
Linseed meal	2 pounds
Wheat bran	3 pounds
Dairy feed	3 pounds

44

Corn silage	40 pounds
Clover hay or alfalfa hay	7 pounds
Straw	3 pounds
Barley meal	2 pounds
Pea meal	2 pounds
Wheat bran	3 pounds
Dairy feed	3 pounds

LEGUMES FOR THE DAIRY

By Prof. C. W. Burkett
Editor of *American Agriculturist*

PROF. C. W. BURKETT

THE basis of the profitable dairy ration is undoubtedly hay and silage. To get the best returns from these and the greatest efficiency from the cow, grain feeds rich in protein must be supplied in addition. The cow must have a reasonable amount of protein in her ration if she is to do her full duty at the milk pail. Naturally, the less protein there is in the roughage feed the more that will need to be supplied in the grains. That means ordinarily that more grain will need to be fed. By lessening the quantity of grain fed, the greater will be the net profit; but the only way known of lessening the quantity of purchased grain is through the feeding of home grown roughage materials that are heavy carriers of protein.

Fortunately we have a class of farm crops that are relatively high in protein. These must be sought in the future to the fullest extent if the greatest profit is to be had from the production of milk, butter and cheese. I refer to the legume crops. The list includes alfalfa, the clovers, cowpeas, soy beans, the vetches and Canadian field peas. Alfalfa is only mentioned here since it has been treated elsewhere.

THE CLOVERS STANDARD EVERYWHERE

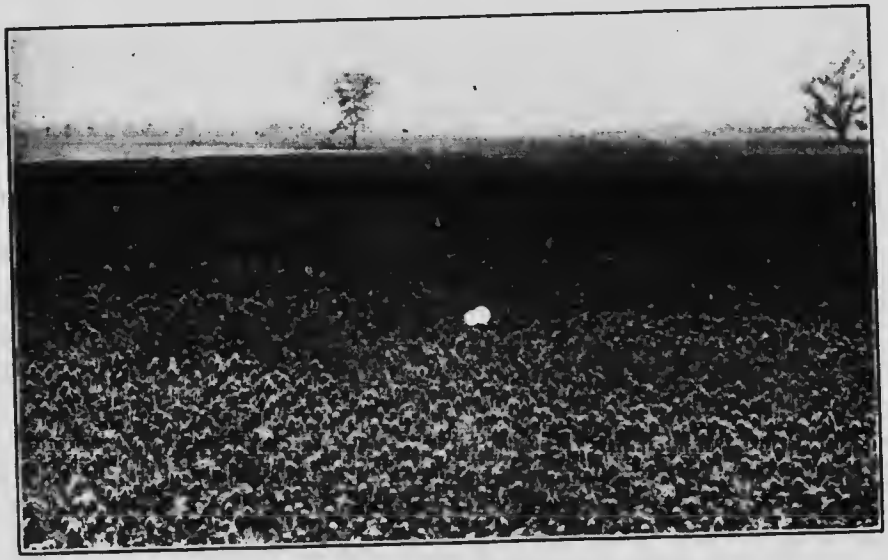
In the clover class we have the common red clover, white clover, crimson clover or scarlet clover, Alsike clover, mammoth clover and Japan clover. In a general way Japan clover is limited to the southern section of the country. It is subject to injury from frost and is therefore a summer crop only. As a southern pasture grass it is unsurpassed. It grows on the poorest and barest red clay knobs, and on exhausted, gravelly or worn-out sands, and at the same time produces fair grazing. It spreads rapidly and crowds out the common and worthless plants of the neighborhood. It is an annual and dies down each year, leaving its stems, leaves and roots to decay and enrich the soil. The seed produced remains on the soil ready for the following year. In starting the crop, scatter the seed broadcast and harrow lightly.

Crimson Clover.—This annual is most at home in the South and along the Atlantic seaboard. It grows successfully as far north as New Jersey and Long Island. It is sown in late summer or early fall and reaches maturity in the spring time of the following year. In the rotation system crimson clover should be grown as the catch crop. On preparing the soil

the aim should be to secure a fine, compact and moist seed-bed. If the plowing be done just previous to seeding, the harrow and roller should be freely used so as to secure a compact bed. From 5 to 10 pounds of seed should be sowed to the acre.

Red Clover.—The seed may be sown broadcast by hand or by means of a hand seeder or with an attachment to the grain drill. From 5 to 10 pounds of seed are usually sown to the acre, the latter quantity being preferable. Clover may be included in any and all grass seedings. By the second year the clover disappears and then timothy, red top or other grasses included in the mixture are ready to start at their best. Its ability to grow in almost any place makes it a universal American crop. It can be adjusted to almost any system of crop rotation, and for this reason it should be more commonly grown than it is. The dairy farm that neglects clover suffers a great loss, not only in the admirable needs for the dairy stock, but through the fertility that might be provided to the land when silage and other pasture crops are grown.

Alsike Clover.—This plant compared with common red clover is characterized by a pinkish rather than luish red tinge of its blossoms. Its roots are smaller. It produces less . .ture after a season of maturity and also matures later than the common red varieties. It has a perennial rather than a biennial habit of growth. It feeds somewhat near to the surface and therefore does not possess the drouth-resisting qualities of the stronger varieties of clover. Its range of distribution is more limited than the common red variety and it is better known in the northern states than in the southern states. It is especially fitted to clay soils, clay loams and bottom lands. If moisture is present it will do well on any soil. From three to five pounds of seed are used to the acre. It is frequently



CRIMSON CLOVER A SOIL BUILDER OF THE FIRST ORDER

sown alone, but is most generally used in combination with other grasses. Acid soils do not affect it as they do the common red variety.

Mammoth Clover.—This strong, vigorous legume resembles the common variety in form and leaves and general habit of growth. The stems and heads are larger, it attains a greater height, matures later in the season and its roots are large and penetrate the soil to a great depth. It occupies the same place in the rotation and calls for the same methods of seeding and preparation as that given the common red variety. When sown alone the usual amount is 10 pounds of seed to the acre, but when sown in combination with other seeds this amount is proportionately reduced. The mammoth variety is more inclined to lodge and is more difficult to harvest and to cure than the other varieties. It yields a little heavier to the acre. The hay is coarser and is not so popular in dairy stables nor so much relished by animals. It is especially prized as a green manure.

White Clover.—This little perennial is pretty well established all over the country. It is best adapted to rather moist soils and restricted to lawns and permanent pastures; and always in combination with other crops. Its yield is small, but because of its perennial character and its creeping habit and its tendency to occupy all the waste spaces left vacant by other plants it deserves recognition in all permanent pastures used for dairy cattle.

COWPEAS, THE CLOVER OF THE SOUTH

What clover is to the North, the pea is to the South. On poor sandy land, with a few hundred pounds of fertilizer a crop of cowpeas can be grown that will simply astonish the visitor unused to them. Not only an abundance of choice grain can be made from them, but the hay one acre will yield will three times pay the cost of the crop. The hay, if properly cured, is rich in nutrition. All classes of farm animals relish it and will gain in weight even though given no additional feed. The cowpea is not restricted to the South and does equally well in the North. The difference in the crop system has favored its culture in the southern states and the popularity of clover in the North has been against it. As a nitrogen gatherer, a humus maker and consumer of rough plant food, the cowpea is unexcelled. It is unequalled by any other plant unless it be alfalfa.

The cowpea responds to good tillage. A well-fined, loose seed-bed is the ideal one. Never plant until the ground is warm. Sow broadcast or with grain drill at the rate of one to two bushels to the acre. If planted in drills make rows about 24 to 30 inches apart. Cultivate a few times. This not only hastens the growth, but increases the yield considerably. The crop is cured for hay in a manner very similar to the curing of clover or alfalfa.

A SPLENDID ORIENTAL LEGUME

Soy beans, like the cowpea, want warm weather. Their uses are somewhat similar to those of the cowpea. They grow well in the corn

field and when put into the silo with corn make admirable silage. They grow in a wide range of soils and may be planted in rows or broadcasted. When wanted mainly for grain the seed is put in rows about 24 inches apart for the small varieties and 36 inches for the large varieties. Once started they grow rapidly. If grown for grain this may be ground and fed in the regular grain mixture, and if made into hay, fed as cowpea or clover. The high value of the seed acts against the use of soy beans as a grain food.

THE TARES OF THE CEREALS

The vetches are called the tares of the cereals but are relished by live stock of all kinds. They are excellent for milk production and their fattening properties are of a high order. They have a special adaptation for being grown along with other grains to provide soiling food or hay. They may be used with oats or wheat and when so grown the combination makes an admirable hay mixture, especially in those regions where clover, alfalfa or other hays are not generally grown. The vetches flourish best in moist, clay loam soils of free working texture. The spring vetch should be sown for forage as soon as the ground is dry enough to be worked without injury. The winter vetch ought to be sown long before winter to enable it to become firmly established that it may the better withstand the rigors of winter. The seeding may be broadcasted but it is better sown with a grain drill if sown alone or along with other seeds. It should be buried about as deeply as the cereal grains. The hay of the common vetch is about as nutritious as common clover and is relished even more. On account of the high value of seed it is never fed to live stock, although it is excellent food.

A MIXTURE FOR SOILING OR HAY

Oats and Canadian field peas seeded together make an admirable soiling mixture, or hay. The peas use the oats for support and when cut in the green state both are at their best. The chief value of the Canadian pea is for forage. They like a porous moist clay loam. About two bushels of oats and one bushel of peas are used to the acre. They may be mixed before seeding and sown broadcast or with a drill. The peas do better if deeply covered. Some growers first disk in the peas to a depth of three or four inches and then seed the oats by hand or a grain drill. When grown as a dual crop the harvesting is done about the time the oats are in milk stage. As a hay it is both appetizing and nutritious, and as a food for dairy cows is unsurpassed. In many dairy sections the custom prevails of seeding each spring a small acreage to oats and peas to get an early soiling crop. When the crop reaches a height of a couple feet daily cuttings are made and these are given to the cows as green forage. If the clover or alfalfa crops are available, or the pasture is ready before all the oats and peas are used up, it is customary to cut the remaining part for hay.

ALFALFA THE WONDERFUL

By Hon. F. D. COBURN

Former Secretary Kansas Department of Agriculture

HON. F. D. COBURN

MOST of the supposed drawbacks of alfalfa growing are in a large measure imaginary. This is in spite of the lack of lime in some soils, or excessive rains in haying time; in spite of severe winter temperature in the North and unpromising soil conditions somewhere else, and in the face of Grandpa's justifiably high opinion of clover. Yet, no inference should be drawn from such a statement that alfalfa flourishes or survives alike in all places.

The Wisconsin Experiment Station says an acre of alfalfa will yield three times as much protein as an acre of clover, nine times as much as an acre of timothy, and twelve times as much as an acre of broom grass. A recent experiment at the Illinois station showed that for dairy cows a ration containing 10 pounds of alfalfa produced 17% more milk than the same ration with timothy used in lieu of alfalfa. Also that "alfalfa was worth $10.86 more a ton than timothy, and when timothy is worth $10 a ton an acre of alfalfa is worth $68.44 more than an acre of timothy under the conditions which existed in this experiment and when milk is sold at $1.30 a 100 pounds."

While unequalled as a hay or forage for all classes of farm animals, including fowls, to no farmer is alfalfa more essential than to the dairyman. Wheat bran, so long his reliance as the one best adjunct to other feeds in milk-making, has, on account of its high price, and poor quality due to modern methods of milling, made some less expensive substitute a necessity, and such a substitute is afforded by alfalfa, which as hay or ensilage, more nearly approaches bran than any other feed available.

Corn silage and alfalfa make in themselves practically a complete balanced ration for dairy cows. Alfalfa hay fed to animals has much the same laxative effect on them as June pasture. A dairyman at Elgin, Ill., having 50 cows says that every month's feeding of alfalfa in winter gives him a month of practically pasture conditions. "The cows show the pasture-effect in the glossy condition of their hair and in the yield of milk, and have never before looked quite so well."

Remarkable plant that it is, yielding under widely varying conditions well-nigh incredible growths of incomparable forage, some brains are requisite to success in its growth. To say that "any fool can grow alfalfa" is quite misleading, but with fair treatment under fairly favor-

able conditions it is bringing good fortune to thousands of those growers who know it best and use a fair intelligence in their dealings with it. Among its fundamental requirements is a fairly fertile soil, always—which it improves rather than depletes—free from weed seeds, in good tilth, with a surface painstakingly prepared. Alfalfa roots go down where those of no other plants go, and reaching the moisture, the mineral and other elements in the subsoils, bring them to the surface.

As a fertilizer alfalfa roots work most astonishing changes in the soil. They push their downward way in every direction, honeycombing the land with their growth; in the eventual process of decay some of them are all the time dying, and plowing up an alfalfa field one finds the subsoil filled with their decaying matter, leaving humus below where any other agencies have put it. It is there for future use, and the soil is filled with perforations through which the rains percolate, carrying with them other fertilization from the surface.

Alfalfa is not primarily a pasture crop; cattle, sheep and ruminants —animals that chew the cud—grazing on it will almost invariably bloat, and probably die, if they do not have prompt attention. Horses, hogs and animals that do not chew the cud, can graze on it without danger. Further, it is almost too valuable for pasture; that is, it can be utilized to greater profit in other ways. One of these is to mow and feed it uncured. If so used, slightly wilted, nothing bloats from eating it. Cured as hay, it does no harm to anything that eats it. One can have a piece of land in alfalfa and keep cutting it from one side to the other, and maintain it fresh all the time; when he gets through from one side of the field, the other side is ready to cut again, and it can be profitably used with very excellent results in that way. Properly, a man should probably have part of his farm in alfalfa while he is raising other crops on the other part, and after a field has been in alfalfa for four or five years, he should plow it up, plant those other crops on the alfalfa ground, sow the rest of the land in alfalfa, and follow that sort of rotation.

ALFALFA, SHOWING ROOTS

Wherever fall seeding is found to do well it is generally conceded preferable. This means in a general way sowing, say in August or September. And with all conditions favoring, the first half of the month, or earlier, is best. Whatever the time selected the largest measure of success comes to the farmer who has made proper preparations. Fall sowing has a number of advantages peculiarly its own. First, no time is lost in the producing record, for sowing then two or three cuttings will be had the following season, while with spring sowing it is often a struggle for existence in the first year, owing to weeds and the dry weather while the plants have as yet but a feeble root hold. That fall-sown continues

its growth promptly in the spring and naturally stands a good chance to smother the weeds, the great foes to establishing alfalfa; the frequent mowings also help in their extermination. Another feature is that the small, delicate alfalfa plant, and there are few more delicate at first, in its earlier stages obtains its nourishment from the surface soil, and hence the cleaner the ground the more plant-food there is available to the alfalfa, and the thriftier the growth. Incidentally, it is largely for this reason, too, that alfalfa should not be sown with a nurse crop.

The quantity of seed to sow per acre is much in dispute. Twenty pounds is the maximum, which is advised on the theory that it is better to sow too much rather than too little, and especially considering the chances there are that from one cause or another so many of the seeds or plants may prove failures. As a matter of fact, however, if each seed in twenty pounds grew on a single acre, that acre would have ten times as many plants as could thrive or survive.

Quality in seed should be carefully looked after, and the percentage of germinability and purity ascertained before buying. If the farmer does not have faith in his own ability to properly make these tests he may have them made without charge by sending samples to his state experiment station. The average seed on the markets is likely to be found with heavy admixtures of trash and the seeds of many noxious weeds as well as those of other plants The best seed has a bright golden or egg-yellow color, with a glossy appearance, and 90% should grow.

Sowing may be done by broadcasting and the seed covered by harrowing, or with grain drills; an inch of fine, firmed soil is the ideal depth and covering Many prefer planting with a drill having a press-wheel attachment, as with this the depth can be regulated. Some are

A SEASON'S FOURTH CUTTING OF ALFALFA NEAR TOPEKA, KANSAS

partial to running the drill across the land in one direction, sowing half the seed, and cross-drilling with the other half, thus avoiding "skips" in the stand. It is probably advisable to use either the portable seeder or the drill, for with the former a more even distribution can be had than if the sowing is done by hand, the seeder to be followed by thorough harrowing, while sowing with a drill makes it certain that the seeds are in instead of on top of the ground. Of late a grain drill adjustable to making seed rows three instead of six or eight inches apart is finding considerable favor. When it is used cross-drilling is not necessary.

For success alfalfa must have in its soil certain bacteria that are common to few other plants, but sweet clover is one of those having the same inoculation. When alfalfa is planted in a field where none has grown before, it is wise to introduce some of the right bacteria. The process is simple. Soil from ground on which alfalfa or sweet clover is growing luxuriantly and where the nodules in which they multiply show that it contains the desired bacteria, is scattered broadcast, at the rate of 200 to 500 pounds or more per acre, and harrowed in, just before or after sowing seed. If the soil is sour 500 to 1000 pounds of lime per acre is a corrective, and a liberal coating of manure once in two or three years is a wonderful tonic to its growth.

Alfalfa should be mown for hay when it begins to bloom, or when the new shoots at the root-crowns are well started. Harvested thus early a higher feeding value is obtained, and by promptly taking off the crop there is no check to the subsequent growth. If let stand until in full bloom, the oncoming "shoots" are in danger of being mowed off, thereby arresting their progress and delaying their maturity. This may mean one less cutting in the season. Also, there is greater loss of leaves when the plants are left too long uncut.

It is better to mow alfalfa after the dew is off, and it is always important to rake before the leaves become dry and crumbly. It is through the leaves that the sap in the plant is evaporated in curing; if they are too quickly dried by the hot sun this evaporation is made impossible, and a poor grade of hay will be had. Forking up the windrows into rather high, narrow cocks, possibly the same day as cut, is found excellent. Cocked like this, moderate rain the following night would do it little, if any, harm, as the partly cured hay will turn water quite well. With good weather the next day the cocks can be opened after the dew is off, possibly turned over, and in the afternoon may be fit for stacking.

Good practice is to stack as soon as it is ready. A simple test as to fitness is to tightly twist a wisp of the moist hay, and if no juice exudes it is ready, otherwise it should be further cured. After a barn the next best place for storing is in a purposely constructed shed. But by far the most of the hay in the prominent hay-producing states is stacked out-of-doors. Hence the kind of stack is important. Not infrequently as much as one-fifth or one-fourth is spoiled because of carelessness in this regard. One of the farmer's best investments is the hay barn, and its presence in thrifty communities is testimony to its worth.

THE SILO AND SILAGE

By CHARLES S. PLUMB

Professor of Animal Husbandry, Ohio State University

PROF. CHAS. S. PLUMB

I AM going to assume that you are a farmer, and are thinking about building a silo to preserve green food for your stock. You have heard more or less about silos and silage, but are in some doubt as to what to do.

The introduction of the silo to America occurred in 1876. From then on for many years it was the source of much argument and favorable and unfavorable discussion. Gradually a better understanding of silo construction and the use and value of silage was established. Today tens of thousands of silos are in constant use. They are no longer an experimental proposition. Instead, they are well established features associated with that class of live stock, and especially dairy farming, that requires careful study and close attention to all details to make a satisfactory profit.

The main feature in building a silo is to keep the silage as slightly exposed to outside air as possible. For that reason a place that has a tight bottom and sides, is regarded as necessary. In recent years, silos made of staves, held together by adjustable iron hoops, have been most popular. These stave silos are manufactured and sold by men in different parts of the country, who make a specialty of manufacturing them. The farmer need have no difficulty in setting them up. Concrete is also being considerably used now, and is meeting with some favor.

The capacity of the silo is a matter of importance. Unless one is keeping at least ten cows the cost of the silo is usually not justified. A round silo, 28 feet high, will hold the silage for about a dozen cows during the usual feeding season. A good standard size ranges from 14 to 16 feet in diameter and 30 to 32 feet high. Under ordinary conditions cows eat from 30 to 40 pounds of silage a day, according to their size and condition of lactation. You can easily estimate how much capacity is needed, on the basis of this amount to be fed per head. If one has 30 cows to feed, then about 1,050 pounds a day would be required, and for a feeding season of seven months or 210 days, 220,500 pounds or 110 tons. A round silo 30 feet deep and 16 feet in diameter inside, holds about 120 tons. The capacity of the silo should enable one to feed from the surface daily to a depth sufficient to prevent moulding. This is usually placed at around 1½ to 2 inches. In recent years some silo owners on high priced lands, and not pasturing, feed silage every month,

beginning to feed just as soon as the silo is filled, and keeping it up until next filling. Others feed the entire year excepting during the flush of pasture in May and June.

CROPS FOR THE SILO

Indian corn is by far the most satisfactory, and is the one in universal use in America. Many persons depend on the corn for the silo, by simply drawing on what they need from the regular cornfield such as is a comm n feature in the corn belt. In New England and some of the cooler sections, corn is usually specially grown for the silo, some heavy yielding variety being planted. The proper time to cut the corn is when the kernel is in the glaze, but before the leaves of the plants dry up. In central Ohio, we usually fill our silo as early in September as possible after the crop is ready, which may be from the fifth to the tenth or even later. Sorghum makes good silage, and in the semi-arid sections, may replace corn. Silage made from it, however, inclines to be somewhat more sour or acid than that from corn. Clover has been put in the silo very often, but there is much uncertainty in its keeping without considerable loss. None of the clovers, including alfalfa, can be preserved as satisfactorily as corn.

THE COST OF PRODUCING SILAGE

Naturally this will depend up n a variety of conditions, including value of land, crop used, cost of growing, yield and expense of filling. Quite a wide range of figures have been published, ranging from 75 cents a ton up for corn silage. A recent newspaper bulletin from the Nebraska station, by Prof. Pugsley, gives the following on this point: "Prof. Mumford of Illinois states that corn yielding 42 bushels per acre and worth 35 cents on the market, will give silage at $2.75 a ton. In my own instance, last year where it took 18 acres to fill two silos of 110 tons each, and with an estimate of the corn at 60 bushels an acre at 35 cents a bushel, and with the labor of filling extending over a period of four days, and costing $110, and allowing the stalks to be worth $1 an acre on the market, the cost of the silage per ton was $2.59." Undoubtedly the cost ranges in many cases from $2.00 to $2.50 a ton for filling with corn.

SUGGESTIONS ON FILLING THE SILO

Any green crop may be used, and it may be thrown in and packed down without cutting if desired. However, the only satisfactory and economical plan is to cut the crop and pack it compactly in the silo. Corn is usually cut in about half inch lengths with a cutter, or is shredded, and is then blown into the silo, or is transported to the top and dropped in from a carrier. In either case satisfactory silage should be made. As the corn is emptied into the silo, it should be evenly distributed therein, so as to settle uniformly in filling. Otherwise the contents will not pack evenly, and so the best of keeping is not assured.

A good way to do, is to run the cut corn into a cloth down-spout, if

one may so term it, extending from the unloading point of blower or carrier to the height of a person's elbow who stands in the silo. One may take ordinary sacks and by opening up the bottoms, and then sewing a number of sacks together, end to end, may make a good cloth tube with which to distribute the cut corn evenly in the silo. As the silo fills up, the lower end of the sacks can be removed or rolled up. Even a good sized boy will thus keep the silage well spread with ease. Then he should tread it down, especially about the sides, for close packing here is a valuable aid in preservation.

If the crop is inclined to be dry and does not pack as well as it would otherwise, then plenty of water sprayed over the silage from time to time during filling, will be a help in preservation. There is no special rule as to rapidity of filling. Some persons fill as quickly as possible, others take several more days than might be necessary. One must, however, keep in mind putting the crop in, in proper maturity and not over-ripe. After filling, unless one is to begin feeding at once, it is desirable to cover the top of the silage with 6 inches or more of straw, to keep out the air and so cause as little loss of feed as possible. One usually expects some loss at the top and about the doors, or at points of exposure, such as cracks.

VALUE OF SILAGE FOR FOOD

Many experiments have been conducted by American experiment stations, comparing the relative feeding value of corn silage with fodder corn and hay in particular. Numerous experiments have been conducted, especially with dairy cattle, and more recently with beef cattle, in which silage is shown to be one of the most palatable and desirable of foodstuffs. There is generally a loss of around 15 per cent in the silage, and more toward the top and less toward the bottom of the silo. In milk production, interesting experiments have very generally shown that more milk was produced from 100 pounds of dry matter in silage than from 100 pounds of dry matter in fodder corn. Henry states that at the Wis-

A De Laval Cream Separator is used on this farm.

ATTRACTIVE AND WELL ARRANGED BARNS WITH SILOS IN CONNECTION

consin station, "from 29,800 pounds of green fodder were obtained 24,440 pounds of silage, which, fed with 1,648 pounds of hay and 2,884 pounds of grain, produced 7,496 pounds of milk, containing 340.4 pounds of fat. From 29,800 pounds of green fodder were obtained 7,330 pounds of field cured fodder corn, which, fed with 1,567 pounds of hay and 2,743 pounds of grain, produced 7,119 pounds of milk, containing 318.2 pounds of fat." As a general thing, one ton of timothy hay and three tons of corn silage have about the same feeding value. It must be remembered, however, that an acre of corn will produce far more digestible food than an acre of hay. At the Pennsylvania station, a good average corn crop has produced from 1⅓ to 2¼ times as much food per acre as a good hay crop.

Injury to milk from silage fed cows in the past has been more or less a subject of comment. This argument against the silo is no longer worth considering. Today the choicest of milk is produced by herds fed silage. Condensed milk factories that formerly objected to milk from silage-fed herds, no longer object to this food. In fact, one of the largest condensed milk factories for years advocated that milk producers put up silage. The one great point is to feed soon after milking, to avoid any possible odor from the silage affecting the milk. With any fair degree of intelligence, there should be no difficulty in producing the best of milk.

TABLE OF SILO CAPACITIES AND REQUIREMENTS

Dimensions	Capacity in tons of silage	Acreage to fill; 15 tons to acre	Cows it will keep six months, 40 lbs. feed per day
10 x 20	28	2	7
12 x 20	40	3	11
12 x 24	50	3⅓	13
14 x 22	62	4⅓	17
14 x 24	67	4⅔	19
16 x 24	86	6	25
16 x 26	95	6¾	27
16 x 30	108	7½	31
18 x 28	120	8	33
20 x 24	135	9	36
20 x 30	170	12	46

PLANTING CORN FOR THE SILO

Most investigators and farmers assert that corn will produce the most feed as silage when so planted as to allow approximately one square foot of ground to each plant, the corn being planted in rows three to four feet apart, with plants six to eight inches apart in the row. When planted in this manner most of the stalks will mature good ears and the crop will then have the greatest feeding value both per acre and per ton. Other men claim that thick planting will produce more feed per acre and that it will be the equal, ton per ton, of silage made from mature corn. Prof. Haecker plants corn with a drill, stopping up all but the two holes at both ends and in the middle. This gives him a double row of corn every three feet. He asserts that not only more feed per acre may be secured but, ton for ton, silage made from this corn shows as much digestible matter as silage from the matured corn.—*Hoard's Dairyman.*

BUILDING UP A DAIRY HERD

By CHARLES L. HILL
Rosendale, Wisconsin

CHARLES L. HILL

WE SHOULD start any building on a good foundation. Too often those who begin dairy herd improvement are advised to start with high priced pure-bred stock; to do so is almost to guarantee a failure from the start. Pure-breds should be purchased only by those who have first succeeded with grades.

Any farmer who has a herd of cows is certain to have one or more as good for foundation animals as any he can buy, but only a careful system of feeding and weeding will determine which ones they are.

Only a small proportion of cows are fed so they can produce anywhere near their maximum yield. Before condemning a cow she should be fed for an entire year an abundance of a well balanced ration. Having done this you are ready to weed out the unprofitable cows. But this can be done intelligently only by careful weighing and testing the milk from each cow for an entire milking period.

While it will not be necessary to weigh the milk of every milking to get a record approximately correct as an estimate of the cow's yield, still any dairyman who has tried it will testify that the weighing of the milk of each individual cow every milking pays enormous returns for the time it takes to do it.

Every milker takes an interest and pride in keeping up the yield of the cows he milks. Such weighing will also often foretell any ailment or trouble with the cows, or call the owner's attention to any shortage of the feed when the cows show more than a normal shrinkage.

It does not take as long to weigh and record weight of milk as one would think. Ten seconds, twice a day, will be the average time required to weigh a cow's mess and record it on the sheet. This is equal to three cows a minute, or ten minutes a day for a herd of 30 cows.

While a 25-cent spring balance will do the work accurately enough, a regular milk scale made for this purpose and costing $2.50 to $3 will be found the cheapest in the long run. This scale is divided into pounds and tenths of pounds and weighs up to 30 pounds.

The owner who first weighs the milk of his individual cows for a year is in for a great surprise in their relative yields. Some cows that never gave a large daily yield, and therefore are not considered of the

best, will, because they are persistent milkers, be almost certain to lead the herd for the year.

TESTING THE MILK

While weighing the milk is the first great step in weeding out the poor cows, it is only one step. Once each month each cow's milk should be tested by the Babcock test. About the middle of the month, a small sample of the milk, from both morning and evening milkings should be placed in a pint fruit jar with closed top. This sample is best taken by using a small dipper made especially for the purpose, and holding an ounce or two, sample being dipped from the milk pail as soon as the milking is done. An inexpensive Babcock tester can be bought that will test two samples at a time and do the work as well as a larger and more expensive machine. In any herd of five cows or more I would advise the purchase of the best cast iron 12 bottle tester to be had. With the rules sent with every machine, whether large or small, any person of average intelligence can make an accurate test from the samples saved in the fruit jar. The weight of the milk given for the month, multiplied by the per cent of fat as shown by this test, will give the yield of butter-fat for the month for each cow and at the end of year the sum of the months' totals will give the yearly production of each cow.

As great a surprise awaits the owner who first tests his cows as when he first weighs their milk. Whatever the breed a difference of 2% will be found between the highest and lowest testing cows. Official yearly records of pure-bred cows show that the highest testing cow of each breed gives milk about twice as rich in butter-fat as the lowest testing cow of the same breed. While in a herd of grade cows no such wide variation can be expected, still surprises are always in store for those who first test their cows.

The yearly yield of milk or fat is not the final factor in determining which is the most profitable cow: some cows eat nearly twice as much as others. As a general rule a cow consumes food in proportion to her size, but great variations will be noted in individual cows. Having determined the best cows, the right foundation is made for developing a herd. But all cows have their off years in milk production, and allowance for a cow in her off year must be made. The per cent of fat in a cow's milk is however a very stable quantity, and little variation will be found from year to year.

There are now being organized in many states cow test associations. By joining an association a dairyman is enabled to have his individual cows tested at a cost of $1 each a year. While he can do it even cheaper himself, nevertheless, it is wise to join an association.

BUYING A BULL

The statement so often made, "The bull is half the herd," falls far short of the truth. The whole future success of the business depends on the bull. By far the best bull to buy is an old bull that has proven his

ability to sire good cows in some other herd. As a general rule a bull if well cared for should be good for service until he is 10 years old, and many bulls have been good sires up to 20 years old.

The next best way to get a bull is to get a young one whose maternal ancestors for many generations have made good yearly butter-fat records. The bull should be kept in a clean, light, well ventilated stall, and either exercised by working him on a tread power, or turned out into the strongly fenced yard, where he can have a barrel or stump that he can throw around.

The right bull crossed on the selected cows should work marked improvement at once and his two year old heifers should with their first calves produce nearly as much as their mothers did at maturity.

The largest yearly production from cows properly cared for, can be obtained from cows that calve in October and November, and the best calves to raise are those born at that time of the year.

It seldom pays to make veal of the bull calves. While they may pay fair returns for the milk they suck from their mothers, a cow will nearly always give enough more milk in the year, if the calf is taken away at once, to more than make up the difference.

Take the heifer calves that are to be raised away from their mothers when two to four days old. Put them out of sight and hearing of the mother, and let them go 15 to 18 hours before you try to feed them, as they will then be hungry enough to want food. It will pay for the first three or four weeks to feed them three times a day, using not over three pounds of new milk to a feed, and add enough hot water to bring the milk up to 100 degrees. With your fingers wet with milk coax the calf to put its nose into the milk in the pail.

Do not let the calf suck your fingers, but as soon as it gets started withdraw from mouth and hold them just over the nose. Continue the process till the calf drinks alone. Often the calf will learn the first time, and nearly always by the second or third feeding time. At this period of the calf's life it is very important that it should either be put in a small box stall by itself, or fastened up when fed its milk so that it will not acquire the habit of sucking other calves' ears, teats or navels. A little whole oats and bran mixed should be kept in a clean manger before it. It will learn to eat grain much earlier in life if a little of the mixture is put in its mouth right after it has had its milk, and while its mouth and nose are still wet. This also reduces the inclination of the calves to suck anything in sight.

RAISING THE CALVES

Keep the choicest hay available always within reach. Hay made of June grass or second crop clover is the best for this purpose. Alfalfa hay fed to very young calves is apt to keep their bowels too loose.

At two to four weeks old change gradually from new milk to skim-milk, fed if possible direct from the cream separator while still warm

with the animal heat. Scrupulous cleanliness of stalls, mangers and feed pails is the price of success in calf raising.

Increase the calf's ration of bran and oats up to the time when it will eat three or four pounds a day. Until the calf is eight or ten months old the whole oats are better for them than ground, but as soon as they begin to pass through the calf's stomach whole feed them ground.

Feed the calf skim-milk as long as it can be spared, even up to two years old. In any case feed it milk at least twice a day up to the time it can be turned to grass late the next spring.

Even if turned to grass continue the grain ration, and if milk is fed, the calf will make wonderful growth, but in this case keep the calf fastened up in stanchions, or tied with a halter, until the mouth and nose are dry, so it will not suck its companions.

Small amounts of corn silage will be good for the calf at all times. The second winter calves should be fed liberally of clover or alfalfa hay, corn silage, and a moderate grain ration but without anything tending to fatten. We want to develop a large capacity to eat roughage.

Breed so as to calve at 24 to 28 months of age. After five or six months in calf it will do no harm to begin to lay on fat so that by the time she calves she will be fat enough for beef. As she is dairy bred, and reared right, she will soon turn this fat in her body into butter-fat in the milk pail with profit to her owner.

Let her give milk a full year, the first milking period, thus calving the second time 14 to 15 months after the first time. This will help establish the habit of persistent milking.

If she was a spring born heifer have her drop her first calf in June after she is two years old, and the second one a year from the following September or October, thus giving her a long milking period, and at the same time making a fall cow of her.

From calfhood handle her kindly and especially after she is bred, rub her udder frequently; when she freshens there will be no "breaking her" to milk. When you do milk her the first time fasten her if possible in a stanchion next to a wall or partition where she cannot move, and proceed kindly to milk her whether she acts willing or not. All heifers should be trained to stand at right angles to the stanchions or stalls, and to permit the milker to pull her back to place, with his hand in front of right leg, grasping the left hock, thus teaching her at the start that she must stand as you wish. Milk her quietly and rapidly; nearly all cows give their maximum yield when milked quickly.

Remember your heifer is a mother, with all a mother's instincts. You will obtain her maximum production in such a measure as you make her think you are her friend, or even her calf.

Proceed to test her the first year so that you can be sure you have a good cow, or else that you selected the wrong bull for her father.

From first to last attention to details is the price of success.

DAIRY CATTLE IMPROVEMENT ASSOCIATIONS

By FRED W. MERRILL, *Advisory Expert*
Dairy Development Department
The De Laval Separator Company

FRED W. MERRILL

THE greatest and most permanent progress in dairying is made in those communities where the men who are behind the industry appreciate the value of pure breeding in dairy cattle. The use of the scrub and the grade sire is undoubtedly the source of discouragement and financial loss to hundreds and thousands of men who might have developed into progressive and successful dairymen had they recognized that the foundation of the dairy industry is the dairy cow, and that her ability to utilize farm crops and convert them into milk and butter-fat is dependent upon the breeding of her ancestry.

The dairy cow is the product of hundreds of years of careful selection and intelligent breeding. No man can continue in the dairy business successfully if he does not improve the quality of his herd by the use of pure-bred bulls; bulls whose ancestry shows that for at least six generations there has been a constant and increasing tendency to produce more milk and butter-fat.

A dairy bull differs from the beef bull in the purpose for which he has been bred. The aim of the breeders of dairy cattle has been to increase the production of milk and butter-fat among the individuals of the various breeds. To obtain this, the form or type of the animal had to be changed and made to correspond to the work the animal had to do. The reason why we have the dairy type so well established is because we have found more profitable milk production to accompany that type.

The dairyman, then, who expects to milk cows and raise his heifer calves, and thereby maintain his dairy herd, must have a dairy bull—one whose type has been estahlished and one which has been bred for milk production for hundreds of years.

Oftentimes men select a calf and save him for a bull because his dam was a good milk cow and pay no attention to the breeding on the sire's side. In fact, this is quite the rule and accounts for little progress in improving the dairy herd. Even though the dam is a fairly good cow, she is not able to impress the function of giving milk upon the calf strongly enough so that he, in turn, can transmit it to his progeny, for

the reason that milk production is a character by itself and comes to an animal only through a line of breeding for that purpose.

Avoid using a grade bull, or one with a scrub for one parent and a pure-bred for the other. Little progress can be made in this way.

A careful study of the following table will show any man what he might accomplish with his herd of common cows by using a bull of pure breeding. With the increase of purity of blood there is a corresponding increase in milk and butter-fat production.

DISAPPEARANCE OF UNIMPROVED BLOOD BY THE CONTINUOUS USE OF PURE BLOOD SIRES

Generations	Sires % of Purity	Dams % of Purity	% of Purity	% of Impurity
1st cross.....	100%	0%	50% or $\frac{1}{2}$	50% or $\frac{1}{2}$
2nd cross.....	100%	50%	75% or $\frac{3}{4}$	25% or $\frac{1}{4}$
3rd cross.....	100%	75%	87.5% or $\frac{7}{8}$	12.5% or $\frac{1}{8}$
4th cross.....	100%	87.5%	93.75% or $\frac{15}{16}$	6.25% or $\frac{1}{16}$
5th cross.....	100%	93.75%	96.87% or $\frac{31}{32}$	3.13% or $\frac{1}{32}$
6th cross.....	100%	96.87%	98.44% or $\frac{63}{64}$	1.56% or $\frac{1}{64}$

The purchase of a pure-bred bull by the small farmer entails an expense that is oftentimes not justifiable, but several men whose available cash is limited can co-operate and organize a *Bull Association.*

A bull association is an organization maintained by farmers for the purchase, use and interchange of bulls. The farmers in such an organization should own collectively about 200 cows.

The community should be so divided that the cows are evenly distributed into groups or blocks with 50 cows in each block and a pure-bred, bull, representing the breed chosen, placed with each block.

The bull can be retained in a block for a period of two years, when an interchange is made; bull from block one going to block two; bull from block two to block three; bull from block three to block four, and bull from block four to block one.

This interchange of bulls provides that each breeder in the association can have the continued use of pure-bred bulls during a period of eight years for the small sum of $25 to $50.

Bull associations can be financed in two ways:

First.—With 200 cows an assessment of $2.50 per cow can be levied. This would amount to $500 and four splendid bulls of any dairy breed can be bought for this amount. The advantage of this plan is that the breeder pays only for the number of cows he owns.

Second.—Shares of stock may be sold at so much per share and enough shares sold to secure money sufficient to purchase the bulls. The disadvantages in this plan are readily seen, in that the owner of two cows pays as much as the man with twenty.

A service fee of $1.00 per cow should be maintained, in order to defray the expenses of the association, and also to provide a sinking fund

to be used in an emergency, as may arise when a bull dies or becomes injured.

The care and management of the bulls are provided for in the by-laws of the association.

To begin with, one breed of cattle should be selected and the wishes of the majority must prevail in selecting the breed. There is so little difference in the real value of the breeds that there is no chance for a mistake to be made if Jerseys, Guernseys, Holsteins, or Ayrshires be chosen.

Stick to one breed, however, and in a short time, five to eight years, the community will be known because of the quality of its stock and the progressiveness of its people. The influence of pure-bred bulls on the progeny of common cows is shown by the following actual results obtained in South Dakota:

	Lbs. Milk	Lbs. Fat	% Fat
DAM (a common Hereford Cow) produced in one year	3209.6	135.79	4.2
DAUGHTER (Sired by pure-bred Holstein) produced in one year	5895.4	223.23	3.8
INCREASE OVER DAM	2685.8	87.44	
DAM (A common Shorthorn Cow) produced in one year	4090.7	175.05	4.3
DAUGHTER (Sired by pure-bred Holstein) produced in one year	6090.2	222.88	3.7
INCREASE OVER DAM	1999.5	47.83	

These records were made during 237 days, the lactation period of the two common cows; but the heifers persisted in giving milk for the full year, or 365 days, and their yearly record was as follows:

	Pounds Milk	Pounds Fat
First daughter produced.....	8569.9	310.71
Second daughter produced.....	7228.5	271.89

SO. DAK. EXP. STATION.
C. Larsen, Professor in Dairy Husbandry.

The Ohio Experiment Station gave this information in Circular 135:

"One Holstein-Friesian Bull, used at the Ohio Experiment Station, increased the average production of his seven daughters 1299 pounds of milk and 40 pounds of butter-fat per year above that of the dams. Forty pounds of fat per year for six years by each of seven cows, would be 1680 pounds of fat; 1680 pounds at 30c per pound equals $504. This animal cost $100 when a calf."

A cow-testing organization in Utah revealed the fact that 495 cows produced on the average 254 pounds of fat, which is 90 pounds higher than the average for the county. This is accounted for by the fact that pure-bred bulls were used by members of the association.

One of the best proofs we have of the value of the use of pure-bred bulls is in the price we are paying for grade heifers of all breeds in those sections of country where pure-bred bulls have been in use for some time.

Grade heifers, 12 to 18 months old, will sell for $55 to $75 per head; 18 to 24 months old, from $70 to $100 per head; cows two, three and four years old are worth from $100 to $175 a head.

At Litchfield, Michigan, there is an organization known as the "Jersey Cattle Association." Not only do they use pure-bred bulls, but the majority of them have a number of pure-bred cows. This community, heretofore stocked with mixed, grade and cross-bred cattle, is likely soon to be known as a "Jersey Breeding Center."

Waukesha and Jefferson Counties, Wisconsin, are known all over the United States and in Canada, Mexico, Japan and Australia because of their dairy cattle. People go there from these places to buy grade cattle because pure-bred bulls have been in use among the majority of the farmers organized into breeding communities.

Whatever the pure-bred bull association has done for communities in Wisconsin, Minnesota, Ohio, Iowa, Utah and other states, it will do for any community whose men have that spirit of aggressive co-operation sufficient to start improvement along agricultural lines and keep it going.

AVERAGE PERIOD OF GESTATION

The period of gestation in animals varies considerably but the following is an average period based on a long series of observations:

Elephant	2 years
Camel	11—12 months
Ass	12 "
Mare	11 "
Cow	9 "
Sheep	5 "
Goat	5 "
Pig	3½ "
Bitch	9 weeks
Cat	8 "
Guinea Pig	65 days
Rabbit	30 "

AVERAGE PERIOD OF INCUBATION

Chicken	20—22 days
Geese	28—34 "
Ducks	28 "
Turkeys	27—29 "
Guinea Fowls	28 "
Pheasants	25 "
Ostriches	40—42 "

WEIGHTS OF EVERY-DAY THINGS

A barrel of flour weighs	190 pounds
A barrel of salt weighs	280 "
A barrel of beef weighs	200 "
A barrel of pork weighs	200 "
A barrel of fish weighs	200 "
A keg of powder equals	25 "
Anthracite coal, broken—cubic foot averages	54 "
A ton loose occupies	40—43 cubic feet
Bituminous coal, broken—cubic foot averages	40 pounds
A ton loose occupies	40—48 cubic feet
Cement (Hydraulic) Rosendale, weight per bushel	70 pounds
Cement (Hydraulic) Louisville, weight per bushel	62 "
Cement (Hydraulic) Portland, weight per bushel	96 "
Gypsum, ground, weight per bushel	70 "
Lime, loose, weight per bushel	70 "
Sand at 98 lbs. per cu. foot per bushel	122½ "
18.29 bushel equals a ton; 1.181 tons	cubic yard
Lime, well shaken, weight per bushel	80 pounds

VENTILATION OF DAIRY BARNS

By THE LATE F. H. KING

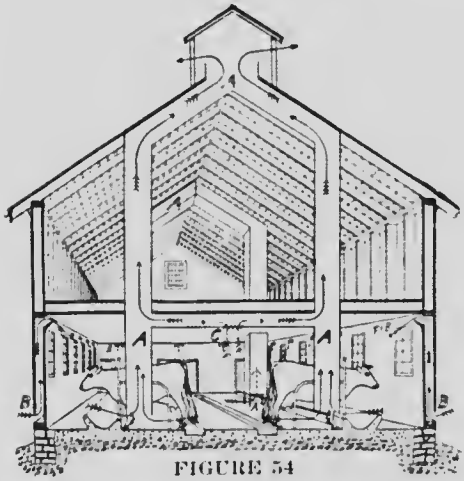


FIGURE 54

Showing a pair of U-shaped outtakes adapted to stables of 60 to 80 cows. A A A A are the outtakes; B B B B are the intakes; C, ceiling register in a cross-arm joining the two sides of the outtake, to be opened when needed for cooling the stable and re-luforcing the draft. (From "Ventilation for Dwellings, Rural Schools and Stables", by F. H. King.)

IF on going into a stable in the morning, in comparatively mild weather, dampness is evident on the walls and ceilings, this is a pretty clear indication that a sufficient amount of air is not passing through. Every cow in your stable above 1000 pounds in weight, throws into the air, from lungs and skin, during each 24 hours, an average of more than 10 pounds of moisture. If you do not have air movement sufficient to contain this moisture as it passes through the stable, it must condense on the walls.

Oxygen of the air is as indispensable a part of the food of the cows as is the fodder and grain you feed them. The amount of air necessary to supply the oxygen is really very large, and equals in weight more than 2.5 times the feed and water combined, even where each cow breathes perfectly fresh air. Outtakes and intakes for horses and cows should provide not less than 30 square inches per head when the outtake has a height of 30 feet.

A ventilating flue 2 by 2 feet, through which the air moves at the rate of a little more than three miles per hour, gives sufficient air for 20 cows. The walls of the

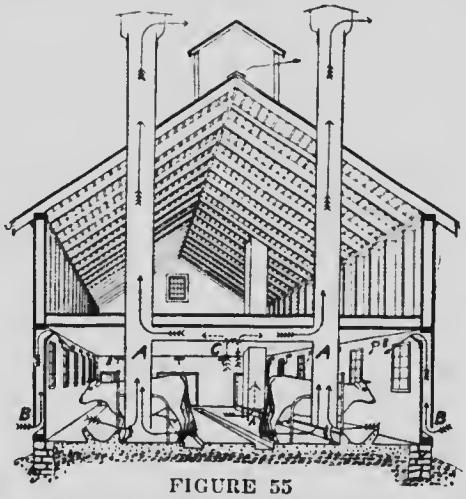


FIGURE 55

Showing single straight-away outtakes which avoid all angles and render possible the strongest draft. A A are the two outtakes; B B are the intakes; C, a ceiling register in the cross-arm joining the two sides of the outtake. (From "Ventilation for Dwellings, Rural Schools and Stables", by F. H. King.)

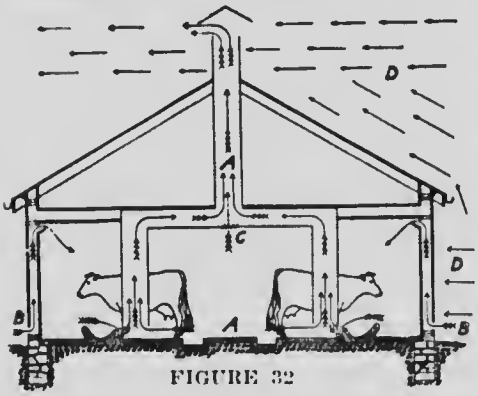


FIGURE 32

Section of dairy stable showing the action of the wind at D D, forcing air into the stable by direct pressure at B B and out of it by suction at the top of the ventilating shaft A A. At C is a ceiling register in the ventilating shaft, to be opened only when the stable is too warm or when the draft is too feeble. (From "Ventilation for Dwellings, Rural Schools and Stables", by F. H. King.)

ventilating shaft must be air-tight from top to bottom except where it is intended that air should enter; of the same diameter throughout; as nearly straight as possible; and should rise above the level of the highest part of the roof where the wind can have free sweep across its top. The longer the ventilating shaft, just as in the case of the chimney, the stronger the draft. I would urge the use of galvanized iron for the ventilating shaft, so as to ensure permanently air-tight walls. It is not sufficiently appreciated that the ventilating flues should be as few as practicable, and *large*, while the fresh air intakes should be as many as practicable, on all sides of the stable if possible, and *small*. As the air is fouled, deprived of its oxygen, and breathed toward the floor; as the coldest air is at the floor; and as all air must be inspired from near the floor, the exhaust should be continuously and as fully as possible from the floor, because then, not only will the fouled air be mechanically withdrawn from this level, but the warmed and pure air will be forced to the floor where it is used.

Air cannot flow continuously from the stable unless an equal volume of air flows into it, and so, no matter how many ventilating flues you have, there can be no ventilation without intakes. Perfect ventilation and a warm stable can only be had with a thoroughly tight ceiling. By making the fresh air intakes open at the ceiling on the inside, and near the level of the stable floor on the outside, it becomes impossible for the warm air of the stable to pass out at the ceiling opening as it would do if the outside opening were on a level with the inside opening.

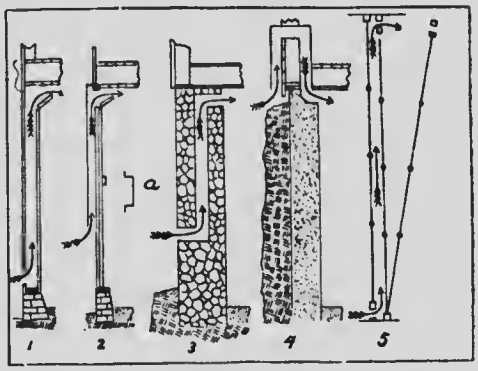


FIGURE 50

Several types of intakes. 1, utilizes the space between studding; 2, made of galvanized iron shaped as at A; 3, constructed in masonry wall; 4, for basement stable already built; 5, utilizing space between double windows. (From "Ventilation for Dwellings, Rural Schools and Stables", by F. H. King.)

CARE OF CREAM ON THE FARM

By J. D. JARVIS, *Advisory Expert*
Dairy Development Department
The De Laval Separator Company

J. D. JARVIS

A PERSON is interested in an article or subject only to the extent that the article or subject will benefit him. The care of cream on the farm will interest you only to the extent of the price you will receive for the butter-fat in your cream. The price you receive for your cream is in the long run determined by the price your creamery receives for its butter. The price the creamery receives for its butter depends upon the quality. It stands to reason that extra quality butter cannot be made from poor quality cream. Your cream buyer knows this as well as you do. So beware of the cream buyer that tells you that old, sour, rotten cream is worth as much as clean, sweet-flavored cream.

Today competition in many localities is keen among the cream buyers and they force one another to accept anything that looks like cream. When the cream buyer pays your neighbor just as much per pound butter-fat for a can of old, sour, rotten, abused cream as he does you for a can of good, clean-flavored, properly kept sweet cream he is paying the neighbor for something he is not getting and if there is such a thing as misreading the Babcock butter-fat test, the chances are that it will be the can of your cream that will suffer.

According to the Dairy Division of the United States Department of Agriculture, there is manufactured annually over 627,000,000 pounds of creamery butter and 995,000,000 pounds of farm butter, or a total of over 1,500,000,000 pounds of butter. From reliable information only 15% of this butter grades as "extras" or best quality butter, while the remaining 85% grades from "firsts" to "packing stock", the poorer qualities of butter.

There is an average range in the market price between "extras" and "seconds" of 4 cents per pound and between "seconds" and "packing stock" of 8 cents per pound. Taking the lowest range, 4 cents per pound, on 1,500,000,000 pounds of butter, the loss due to neglect or ignorance would be $60,000,000 as it is safe to assume that the butter-fat in the "packing stock" butter was as pure, clean and wholesome as the butter-fat in the "extra" quality butter when it was drawn from the cow at the time of milking, and that this difference in quality and

price is due to neglect or lack of intelligence in taking proper care of the butter-fat from time of milking until the butter was consumed.

This large sum of money, if saved, would benefit the farmer, creamery operator, and the consuming public, because more daily cash money placed into the trade channels will help business in general. For this reason, everybody should be interested in better quality cream and better quality butter.

CLEANLINESS

The care of cream begins the moment milk is drawn from the udder of the cow and since milk is one of the most delicate and perishable human foods, it is of the utmost importance that it should be produced under proper sanitation and cleanliness. The cows should be kept clean and healthy; they should receive wholesome feed and kind, gentle treatment. The milkers and all who handle the milk or cream should appreciate cleanliness and thoroughly clean the stable and all dairy utensils every time they are used.

A good housewife does not let the supper dishes stand overnight and use them again for breakfast without first washing them. And still, the small amount of food particles left on the supper dishes is far less repulsive and objectionable than the dirty, filthy, often bloody, pus matter that collects in the separator bowl.

The tinware and the separator bowl should be washed as follows: First, they should be rinsed in luke-warm water to remove all milk particles; then washed in warm water to which a good washing powder has been added; next, they should be scalded in boiling water; after this, they should be inverted and allowed to dry. Tinware when not in use should be placed in pure air and sunlight because these agencies will destroy undesirable germs.

Milk and cream absorb odors like a dry sponge absorbs water. Mainly for this reason, do not feed the cows strong-flavored feeds, like silage, cabbage, turnips, etc., just before or at milking time. Do not keep cream in musty cellars or near strong smelling vegetables, or the cooking odors of the kitchen. Do not let the men store their felt boots, overalls, old harness or any strong-smelling material in the milk house.

RICH CREAM

Rich cream will keep better than thin cream, just as thin cream will keep sweet longer than milk. Rich cream is also more profitable to the patron and to the creamery, hence they should agree upon a cream testing between 30 and 45 per cent butter-fat. (See booklet on "Advantages of Richer Cream," which may be had upon application to The De Laval Separator Co.)

COLD TEMPERATURE

Thirty years' business with farmers and farmers' wives has demonstrated that, as a rule, they are willing to do their best. The principal difficulty is lack of facilities or not realizing just what is needed. In

order to throw some light on the subject, "Cold Temperature," and to demonstrate to the creamery operator, large or small, as well as to the farmer, just what can be done, the De Laval Dairy Development Department undertook, in 1913, an extensive experiment on controlling the temperature of cream on the farm by means of well water and a properly insulated tank or cooler.

Two samples of milk were kept at 50 and 70 degrees respectively, and after a period of twenty-four hours there were in the milk held at 50 degrees five bacteria for every one at the beginning, while in the milk held at 70 degrees there were seven hundred and fifty bacteria for every one at the beginning.

It has been found that bacterial development is very slow below 60 degrees temperature. In most states the temperature of well water is below 60 degrees, hence the thought suggested itself that if the cream were kept at the temperature of the well water, nine-tenths of the poor quality cream troubles would be over.

Some farmers do keep their cream in cans hung in wells or cisterns, but there is a chance for dirt, dust and foreign materials to fall into it, and besides the cream absorbs the stale, dank odor of the air which is in the bottom of the well.

The thermos bottle and fireless cooker have demonstrated that keeping cold water cold or hot water hot is merely a matter of insulation. The idea was conceived, therefore, that in a tank perfectly insulated on top, bottom and sides and connected up so that all the water pumped for stock purposes would flow through it, the water always would be of practically the temperature of well water, and a can of cream kept in it would be cold enough to keep it in good condition for several days.

All the available data relating to the heat-resisting properties of wood, various metals, felt, charcoal, sawdust, cork, paper, vacuum and various patented materials were considered and the manufacturers of thermos bottles and fireless cookers were consulted. A large number of sample tanks were made and carefully tested. A ten-gallon can of cream kept in one of these tanks (see illustration) in a room averaging 100 degrees in daytime and 85 degrees at night had a temperature of 59½ degrees at the end of the week.

In order to prevent the mixing of warm cream with cold cream (cream of older separation) a small two-gallon can, shown on top of tank, is used for the warm cream and then lowered into the tank through the small square opening in the back. The can is held down by a convenient latch which engages the square ends of the handle. The cream stirrer shown across the top of the small can can be left in the small can so the cream may be stirred at frequent intervals until thoroughly cooled. The lid to the compartment for the small can is ventilated, thus allowing the animal odors and vapors to escape. Just before separation the cream in the small can is emptied into the can in the large compartment. It is then washed and ready for the next separation.

The tank is intended to be set outdoors, where the air is fresh and pure, and between the well and the stock tank, so all the water pumped daily for stock purposes flows through it. The insulation is so perfect that it is not necessary to have the tank under a roof. Even when it stands in the direct rays of the sun in the hottest summer or in sharp cold winds of the coldest winter, the water in it will be within a few degrees of the temperature of the well water, if the water required for six horses or cows is pumped through it.

During the spring of 1914 fifty of these tanks were constructed and loaned to patrons of creameries in the North and South Dakotas, Kansas and Oklahoma. They were put out under the supervision of De Laval Advisory Experts. The results were very gratifying. Many farmers, who before they used these tanks were delivering the poorest cream, immediately began furnishing the best cream. Butter-makers were astonished and could hardly believe their own eyes. In one case cream was kept perfectly sweet for over a period of one week during very hot weather. These tanks also gave good service where used during the winter, because if they were able to keep out heat, they were likewise able to keep out cold.

The experiment had the desired result. It attracted attention of creamerymen and cream producers all over the country and the American Association of Creamery Butter Manufacturers and the Dairy Schools took up this movement of better quality cream by recommending the use of similar tanks. It is now possible for those who desire to purchase similar cream tanks, to obtain by writing either to the Dairy Supply Houses, the Secretary of the American Association of Creamery Butter Manufacturers, Chicago, Ill., or to your local creamery.

The De Laval Separator Company did not intend to manufacture or market cream tanks. This practical experiment was purely for educational purposes and the sole thought was to show the way for improving the quality by taking better care of the cream on the farm.

THE MOST SATISFACTORY TANK FOR KEEPING CREAM COOL

WHEN COWS ARE DUE TO FRESHEN

By F. H. SCRIBNER
Rosendale, Wisconsin

F. H. SCRIBNER

PROBABLY as much importance hinges upon the freshening period as any other factor in keeping and developing dairy cows. The basis of modern dairying is the maternity of the cow and success in this art depends upon the reasonable consideration of this important fact. While we consider feed the principal means of bringing about maximum results, yet the best of results in milk production, or in use of feed stuffs, cannot be obtained unless some consideration has been made of the freshening period.

A period of rest is an absolute necessity. A special purpose dairy cow directs all her energies toward digesting and assimilating feed for milk production, with the result that a large proportion of body tissue has been exhausted, or worn out. Sufficient time should be allowed between drying off and freshening time that the body may recuperate, and that some extra nourishment may be given the unborn calf at this particular period when greatest development takes place.

Building up worn-out body tissue is not the only consideration that creates a need of fixing up, for we find that the making of milk requires large amounts of nervous energy, and that these nerve centers need a relaxation from the strenuous work of the year, the same as a person doing severe mental labor requires a vacation even more than the person doing merely heavy physical labor. Six weeks of absolute rest from milk giving is none too much.

A cow that has not had some preparation for this important period is handicapped for a successful year's work. We often hear the expression, "My cows are dry now, and we are not feeding." I believe feed was never put to better use than after the cow is dried off. Feed liberally at this time, not with heating and constipating feeds, but feeds that will keep the digestion perfect, and yet be nourishing enough to build tissue and furnish proper necessities for the unborn calf. A straw stack cow never made a world's record.

A memoranda book in the barn giving dates when each cow is due to freshen is of utmost importance, for without this knowledge, cows may be milked either too long or not long enough.

The cow should freshen in a box stall, which has been thoroughly cleaned and disinfected. She should occupy this stall some time in

advance, that she may become acquainted and used to her new surroundings, avoiding draughts, excitement, and cold drinks of water, all of which have a tendency to bring on milk fever, as well as udder troubles. A dose of salts and hot bran mash after calving, aid digestion and carry away any feverish condition. The udder should not be all emptied out for at least two days, simply relieving those quarters the calf has left.

Increase the feed very gradually until such time as the cow appears in a normal condition, when she may be given a full feed.

BEST COWS OF THE LEADING DAIRY BREEDS

JERSEYS

Name of Cow	Milk Pounds	Butter-Fat Pounds
Sophie 19th of Hood Farm	17,557	999
Spermfield Owl's Eva	16,457	993
Eminent's Bess	18,782	962
Jacoba Irene	17,253	952
Olympia's Fern	16,147	937
Lass 66th of Hood Farm	17,793	910
Lass 38th of Hood Farm	15,284	890
Teneslа's Owl's Rose	17,056	863
Lass 40th of Hood Farm	18,661	854
Olga 4th Pride	16,275	851
Adelaide of Beechlands	15,572	849

HOLSTEIN-FRIESIAN

Name of Cow	Milk Pounds	Butter-Fat Pounds
Duchess Skylark Ormsby	27,761.7	1,205.091
Finderne Pride Johanna Rue	28,403.7	1,176.47
Finderne Hollugen Fayne	24,612.8	1,116.05
Banostine Belle De Kol	27,404.4	1,058.34
Pontiac Clothilde De Kol. 2d	25,318.0	1,017.28
High-lawn Hartog De Kol	25,592.5	998.34
Colantha 4th's Johanna	27,432.5	998.26
Lothian Maggie De Kol	27,967.6	990.80
Maple Crest Pontiac Flora Hartog	25,106.3	986.11
Crown Pontiac Josey	28,752.3	982.23
Maple Crest Pontiac Spotted Annie	21,393.0	981.02

GUERNSEYS

Name of Cow	Milk Pounds	Butter-Fat Pounds
Murne Cowan	24,008.0	1098.18
May Rilma	19,673.0	1073.41
Spotswood Daisy Pearl	18,602.0	957.38
Julie of the Chene	17,661.0	953.53
Imp. Daisy Moon II	18,019.4	928.39
Miranda of Mapleton	16,630.7	927.16
Dairymaid of Pinehurst	17,285.3	910.67
Dolly Dimple	18,458.8	906.89
Imp. Beauty of Park Farm	14,686.9	898.82
Imp. Queen Regent IV	15,862.5	889.57
Johanna Chene 30889	16,186.7	863.36

AYRSHIRES

Name of Cow	Milk Pounds	Butter-Fat Pounds
Garclaugh May Mischief	25,323.7	897.87
Auchenbrain Brown Kate 4th	23,022	918.
Garclaugh Spottie	22,589	816.25
Lily of Willowmoor	22,106	889.
Auchenbrain Yellow Kate 3d	21,123	888.33
Gerranton Dora 2d	21,023	805.
Jean Armour	20,174	775.
Rena Ross 2d	18,849	713.56
Netherall Browning 9th	18,110	821.
Keepsake 2d	17,410	711.27
Nether Craig Spicy Queen	17,074	692.69

TESTING DAIRY COWS

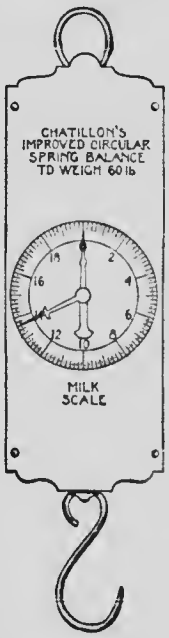
By PROF. G. H. BENKENDORF

Department of Dairy Husbandry
Wisconsin College of Agriculture

G. H. BENKENDORF

ON JULY 1, 1915, there was a total of 211 cow testing associations in the United States. These associations are voluntarily maintained by the farmers themselves. Farmers have become firmly convinced that they can make more money if they "weed" out of their herds those cows that do not pay for their keep.

Past experience of these associations has shown that about 25% of the cows tested are sold by the farmers before the year's work is over because they have been proven to be unprofitable. These associations each have a membership of approximately 30 dairymen who own about 450 to 500 cows. They employ a young man who goes from farm to farm, spending a day at each place. He weighs the milk from each cow in the evening and takes a sample of the same. Next morning he again weighs the milk and takes another sample. The composite samples taken should be proportionate to the amount of milk given by the cow. He then tests the composite samples. Multiplying the combined weights of the evening and morning milk by the tests gives him the amount of fat produced by the cow per day; multiplying this by the number of days in the month will indicate the production of the cow during the month.



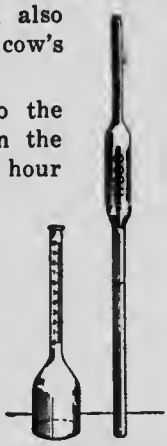
MILK SCALE

Where a farmer is so situated that he cannot join a cow testing association, he need not be discouraged, for it is entirely possible for him to do the work himself. In fact, there are thousands of dairymen who regularly test their own cows. The apparatus used is cheap and can be purchased from any dairy supply house in any part of the country. All that is needed is a milk scale, a Babcock tester with glassware, a sample dipper, some sample bottles, and a properly ruled note book.

It is only a matter of a moment or two to obtain the weight of each cow's milking and record the same in a note book or milk sheet kept near the scale for that purpose. The milker now takes a sample from the bucket by means of a sample dipper and transfers it to

DR. BABCOCK, INVENTOR OF THE BABCOCK TEST

a four or six ounce sample bottle, properly labeled to prevent error. In view of the fact that the cream rises very rapidly in milk, it is always advisable to pour the milk from one bucket to another before sampling. At the next milking the same procedure is followed, and the sample is added to the sample taken at the previous milking. In this way the dairyman will know how many pounds each cow produced that day, and he will also have a composite sample of each cow's milk.



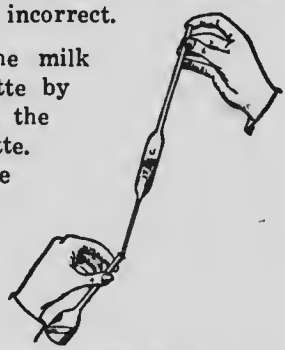
PIPETTE AND TEST BOTTLE

At the milking previous to the one in which a sample is taken the cow must be milked dry, and the hour of milking must be observed so that the milking next day will be at the same hour. If this point is not watched carefully, it is plainly evident that a cow may be given credit for only 23 hours' work whereas she works 24 hours; or she may be producing milk for 25 hours and having it entered on the books as 24 hours' work. In either case the dairyman would be committing the unpardonable sin—fooling himself. It therefore is very important for a farmer to find out whether the cows keep him or whether he keeps the cows.

DETAILS OF MAKING THE BABCOCK TEST

Sampling.—The most important part of the work consists in taking the sample properly. Before the milk is drawn into the pipette, it should be poured back and forth several times especially if any cream has come to the surface or adheres to the side of the sample bottle. If these precautions are not observed the test is bound to be incorrect.

Filling the Pipette.—Immediately after the milk is mixed it should be drawn up into the pipette by sucking with the mouth until the milk passes the mark on the stem above the bulb of the pipette. The forefinger should be placed quickly over the end of the pipette, and the milk should be allowed to escape from the pipette drop by drop until the mark on the stem is reached. It is an easy matter to maintain the proper height in the pipette by exerting a little pressure with the forefinger. By seeing that the forefinger is dry and by practicing a little, a beginner will be surprised to see how rapidly he will become proficient in the use of a pipette.



SHOWING PROPER WAY TO TRANSFER MILK FROM PIPETTE TO TEST BOTTLE

Transferring the Milk to the Test Bottle.—It is an easy matter to transfer the milk from the pipette to the test bottle by inclining the milk test bottle and placing the end of the pipette into the top of the neck of the test bottle. The speed with which the milk flows into the bottle can be regulated by the forefinger. If the milk is directed to flow along the lower side of the neck of the inclined bottle it will not be difficult for the air within the bottle to escape. There is always a drop at the tip of the pipette which should be gently blown into the test bottle.

Adding the Acid.—The acid used for making the Babcock test is the ordinary commercial sulfuric acid. It is usually obtainable at a drug store, but can be easily secured at almost any creamery or cheese factory. Care must be exercised so that it does not come into contact with the hands or clothing. If such an accident should happen, the acid should be washed off immediately by using plenty of cold water. If it gets on the clothing, the washing should be followed by an application of dilute ammonia. The acid bottle should be kept corked to prevent its getting weak, and *should also be kept away from children.*

The acid measure should be filled to the mark, and the acid should then be slowly transferred into the milk test bottle. If the acid is allowed to flow along the lower side of the neck of the test bottle, the air will escape. It is better to hold the bottle by the neck while the acid is being poured into it rather than to hold it by the bulb for the bottle will rapidly heat up when it is filled with the acid.

Mixing the Acid and Milk.—If one holds the milk test bottle by the neck in a slanting position it is an easy matter to mix the acid and the milk. It should be done with a rotary motion and *not with short jerks.* The rotary motion should continue until the milk and acid are thoroughly mixed and all the curd dissolved. The mixture will get very warm and will soon become black.

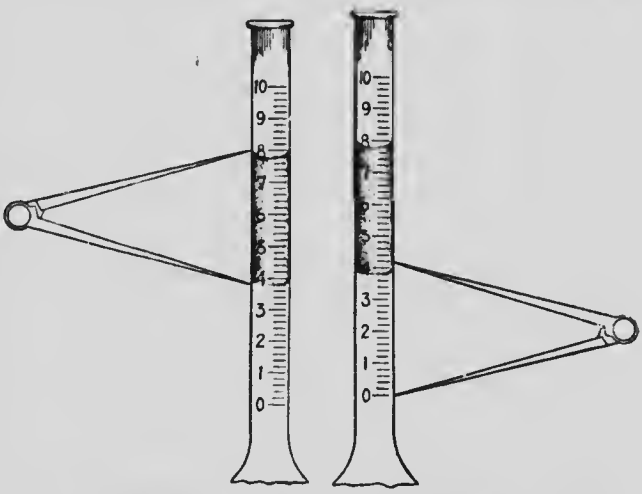
Whirling and Filling the Bottles.—The test bottles should then be placed in the tester opposite each other in order that the machine may run smoothly. If the bottles are not in "balance" the machine will vibrate badly and may even cause serious trouble. The speed at which the handle should be turned is usually indicated on the machine. This speed should be maintained for fully five minutes. The bottles should then be allowed gradually to come to a stop. All efforts to stop the machine suddenly should be discouraged. The bottles should then be filled to the neck with clean, hot soft water. This can readily be done with a pipette or acid measure. Then the bottles should be whirled a second time for a period of two minutes. After the machine has been stopped more hot soft water should be added. The purpose of the second filling is to wash the fat free of any curd or sediment that may be mixed with it and also to bring all the fat well up into the graduated part of the neck of the bottle. A third whirling at full speed for two minutes will bring the fat into the neck so that it can be read.

A word of precaution at this time may not be out of place. *Only*

enclosed testers should be used, and care should be exercised that the cover is not removed while the bottles are in motion.

Reading the Fat Column.—After the bottles have been whirled, they should be placed in water having a temperature of 120 to 140 degrees F. The reason for this is that the bottles are so calibrated that only correct tests can be made when the fat in the neck of the bottles has this temperature. For this reason the fat column should be submerged beneath the water and allowed to remain there until it has had time to adjust itself to that temperature. This is particularly important where hand testers are employed.

A fat column can be read very readily with the aid of a pair of dividers. The legs of the dividers are spread so that one of them rests on the highest point while the other rests on the lowest point of the fat column. If now, the dividers remaining unchanged, the lower leg is placed at the zero mark, the upper point will indicate the correct reading of the test. It must be remembered that the extremes of the fat column are read. Another way, but not quite so reliable, is to read the position of the lower part of the fat column and subtract this reading from the upper reading of the fat column. For example, if the lower reading is 1.6, and the upper reading is 5.4, the test of the milk is 5.4 less 1.6, or 3.8%.



THE DIVIDERS IN THE FIRST POSITION FOR READING THE TEST

THE DIVIDERS IN THE SECOND POSITION FOR READING THE TEST

Emptying the Waste.—As the acid used is very strong, special effort should be taken to see that the waste from the test bottles is well taken care of. It is best to empty the bottles into earthen jars and wash the bottles with weak alkali water and then with clean water. The waste acid should be emptied where it will not do any injury.

TESTING CREAM

Owing to the rapid development of the hand separator system a very large part of the milk now produced is separated on farms. The advantages of this system appeal to dairymen who would rather market

cream than milk. The Babcock test offers a simple method for the determination of fat in cream. The same machine that is used for testing milk can also be used for testing cream. The bottles, however, must be especially constructed as the necks must have a larger capacity. In addition, some accurate and simple scale for weighing the sample is necessary. Cream scales and cream test bottles can be purchased at any dairy supply house.

Owing to the inaccuracy of testing cream when measured by a pipette most states have passed laws making it illegal to test cream by this method and requiring that cream must be sampled by weight. Nine grams are now generally used. After the nine grams of cream have been weighed into the cream bottle, sufficient sulfuric acid is added to the same in small portions until the mixture becomes a chocolate brown color. It is then placed in the machine and the test completed as if it were milk.

TESTING SKIM-MILK

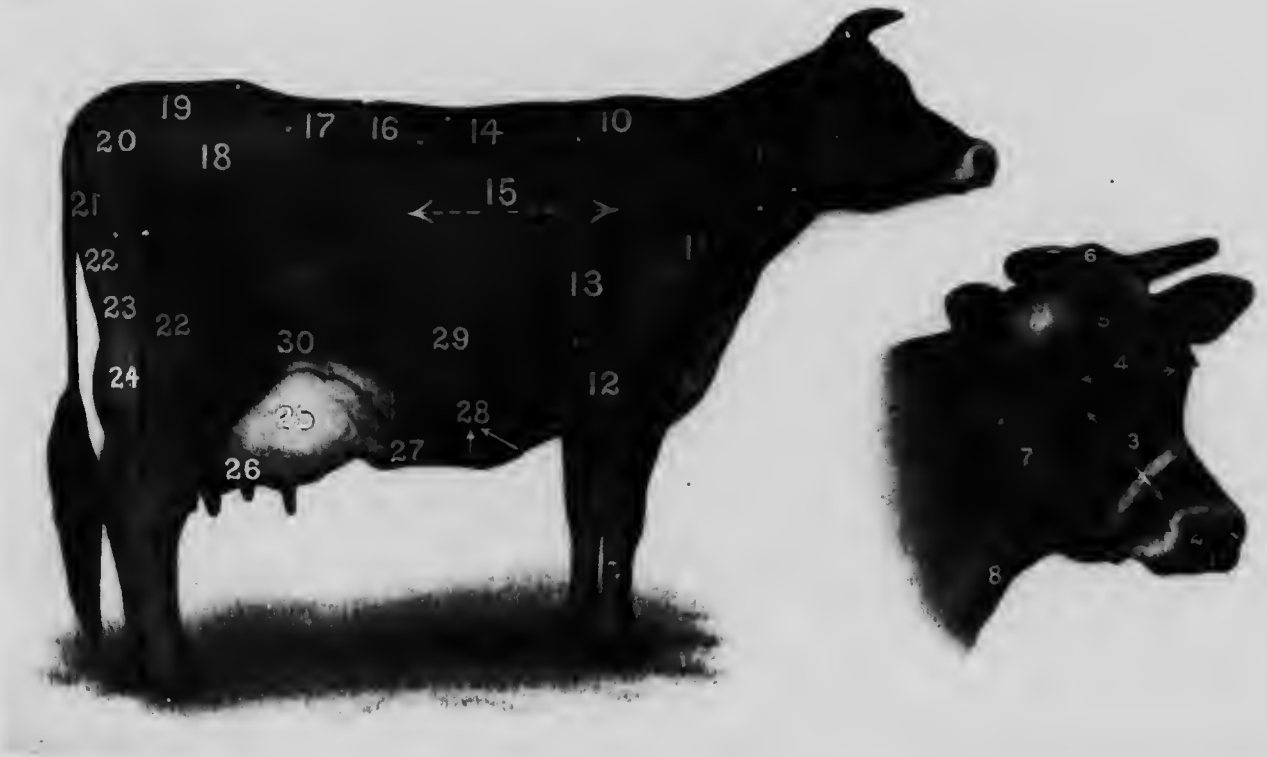
It is needless to state that the skim-milk from a hand separator should be regularly tested to determine whether the separator is doing efficient work. In order that skim-milk may be tested satisfactorily, it is necessary, as in the care of milk and cream, to get a fair sample. This can be done only by getting a large sample from the separator at various times of operation—at the beginning, during the run, and at the end. If possible, it would be better to collect the entire lot of milk in various cans and pour the lot back and forth. Then get a fair sample and test. Care must be exercised that a full pipetteful is taken. Skim-milk often contains so much foam that some of this foam may get into the pipette. For that reason the skim-milk really should be cooled and allowed to stand for the air to escape.

Owing to the small amount of fat in the neck, skim-milk can be tested only in a specially constructed test bottle. It is tested much the same way as milk except that about 20 cubic centimeters of acid should be used and the tester should be whirled at full speed for at least six or seven minutes. One filling and an additional whirling of two or three minutes are sufficient. If possible the tester should be kept hot while the test is being made.

AVERAGE COMPOSITION OF MILK OF DIFFERENT BREEDS

(From comparison of breeds at the N. Y. Agricultural Experiment Station)

No. Analyses	Water Per Ct.	Total Solids Per Ct.	Solids not Fats Per Ct.	Fat Per Ct.	Casein Per Ct.	Milk Sugar Per Ct.	Ash Per Ct.	Nitrogen Per Ct.	Daily Milk Yield Lbs.
				AYRSHIRE					
252	86.95	13.06	9.35	3.57	3.43	5.33	0.698	0.543	18.40
				DEVON					
72	86.26	13.77	9.60	3.70	4.15	5.07	.760	.595	12.65
				GUERNSEY					
112	85.39	14.60	9.47	5.12	3.61	5.11	.753	.570	16.00
				HOLSTEIN FRIESIAN					
132	87.62	12.39	9.07	3.46	3.39	4.84	.735	.540	22.65
				JERSEY					
238	84.60	15.40	9.80	5.61	3.91	5.15	.743	.618	14.07



1. Mouth. 2. Nostril. 3. Length from eye to nose. 4. Breadth between eyes. 5. Forehead. 6. Poll. 7. Jaw. 8. Windpipe. 9. Neck. 10. Withers. 11. Shoulder. 12. Chest. 13. Heart girth. 14. Back. 15. Ribs. 16 Loin. 17. Hips. 18. Thurls. 19 Tail setting. 20. Pin bones. 21. Escutcheon. 22. Thighs. 23. Rear attachment of udder 24. Rear udder. 25. Fore udder. 26. Width between teats. 27. Mammary vein. 28. Milk wells. 29. Belly. 30. Flank.

HOW TO JUDGE A DAIRY COW

By HUGH G. VAN PELT

Editor and Associate Manager, *Kimball's Dairy Farmer*

ALTHOUGH volumes can be, and have been, written on this important subject, the fundamental principles can be intelligently set forth very briefly under the five points that are absolutely essential, and each of which must be present and well developed if the cow be productive to an extent that she is profitable to milk. The cow lacking or poorly developed in any one of these points, it matters little how well she may be developed in the other four, is not a whole dairy cow. She is only part of a cow, and her owner is unreasonable in expecting that she will respond largely, economically and profitably to the food and care he gives her.

These essential points are Constitution, Capacity, Nervous Temperament, Blood Circulation, and Ability.

The necessity for constitution is due to the fact that a productive cow is not only the hardest worked animal on the farm, but furthermore in most sections she is stabled for five or six months out of the year. Too often these stables are dark, cold, damp and poorly ventilated, causing the cow to be subjected to all sorts of disease germs. Unless she be extremely strong of constitution she succumbs to disease, either dying, or becoming unprofitable.

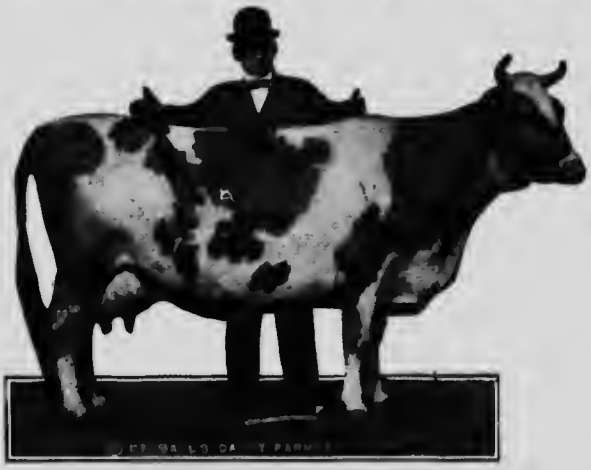
AN OPEN WELL DISTENDED NOSTRIL

Constitution is indicated by large, open, well distended nostrils, through which great volumes of fresh air continually pass to the lungs, which should be located, with the heart, in a respiratory cavity, capacious, due to great depth from top of shoulder to floor of chest, and well sprung front ribs.

Cows with small nostrils, shallow and flat in the region of the lungs and heart, are never strong of constitution.

Capacity is all important because whatever else the cow may be she is a machine, kept upon the farm for the purpose of manufacturing out of the raw material—the grains and grasses grown on the fields—the finished commodities, milk and butter-fat. Like any other machine her value is determined largely by the amount of raw material she can handle economically during a given period of time.

To be capacious, the cow must be long from shoulder to hip bones, have well sprung and deep ribs, giving sufficient space for the storage of much food. In addition the body should be covered with hide that is soft and pliable, which in turn is covered with hair that is soft and silky. This texture indicates power of digestion, and coupled with size of barrel, insures great capacity.



SPLENDID LENGTH FROM SHOULDER TO HIP BONES

Cows which are either short or shallow of body, slab-sided or have hides which are hard and stiff, covered with harsh, wiry hair, are capable of consuming only small amounts of food, a large percentage of which is not digested, assimilated and made into milk; therefore, from the dairyman's standpoint, there is a great waste.

By the term "Nervous Temperament" is meant that disposition which induces the cow or any other animal to work diligently to accomplish a specific purpose. This essential point is indicated by large, bright, prominent eyes set far apart, with broad, well dished face, indicating large brain power for controlling the nervous system.

A SOFT, PLIABLE, ELASTIC HIDE INDICATING POWER OF DIGESTIVE ORGANS

Associated with this is a wedge-shaped body, free from all signs of beefiness during milking periods and a rather refined, open-jointed backbone with the vertebrae apparent to the eye and prominent to the touch. These appearances indicate that the cow has converted all the feed, except that which is necessary for her maintenance, into milk and butter-fat.

On the other hand, the cow that is flat in the face, narrow between the eyes, with dull, sluggish eyes, and body covered more or less deeply with superfluous fat, is one that has misappropriated the food her master has given her, and converted it into fat for protecting her own body, rather than into milk and butter-fat that would be a source of profit.

All milk and butter-fat is made from food consumed by the cow; this food is digested in the abdominal region. Milk and butter-fat are manufactured in the udder; therefore it is necessary for the digested food to be transported from the digestive organs to the udder, in order that the process of milk making may take place.

This transportation of nutrients is accomplished by their being absorbed by the blood, carried and deposited among the tissues of the udder. For this reason, the greater the blood flow through the udder, other things being equal, the greater the supply of milk-making nutrients and the greater the production of the cow

A NETWORK OF VEINS ON THE UDDER

Efficient blood circulation is indicated by a network of veins on the udder; the large milk veins or mammary veins, passing forward from the udder along each side of the abdomen; and the largeness and numerousness of the milk wells or holes in the abdomen through which these blood vessels pass, carrying the blood on its return to the lungs and heart for purification and to be pumped back again.

All great producing cows have large, long, crooked, branching veins, with milk wells large enough to insert the thumb, varying in number from two to four or six and in some instances of exceptionally productive cows, to ten or twelve. The great number of milk wells indicate that the blood circulation is so great that it all cannot return through one milk well on each side, and therefore nature has been compelled to provide additional openings.

Cows with small, short, straight milk veins and only two small wells, give evidence that either the blood circulation is small and sluggish, or

that the nutrients are being conveyed to some other portion of the body to be converted into some product other than high-priced milk and butter-fat.

Ability, the fifth essential point, is determined by an udder that is at once large and of acceptable quality and texture. To be large, the udder must be broad. Breadth of udder is secured only where the thighs are thin and curving outward, giving room for breadth.

To be long, the udder must be attached high behind, and carried far forward, with broad, even and fully developed quarters. Oftentimes size of udder is secured by depth, rather than by length and breadth. Such udders are not commendable, because only a small area comes into contact with the large mammary veins at the juncture of the body, and such udders being pendulent, they are the source of much trouble, because when the cow lies down on cold surfaces the udder is exposed and contracts garget and other udder diseases.

Such an udder is also inconvenient, because during the muddy season the cow carries to the barn mud and filth, a portion of which often finds its way into the milk pail.

Texture of the udder is equally as necessary as size. Texture is indicated by softness and pliability, elasticity and a covering of hair that is short, fine and silky. Such an udder expands when the cow feeds and upon being milked, collapses, giving forth large quantities of milk and butter-fat.

On the other hand, the udder that is hard, beefy and covered with coarse, wiry hair, retains its shape, being just as large after milking as before. Size and development of an udder of this quality make little difference because the cows possessing them are seldom if ever productive or profitable at the pail.

AN UDDER OF EXCELLENT TEXTURE ATTACHED HIGH BEHIND

BREEDS OF DAIRY CATTLE

By F. A. PEARSON

Department of Dairy Husbandry
Illinois College of Agriculture

F. A. PEARSON

COWS now producing from 10,000 to 30,000 pounds of milk are descended from ancestors capable of giving but 2,000 pounds, or less. This ability to yield increasing amounts of milk has come about through changes in type and temperament caused by the surrounding conditions and by careful selection and breeding.

HOLSTEIN-FRIESIANS

The Holstein-Friesian breed originated in Holland and has been an important factor in the agriculture of that country for more than a thousand years. There the breed is known as the Friesian and has been bred pure for many hundreds of years without the intermingling of other blood, with one possible exception. Some two hundred years ago red cattle were imported into North Holland following the inroads of a devastating disease. This blood was mixed with some herds, though many were maintained entirely pure. There are now many registered red and white Friesians in Holland. Red disqualifies for registration in this country, though occasionally the red crops out in calves, whose ancestry, so far as known, were black and white.

This milk has been used and is still used almost exclusively for the manufacture of butter and cheese. The Hollander must send to the block practically all of his bull calves and a considerable proportion of his heifers and cows, and so he has selected a type which will fatten readily when not milking. This type is more beefy and compact and less open in conformation than most of the breed in this country.

DUCHESS SKYLARK ORMSBY, CHAMPION HOLSTEIN COW. YEAR'S RECORD, 27,761.7 LBS. OF MILK; 1,205.091 LBS. OF BUTTER-FAT

The Holstein-Friesian is the largest of the dairy breeds, mature bulls weighing from 2000 to 2600 pounds and mature cows from 1200 to 1600 pounds. Although their average of fat is around 3.4% and lower than that of other breeds, their milk production is enough heavier to make them equal in butter-fat production.

SOPHIE 19 OF HOOD FARM, CHAMPION JERSEY COW. YEAR'S RECORD, 17,557 LBS. OF MILK; 999 LBS. OF BUTTER-FAT

JERSEYS

Little is known regarding the origin of the Jersey breed. It is supposed, however, that it has descended from cattle brought to the Channel Islands in the early days by French refugees. These were probably similar to the Normandy and Brittany cattle now found in Northwestern France. Whatever its origin may have been, it is known that the Jersey on the island has been bred pure for several hundred years. Since 1789 it has been prohibited by law to import cattle to the island, except for immediate slaughter. At that time there was little difference between the cattle on the various islands of the Channel group. The Jerseymen, however, preferred a refined, more nearly solid colored animal, suited not only to the production of butter, but also to the adornment of the estates of the English noblemen. Selection to this ideal has produced the most highly developed dairy type to be found among the dairy breeds, both as to conformation and temperament.

The Jersey produces very rich milk, testing around 5.4% of butter-fat. Most Jerseys are solid in color shading to black at the points, though many are spotted with white, a marking which in no way indicates impurity of blood. Mature cows of this breed weigh from 600 to 1000 pounds. Mature bulls weigh from 1400 to 1800 pounds.

GUERNSEYS

The origin of the Guernseys so far as known is the same as that of the Jersey. The Guernseyman, however, has selected and bred for utility alone and has therefore developed a type of cow larger and more rugged than the Jersey. She is a heavier producer of milk, somewhat lower in butter-fat content than that of the Jersey.

It has not been until recent years that Guernseys have been imported to America. Their popularity is so great at the present time, however, that greater numbers of them are now being brought in than of any other

breed. Although there is a comparatively small number of Guernseys in this country, rapid gains are being made. Their adaptability to our conditions and their general excellence have made these cows one of the most popular dairy breeds.

MURNE COWAN, CHAMPION GUERNSEY COW. YEAR'S RECORD, 24,008 LBS. OF MILK; 1,098.18 LBS. OF BUTTER-FAT

Colors are varying shades of red or fawn and white, the darker color predominating. Mature bulls weigh from 1500 to 1800 pounds. Cows range from 800 to 1100 pounds and give a fair amount of milk, averaging around 5% butter-fat. The breed is similar to the Jersey in economic production of butter-fat. A rich, yellow color is characteristic of Guernsey milk and butter and the breed is preferred by many because of that fact.

THE AYRSHIRE

The native home of the Ayrshire is the county of Ayr, in Scotland. Ayrshires have been developed with such definite purpose that a uniform type has been obtained. Ayrshire is hilly, the soil of only fair fertility and the climate severe. These conditions have tended to give the Ayrshire the two characteristics for which it is most famous, activity and hardihood, which allow it to thrive on poor and rough pastures in a cold and rigorous climate. The color is red, brown or black and white, the darker color in Scotch cattle predominating. Cows fatten readily when dry and produce a good quality of beef.

The Ayrshire has been selected and bred to obtain great symmetry of body and udder and as a result we find such form and style in no other breed. The udder, particularly, is superior in shape.

One of the early objections to the breed in America was the typically small and short teats found on imported cows. American breeders, how-

GARCLAUGH MAY MISCHIEF, CHAMPION AYRSHIRE COW. YEAR'S RECORD, 25,328.7 LBS. OF MILK; 897.87 LBS. OF BUTTER-FAT

ever, are gradually doing away with this difficulty through careful selection.

The breed has obtained its strongest foothold in the New England States and in Canada, where the land is rough and the climate severe. The breed has never been exploited and its slowly increasing popularity is entirely due to its many excellent qualities. It produces large quantities of milk, better balanced in its solid constituents than that of any breed, the fat per cent averaging around 3%. Mature bulls weigh from 1500 to 2000 pounds and cows around 1000 pounds in fair flesh.

OTHER MILKING BREEDS OF CATTLE

BESIDES the four leading breeds of dairy cattle we have the Brown Swiss and the Dutch Belted. Both of these are good milk and butter producers and may be classed with the strictly dairy breeds. They are, however, not as numerous in this country as the four dairy breeds described by Mr. Pearson in the preceding chapter.

BROWN SWISS

The Brown Swiss, as the name indicates, originated in Switzerland. They are remarkably strong, healthy animals, larger and coarser than any other dairy breeds. While many individuals have made excellent dairy and milk records, the total number of the breed in this country is small and it has not, therefore, been as important a factor in the dairy industries here as it has been in Switzerland. The number of animals, however, is rapidly increasing and the breed is receiving more and more attention from dairymen.

CHAMPION BROWN SWISS COW, COLLEGE BRAVURA 2D, PRODUCED IN ONE YEAR 19,460.06 LBS. OF MILK, CONTAINING 998.005 LBS. OF BUTTER-FAT.

DUTCH BELTED

The Dutch Belted Cattle closely resemble the Holstein in form and production. These cattle are invariably black with a white belt around the body. There are probably about 2000 in America. Many people have an erroneous idea that their chief asset is their distinctive color marking. This, however,

is not the case. Considering the small number of the breed, it has produced as many excellent individuals as any breed. At the Chicago World's Fair, 1893, Dutch Belted Cow, Lady Baird No. 82, produced 32 quarts of milk per day, not being equalled by any other cow on exhibition. In 1909 a Dutch Belted cow won a prize of $10, offered by The De Laval Separator Company for producing the largest quantity of milk at one milking on a fair ground.

AUNT MACRINA 931 AND HER DAUGHTER, HAPPY THOUGHT 1540

LEGAL WEIGHT OF VARIOUS COMMODITIES

(Minimum weight, by U. S. Statute)

	Pounds per Bushel		Pounds per Bushel
Apples, dried	26	Lime, unslaked	30
Barley	48	Malt	38
Beans, castor	46	Millet seed	50
Beans, white	60	Oats	32
Bluegrass seed	44	Onions	57
Bran	20	Peas	60
Buckwheat	48	Peas, ground pea meal	42
Clover seed	60	Potatoes, Irish	60
Coal	80	Potatoes, sweet	55
Corn, shelled	56	Rye	56
Corn, in the ear	70	Salt, fine	167
Corn meal	48	Salt, coarse	151
Flaxseed	56	Timothy seed	46
Hemp seed	44	Turnips	55
Hungarian grass seed	50	Wheat	60

RULE FOR ESTIMATING HAY

Hay is often sold in the mow or stack where the weight has to be estimated. For this purpose 400 cubic feet of hay is considered a ton. The actual weight of 400 cubic feet of hay will vary according to the quality of the hay, time of cutting, position in the mow, etc. For making an estimate in a given case multiply together the length, breadth and height of the mow or stack in feet and divide the product by 400. The quotient will be the number of tons.

MEASURING CORN IN BULK

Two cubic feet of sound, dry corn in the ear will make a bushel shelled. To get the quantity of shelled corn in a crib of corn in the ear, measure the length, breadth and height of the crib, inside of the rail; multiply the length by the breadth, and the product by the height; then divide the product by two, and you have the number of bushels in the crib.

BUTTER MAKING ON THE FARM

By S. E. BARNES

of The De Laval Separator Company

S. E. BARNES

THE principal idea and the most important factor in making butter is to make it so good and put it up in such an attractive way that every one will want it.

First of all, everything that comes in contact with the milk and cream must be scrupulously clean, for milk is the most easily contaminated food product that we have, and a little carelessness may spoil a whole batch of butter and make it unsalable.

The cream should be cooled as soon as it comes from the separator and should be kept in a cool place until enough is had to make a churning. It would be well to have a small wooden trough that can be filled with cold water, in which to set the cans or jars of cream to keep them cool. The water in this should be changed frequently, or, better still, a running stream through it all the time would be ideal. After enough cream has been accumulated to make a churning (generally about two or three days' cream) it should all be mixed together in one large can, thoroughly stirred and allowed to stand over night to ripen or evenly sour before churning.

THE POPULAR "BARREL" CHURN

In the winter time this cream may have to be warmed to about 70 degrees F. before it will sour. This should be done at the time of mixing it the night before churning. In this case it should be cooled down the next morning to about 60 degrees F. before the churning is begun. It is always best to have a dairy thermometer and test the temperature of the cream, for the temperature is very important in butter making.

Three times a week during the summer and twice a week during the winter is often enough to churn. A barrel churn is about the most convenient for home use, for it is easy to handle and keep clean, and does not cost much.

When ready for the churn, see that the temperature is at about 60 degrees F., then pour the ripened cream into the churn and churn it until the butter has come in the form of small granules about the size of wheat grains. Then draw off the buttermilk, leaving the butter in the churn. Over this butter pour fresh cold water, put on the lid and turn

A GOOD BUTTER-WORKER IN THE DAIRY SOON PAYS FOR ITSELF

the churn two or three rounds to wash the butter; draw off the water, then the butter is ready to remove from the churn for salting and working.

It should be salted at the rate of one ounce to the pound, and worked with a paddle or on a so-called butter-worker. Always handle the butter with a paddle or ladle; never allow the hands to touch it, for the warmth of the hands would make the butter soft and greasy.

Remember, butter should not be worked too much, only enough to dissolve the salt and get the butter into a nice, waxy consistency. Butter is often worked until it is soft and greasy, which is very undesirable and makes a very poor product. After the working is done, it should then be molded into pound prints and wrapped neatly in parchment paper and kept in a cool place until marketed. Remember that appearance goes a long ways in selling an article.

A HANDY ICE-BOX FOR SHIPPING BUTTER

NEAT, ATTRACTIVE PRINTS HELP YOUR BUTTER SALES

A SIMPLE WAY TO DETERMINE THE AMOUNT OF CREAM OF ANY DESIRED RICHNESS A GIVEN QUANTITY OF MILK SHOULD PRODUCE

This is something one would often like to know, and is capable of determination in very simple manner, provided the percentage of butter-fat in the milk is first ascertained.

Multiply the pounds of milk by the per cent of fat in the milk, and then divide the product by the per cent of fat it is desired that the cream should contain.

The result will be the *pounds* of cream that the amount of milk would produce of the prescribed degree of richness, and if this is divided by 2.091, which is the weight of one quart of cream, the figure thus obtained will be the number of *quarts* of cream that would be produced.

For example, if it is desired to know what quantity of 30 per cent

cream would be produced by 100 lbs. of 5 per cent milk proceed as follows:

Multiply 100 × 5 = 500; divide 500 by 30 = 16.66⅔; divide 16.66⅔ by 2.091 = 7.97, the number of quarts of cream there would be.

HOW TO REDUCE THE RICHNESS OR PERCENTAGE OF FAT IN CREAM

This is something which is likewise frequently desirable to know how to do, that is, to reduce the percentage of butter-fat in a given quantity of cream by the addition of full or skim-milk.

First ascertain the per cent of butter-fat in the cream it is desired to reduce, and second, if full milk is to be used the per cent of butter-fat in same.

Then multiply the pounds of cream to be reduced by the per cent of fat in the cream, and also, separately, a like number of pounds by the per cent of fat it is desired the cream should be reduced to — and deduct one result from the other.

Next subtract the per cent of fat in the full milk to be added from the per cent of fat in the cream desired to be obtained.

Then divide the difference between the two first multiplications by the result of this last subtraction, and the quotient will be the number of pounds of milk required to be added.

For example, if it is desired to reduce 100 lbs. of cream testing 30 per cent of butter-fat to cream that will test 20 per cent of butter-fat by the addition of milk containing 4 per cent of butter-fat proceed as follows:

$$100 \times 30 = 3000$$
$$100 \times 20 = 2000$$
$$\underline{\qquad\qquad}$$
$$1000$$
$$20 - 4 = 16$$
$$16)\,1000\,(62.50$$

In other words, the amount of such milk to be added would be 62½ lbs. and the bulk of 20 per cent cream would then be 162½ lbs. instead of the original 100 lbs. of 30 per cent cream.

If skim-milk is used to reduce the percentage of fat in the cream and there is thus no fat at all in the skim-milk, that part of the formula is naturally omitted, and the result of the first subtraction is simply divided by the per cent of fat it is desired the cream should obtain.

In that case in the above illustration 1000 would be divided by 20, giving the quotient of 50, this being the number of pounds of skim-milk required to be added to reduce the 30 per cent cream to 20 per cent butter-fat richness, and the bulk of reduced cream would then be 150 lbs.

WHITEWASH

Ordinary Whitewash.—This is made by slaking about 10 pounds of quicklime with 2 gallons of water.

The lime is placed in a pail and the water poured over it, after which the pail is covered with an old piece of carpet or cloth and allowed to stand for about an hour. With an insufficient amount of water, the lime is "scorched" and not all converted into hydrate; on the other hand, too much water retards the slaking by lowering the heat.

"Scorched" lime is generally lumpy and transparent, hence the use of the proper amount of water for slaking and an after addition of water to bring it to a brush consistency.

Factory Whitewash: (Interiors).—For walls, ceilings, posts, etc.

(1) Sixty-two pounds (1 bushel) quicklime, slake with 15 gallons of water. Keep barrel covered until steam ceases to rise. Stir occasionally to prevent scorching.

(2) Two and one-half pounds rye flour, beat up in half-gallon of cold water, then add 2 gallons of boiling water.

(3) Two and one-half pounds common rock salt, dissolve in 2½ gallons of hot water.

Mix (2) and (3), then pour into (1) and stir until all is well mixed.

This is the whitewash used in the large implement factories and recommended by the insurance companies. The above formula gives a product of perfect brush consistency.

Weatherproof Whitewash: (Exteriors).—For buildings, fences, etc.

(1) Sixty-two pounds (1 bushel) quicklime, slake with 12 gallons of hot water.

(2) Two pounds common table salt, 1 pound sulphate of zinc, dissolve in 2 gallons of boiling water.

(3) Two gallons skimmed milk.

Pour (2) into (1), then add the milk (3) and mix thoroughly.

Lighthouse Whitewash.—

(1) Sixty-two pounds (1 bushel) quicklime, slake with 12 gallons of hot water.

(2) Twelve pounds rock salt, dissolve in 6 gallons of boiling water.

(3) Six pounds Portland cement.

Pour (2) into (1) and then add (3).

NOTE: Alum added to a lime whitewash prevents it rubbing off. An ounce to the gallon is sufficient. Flour paste answers the same purpose, but needs zinc sulphate as a preservative.

Molasses renders the lime more soluble and causes it to penetrate the wood or plaster surface; a pint of molasses to 5 gallons of whitewash is sufficient.

Silicate of soda solution (about 35° Baumé) in the proportion of 1 to 10 of whitewash produces a fireproof cement.

A pound of cheap bar soap dissolved in a gallon of boiling water and added to about 5 gallons of thick whitewash will give it a gloss like oil paint.

THE DAIRY INDUSTRY OWES A GREAT DEBT TO THE DE LAVAL CREAM SEPARATOR

By GEORGE BERTRAM SHARPE, New York, N. Y.

GEORGE BERTRAM SHARPE

OBID HUSSEY and Cyrus McCormick, through the perfection of mechanical harvesting devices some seventy-five years ago, freed the husbandman from the manual bondage of the cradle and the scythe.

About the same time Elias Howe with his sewing machine freed the housewife from long and toilsome hours devoted to the needle.

But while in nearly every other field of human endeavor mechanical devices and methods had been perfected to lighten almost every kind of labor, there still remained the toil of the milk crocks and the churn in handling the dairy products on the farm.

For from the time four thousand years ago when the Arabs on the plains of Asia discovered the art of making butter until 1878, the essential principles of cream separation and butter making had remained practically unchanged.

In that year the fetters which for forty centuries had bound the dairy industry were unleashed.

Just as Faraday unlocked the secrets of the induction coil from which have sprung electrical devices of every description, or as James Watt saw in the energy developed in the boiling tea kettle the mighty force of steam that should make possible the girdling of the world with roads of steel, so Gustaf Patrik De Laval, the young Swedish engineer, in his invention of the cream separator in 1878, visualized the unfettering of the dairy industry and the gigantic usefulness that would come with the mechanical separation of cream from the milk of the cow.

First and foremost among all foods for man and beast is the milk of the mammal.

We could do without reapers, without sewing machines, without steam engines, without electricity, without most of the multitude of things which human ingenuity has made our servants, but we cannot do without milk.

For without milk the infant must die. Without milk the race must perish.

While compared with other industries the dairy industry is not the

largest, it is, nevertheless, one of the most important. The production and handling and manufacture of milk and its products, the feeding and breeding of dairy cows, the buildings constructed for their housing, the fields tilled for the production of their food—all factors incidental to the production of milk—make the dairy industry not only one of gigantic proportions, but one of the utmost importance in the welfare of mankind.

While previous to the introduction of the cream separator much had been accomplished in the way of breeding more efficient dairy animals and feeding them in more scientific manner, as well as along the lines of better and more economical distribution of dairy products, it was not until the mechanical separation of cream from milk had been successfully accomplished that it was possible for the dairy industry to begin to meet its obligations, or the producers of cream and butter to supply the demands of increasing millions in urban centers, either as to quality or quantity.

DR. CARL GUSTAF PATRIK DE LAVAL

Had the cream separator not been invented the creamery would have been impossible, and without the creamery millions would have been denied the butter to spread on their bread; and without butter, one of the most wholesome, healthful, energy-forming food products would have been lacking in the daily diet of millions of the human race.

Until Dr. De Laval invented the cream separator, the only method of securing cream was to set the milk in crocks or pans, and after letting it stand twenty-four hours or more, skim off the cream. This work invariably fell to the womenfolk on the farm and the daily task of cleaning and washing these milk vessels meant toil and drudgery.

THE FIRST DE LAVAL CREAM SEPARATOR—BELT-DRIVEN

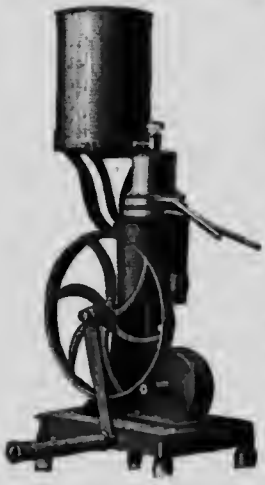
Not only did the cream separator make possible the performance of a task in a few minutes that formerly took a great deal of time, but it had three other very great advantages over the old gravity method; namely, a greater amount of cream, a better quality of cream, and warm, sweet skim-milk to feed to calves and stock.

The saving effected in the quantity of cream produced with a cream separator in comparison with the old gravity method of skimming, when its influence

on the cream industry the world over is considered, mounts up into millions of dollars annually.

Under ordinary conditions of gravity skimming there is a loss of 15 to 25 per cent of butter-fat, while there is practically no loss at all with a high-grade separator like the modern De Laval.

Take, then, a herd of ten fair cows producing 2,000 pounds of butter-fat a year. A loss of 20 per cent would mean 400 pounds annually, which, at 30c a pound, is $120. Then, consider that there are probably fifty to seventy-five million cows in the world whose milk is being used for butter making purposes, and you begin to realize the tremendous economic value of the cream separator.



ONE OF THE EARLIER DE LAVAL HAND SEPARATORS

And when to this we give the cream separator the credit which is justly its due for the production of a much better quality of cream than was ever possible under the old crock and pan method, and compare the feeding value of warm, sweet separator skim-milk with the stale, tainted and often sour skim-milk which was the result of gravity skimming, we begin to see in Dr. De Laval's invention a mechanical device which takes its place in importance beside the reaper of McCormick, the sewing machine of Howe, the steam engine of Watt, and the lamp of Edison.

It has been rightly said that the invention of the cream separator marked the beginning of a new era in dairying.

At first its use was confined almost entirely to large factory machines, and instead of skimming cream by the crock and pan method and churning it on the farm, farmers hauled their whole milk to the local creamery and hauled the skim-milk back again. This saved so much work, and the butter produced in these creameries was so much more desirable in quality, that a tremendous demand was created for creamery butter made from centrifugally separated cream, and all over the country creameries sprang up as if by magic.

The next step in dairy progress was the gathered cream creamery, which followed the introduction of the farm and dairy size cream separator.

Just as the whole milk creamery offered big advantages over the crock and pan and farm churn method of butter production, so the gathered cream butter factory was an improvement on the whole milk creamery.

The farmer was enabled to separate his milk when it was fresh and warm and untainted, and thus had skim-milk for his calves and stock in its ideal condition, instead of bringing back skim-milk from the

creamery cold, and sometimes tainted and sour; and furthermore, he did not run the danger of getting milk from other herds which might carry tuberculosis germs or other infection.

Then instead of having a big load of milk to haul to the creamery and back again every day, he had only a can or two of cream to carry to the creamery or station two or three times a week, and this saving of time and labor, especially in the spring and summer when his farm work was heaviest and his milk supply was greatest, meant much to the farmer.

The farm separator also made possible the great centralized butter plants with their larger facilities for marketing and distributing, and buying cream within a radius of several hundred miles, ensuring a steady and profitable market for cream, even to the farmer in the scattered and remote community with an insufficient cow population to support a local and conveniently situated creamery.

In the dairy industry as in every other, the problem of securing a ready market is a most vital one, but nowadays, except in some few sections of the Southern states and a few isolated localities in the mountainous sections of the West, thanks to the cream separator, the farmer can always find a ready market for his separator cream, and on every farm where two, three or more cows are kept, a good cream separator is not only an economical purchase but is well-nigh indispensable.

As to the part that the De Laval organization has played in the upbuilding of the dairy industry, aside from the development and perfection of the original centrifugal cream separating machine, we have said little, because it is well known to dairy authorities everywhere and to those connected with the industry in a large way, that the De Laval organization has, since the very beginning, always been the leader, not only in improving and perfecting the art and science of centrifugal cream separation, but as well in every movement that has been for the benefit and advantage of dairying in all its various phases.

MODERN DE LAVAL SEPARATOR. NEARLY 2,000,000 IN DAILY USE

Due to this broad-minded and constructive policy, De Laval Cream Separators stand today first in the esteem of dairy farmers everywhere, and the annual sale of De Laval Separators exceeds that of all other makes combined.

DE LAVAL
SEPARATORS
save in 7 ways

QUANTITY of cream that no other separator will recover completely, particularly under the harder conditions of every-day use.

QUALITY of cream as evidenced by De Laval butter always scoring highest in every important contest.

LABOR in every way over any gravity system, and also over any other separator by turning easier, being simpler, easier to clean and requiring no adjustment.

TIME by hours over any gravity system, and as well over any other separator by reason of greater capacity and the same reasons that save labor.

COST since while a De Laval Cream Separator may cost a little more than a poor one to begin with, it will last from ten to twenty years, while other separators wear out and require to be replaced in from one to five years.

PROFIT in more and better cream, with less labor and effort, every time milk is put through the machine, twice a day, or 730 times a year for every year the separator lasts.

SATISFACTION which is no small consideration, and can only come from knowing you have the best separator, and being sure you are at all times accomplishing the best possible results.

Easy to Prove these Savings

These are all facts every De Laval local agent is glad of the opportunity to prove to any prospective buyer. If you don't know the nearest De Laval agency simply write the nearest main office as below.

THE DE LAVAL SEPARATOR CO.

New York Chicago San Francisco Seattle

50,000 BRANCHES AND LOCAL AGENCIES THE WORLD OVER

SOONER OR LATER
YOU WILL BUY A
DE LAVAL
CREAM SEPARATOR