DAIRY
FORTUNES

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DAIRY FORTUNES

....BY....

LANDY LARKIN

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DAIRY FORTUNES.

Dairy Fortunes will assist dairymen, and will enable them to make dimes instead of cents. I have attempted to give the reader the most important points about successful dairying—just enough to enable him to act intelligently and to improve his condition with less labor. I have placed 300 pound cows where they belong—in the butcher's hands. To read, every week, in our dairy papers, that such and such dairymen are proud of the fact that their cows have reached the 300 pound mark, discourages the intelligent, enterprising dairyman. These so-called dairymen tend to weaken my faith in rapid dairy progress. If **Dairy Fortunes** will do nothing more than make these 300 pound dairymen ashamed of themselves, I shall feel that it has accomplished much.

No man can expect to succeed unless his aim in life extends above the cellar floor. The principal object of **Dairy Fortunes** is to cause dairymen to transfer their affections from the puny 300 pound cow to the 500, 600 and 800 pound cows—to get out of the dark, damp and gloomy cellar into the cosy, cheerful parlor. I have painted no picture that can not be excelled.

Within 25 years 5,000,000 cows that will make over 500 pounds of butter each, can be produced in the United States. Why keep 16,000,000 cows when 5,000,000 will produce more milk, more cream and more butter? Most dairymen are easily satisfied and do not expect much. Keep no cow that will not produce \$100 a year. A few years ago I wrote and published a book, and when I talked about selling 500,000 copies of it, my friends said I was a candidate for a lunatic asylum, but the publishers sold over 1,400,000 copies, and they expect to exceed the 2,000,000 mark. I expect to live to the time when cows that will make 600 pounds of butter will be numbered by hundreds of thousands. Every dairyman must read and study what he reads, and must learn that successful dairying depends principally upon his tact and earnest effort. Book learning does not make the successful man. The greatest book ever written about how to get along in the world, was written by a man who always ate the crust of poverty—he could tell other people how to succeed, but was a helpless failure himself.

But few writers, but few editors, but few politicians and no preachers “dare” say what they think, only when they happen to think on the popular side, because their bread and butter are at stake. I have said what I think, and know that **Dairy Fortunes** will be criticised. If it suited everybody it would be worthless. Wendell Phillips said: “At least 90 *per cent.* of the world’s population *are* and always *have been* wrong on all the important subjects pertaining to the improvement of mankind.” To please nearly everybody is a sure sign of weakness. Orders from the publisher’s agents for **Dairy Fortunes** guarantee a very large sale—it will be read and that will satisfy the

AUTHOR.

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COWS.

There are in the United States about 16,000,000 cows, that produce enough milk each year to make about 2,000,000,000 pounds of butter, or about 125 pounds for each cow. Only about one-half the milk is used for butter making, consequently our butter product is about 1,000,000,000 pounds a year. The product of these cows, which equals 2,000,000,000 pounds of butter, at 15 cts. a pound would be \$300,000,000, or \$18.75 for each cow. Adding to this the price of the calf and skim milk, which will not exceed \$9.00, we have \$27.75 as the total product of each cow. The average cost of keeping and caring for a cow can not be reduced to less than \$35.00 a year, which makes her a debtor to the amount of \$7.25 a year, and the 16,000,000 cows, debtors to the amount of \$116,000,000 per year. In other words, if all the cows in the United States should die their owners would save \$116,000,000 each year. These are facts that should open the eyes of cow owners and make them feel ashamed of themselves. The average selling price of all the butter in the United States will not net the cow owners 10 cents a pound, or \$12.50 per cow, consequently a loss of \$13.50 each, or \$216,000,000 a year.

A few dairymen are successful, because they keep good cows and know how to handle them and their product. The expert dairyman, possessing good business tact, and a little capital, can make from \$50,000 to \$500,000 in ten years. If all dairymen possessed these qualifications, such profits could not be made. As there are but few experts in any line of business, and as the history of mankind for thousands of years has demonstrated, that nearly all men are failures in business, the field for first-class dairymen will not be crowded for many, many years. There are few dairymen who have been able to grasp the situation and are reaping a rich harvest. Dairy ideas have not risen much above the 200, 250 and 300-pound cows. When dairymen learn that the place for cows that will not make more than 300 pounds of butter in a year, is the slaughter house, a long step in the right direction will have been made.

First Important Step.—Keep no cows that will not make more than 300 pounds of butter in a year. “What breed shall I keep?” If a cow produces 400 to 500 pounds of butter a year, and does not eat more than a good milker should eat, she is a good “breed” to keep. If a thoroughbred cow is a poor milker, send her to the butcher. There are thousands of thoroughbreds among all breeds of cows, that are worth exactly what the butcher will pay for them and no more.

Milk and Beef Cows.—Milk cows for milk, beef cows for beef, the world over. There should be no mistake in choosing between the two kinds of cows. A man who started out to buy a fine roadster or buggy horse and bought a Norman draft horse, would be a candidate for admission to a lunatic asylum. If a Durham is good for butter, a Jersey is good for beef—the rule

must work both ways. Manifest as much good sense in buying a cow as you do in buying a horse and you will find the right breed. If you want beef cows, buy cows shaped like a box—if you want milk cows, buy cows shaped like a wedge. There is as much difference in

Landseer's Fancy. Splendid Dairy Form.

shape between the ideal milk and beef cows as between the ideal race horse and draft horse. Many farmers keeping a few cows for private use, selling a little surplus milk or butter now and then, keep beef cows, because they want beef calves. Some beef cows give large quantities of milk, but they never get beyond the middle of the procession, and are "total" strangers to those magnificent little giants away up in the front rank. It requires about 50 per cent, more feed to keep a large beef cow, than it does to keep a medium size milk cow. A Jersey, Guernsey, or Alderney cow, weighing about 1,000 pounds, and producing as much milk as a beef cow weighing 1,000, will not require more than 60 to 70 per

cent. as much feed. Our prejudices should not influence us—facts should be our guide. There is but one kind of reverence that will pay any interest on the investment, and that kind is reverence for the truth—for facts—all other reverence is a fraud—a blinder made of ignorance.

Ideal Dairy Cow.—As far as we have succeeded in discovering the points of the ideal dairy cow, they are about as follows :

1. Good length of body and not round.
2. The body should be free from eveness and smoothness.
3. The joints and articulations should be loosely put together, especially the vertebræ.
4. The abdomen should be large and prominent.
5. The body should be double wedge shaped—the little end being at the shoulders.
6. The hip bones should be prominent, and the depression in front of them large.
7. Large pelvic arch.
8. Long, neat, slim tail and prominent switch—the root of the tail should stand up well.
9. The vertebral column large and strong and large depressions between the vertebræ.
10. Flanks thin and highly arched.
11. Thin, flat thighs.
12. Short, Flat neat legs.
13. The line of the back should not be straight—high over hips and at withers, and low necked.
14. Small, thin neck.
15. Small, neat head, prominent, bright eyes, wide apart; dished face, long from eyes to nostrils, strong under jaw, pleasing expression and full of life.

16. Thin withers—shoulders narrow at top, and good width at bottom, slightly sunken back of shoulders.

17. Back and belly lines not parallel.

18. Large through heart region.

19. Skin soft, smooth and tinged with yellow—inside of ears very yellow ; skin should not be too thick nor too thin.

20. Soft, fine hair.

21. Hind legs should stand apart sufficiently to give room for large udder.

22. Large and crooked milk veins—they do not contain milk, but indicate large venous system, necessary for milk production.

23. Should be a greedy eater.

24. Udder should be large when full and small when empty ; should extend far up behind and be long in front ; square rather than round, free from warts and long hair.

25. Teats should be medium size and far apart both ways.

26. Should milk easily, but not leak her milk.

27. Ribs should stand well apart so as to show creases between them plainly.

28. Should weigh 1,000 to 1,200 pounds ; larger the cow the better, if everything else is in proportion.

29. Must be highly nervous and full of life, a greedy eater and drinker.

There are many other points about the ideal cow that are difficult to express and must be learned by experience. While I am not partial to any breed of cows, I believe the majority of up-to-date dairymen will agree with me in saying that the Jersey, Guernsey and Alderney are in the front rank as butter cows, and the Hol-

stein for large quantities of milk. I have a cow, half Jersey and half Holstein, that has produced 460 pounds of butter in a year, but she eats about 25 per cent. more than pure Jerseys producing as much butter. Butter fat is what cows should produce, not water.

Primrose, 21 lbs. 10 oz. in Seven Days.

Thoroughbreds.—Is it best to keep thoroughbreds? Yes, if they are good ones. Many persons claim that they can not afford to keep thoroughbreds, because they cost too much. Thousands and thousands of thoroughbreds are not worth \$20.00 a head, because the butcher will not pay that much for them. As milkers they are worthless, and as an old farmer expressed it, "Worthless yet, as breeders." Many cows, from the finest sires and dams, are not worth \$20.00. Only about one out of five thoroughbreds is worth any more than butchers' prices. Because the best cows are thoroughbreds, is no reason why all thoroughbred cows are worth more than their beef value. Prejudice rules the world. It is

so easy to be a slave to prejudice and to believe that our cow, our horse, our politics, our religion, our child is the best. Stop and think a little and you will discover that the foundation for nearly all our beliefs is rotten and can be knocked from under us with a grain of good sense. Nearly all our ideas in regard to cows, horses, morals, politics, religion, etc., rest upon a foundation of prejudice, circumstances and habit. If that were not true, universal prosperity would take the place of almost universal misery. Education consists in learning how to think, regardless of what anybody else has thought. Apply this principle to cows and you will succeed. Do not keep a certain kind of cows because your great grandfather kept them.

Buying Cows.—Never buy a cow until you have tested her several times, and during the proper milk period, and are satisfied about her milking qualities—quantity, quality, length of time in milk during the year, are important factors to be considered. Do not buy a cow on “hearsay evidence.” Many cow owners are as big liars as hunters, fishermen and believers in ghosts. If you are satisfied that a cow is a good one, do not permit a few dollars to prevent you from buying her. A splendid cow pays you doubly, makes you money, makes you happy. She touches the two p’s—your pocketbook and your pride. If, after you have bought a cow, you discover she is a failure, ring up the butcher, pocket the experience and try again—next time you may do better. There are many 400 to 450-pound cows in every community, and the owners do not know what they will produce.

Testing Cows.—One test is not satisfactory—cows vary—to-day one thing, to-morrow something else.

When a cow is fresh, her milk is low in fat and highest when stripping. It may vary as much as 40 per cent. Test her carefully, when she has been in milk about three, five and six months, for several days and the average for the three tests will be about the per cent. your cow will test. In testing, always take the sample from the entire milking after it has been mixed thoroughly. The first milk of a milking is very poor in fat, and the last very rich, the last half being about $2\frac{1}{2}$ times as rich as the first half.

Never Tested.

When is a Cow's Milk Richest?—It is claimed that milk is richer in fall and winter and poorer in spring and summer. With most cows this is true, but there are exceptions, as some cows will test fully as high in May and June as they will in fall and winter. The low test is evidently due to atmospheric conditions and annoyances from the heat, flies, etc. I have observed that when cows are kept in a cool place away from flies, the milk tests higher than when they are in pasture, subject to all the nervous annoyances of hot, dry weather.

Milking.—Cows should be milked properly to give the best results. No milker is a success unless he is in sympathy with the cows—they must like each other. Some milkers get more milk than others, because they are more agreeable to the cows. Milking should be done quickly and gently—the milker should not hurt the cow—should not squeeze the udder nor pull the teats. To get all the milk, it should be drawn as rapidly as possible. If the cow is permitted to retain some of her milk she will go dry. Should always milk with dry hands. The faster a cow is milked the larger the quantity and the richer the quality. Rapid milking produces an agreeable sensation, excites the milk flow and stimulates the nervous system. It has a similar affect upon the milk glands, to that of the delicious flavor of an apple upon the salivary glands. The milk glands give up all the milk and a certain quantity of buttery mucus that enriches the milk, and is not extracted by slow milking. Kick and otherwise abuse a cow and she not only will not let you have all the milk, but can not. She can not give you milk at will. You must develop the proper conditions. Milking one teat at a time decreases quantity and quality. The longer the period between milking the less the fat in the milk. If the time between morning and evening is ten hours, the difference between evening and morning will be fourteen hours. The quantity of milk in the morning will be much larger and the quality much poorer than that of the evening.

Before Beginning to Milk.—The stables should be cleaned thoroughly, the cows dusted and cleaned, the udder cleaned with a wet rag if dirty, and the stable thoroughly aired and all the dust blown out. If the udder and teats are very dirty they should be washed

quickly with tepid water and dried with a clean towel. That is the sum and substance of this matter in a nutshell, although enough slush to fill Webster's unabridged dictionary is written about it every year. There is but one side to the question. "Should the stable be cleaned before milking?" Certainly it should. The dust and filth stirred up will settle in a few moments, or can be blown out by the wind or by means of fans turned by one man. Good sense is all that is required to settle this question. Do your own thinking on all subjects. As soon as a cow is milked, empty the milk into a strainer bucket and then into the milk can through two or three thicknesses of cheese cloth. The milk can should not be in the milk room, but in an adjacent room, which should be perfectly clean. The same person should milk the same cows in the same order. If your cows are in the habit of being milked in order—1, 2, 3, and you jump from 1 to 3, No. 2 will feel slighted; her nervous system will be disturbed and she will not produce good results. See that every cow gets her proper stall. Do not quit milking until you get all the milk, if it can be gotten—be patient; keep at her until she gracefully yields; let her understand that the milk belongs to you, and that you are going to get it, if it takes an hour. She will soon learn to give you every drop. Do not permit her to dry until you are ready for the dry period. Be kind and positive with her, and she will work to suit you.

Milk Habit, Calves, Etc.—If you have a milk cow do not permit the calf to touch her, remove it as quickly as it is born, and nine times out of ten the cow will not fret a particle nor "bawl" for it a single time, and the calf will not fret. To let the calf suck the cow spoils the

calf, ruins the cow, and paralyzes your pocketbook. When you take the calf away from the cow she will worry and fret about it and hold her milk, and when her year has expired her milk yield will have been about two-thirds of what it should have been—small in quantity and poor in quality. She never will forget that calf until she has another. The first three days the calf should have its mother's milk, fed just as soon as milked; after that give it a pint to a quart, mixed with skim milk, twice a day, for two or three days, gently tapering off to skim milk, mixed with a little middlings or oil meal. I am aware that some dairymen claim that the calf should get the first milk direct from the cow, and that it should remain in sight of the cow, etc. That is one way, but not the best way, and you should not be satisfied with any thing but the best. The best evidence that I am right, is because every cow I have bought from expert cow men, has produced much better results under my management than she did under theirs.

One man will tell you he wants big calves and how much more a milk fed calf is worth than a calf that is fed on skim milk. Suppose the calf is not permitted to touch the cow, but is fed whole milk until ready for the butcher, which will be about thirty days. It will require at least fifty gallons of milk to feed it thirty days. At twelve cents a gallon the milk would be worth \$6.00. The skim milk would not be worth more than \$1.25. The milk fed calf will not sell for more than about \$8.00—take from that \$6.00 for milk, and \$2.00 remain for the calf. The skim milk calf will sell any where for \$5.00—take from that \$1.25 for the skim milk and \$3.50 will remain, or a saving of \$1.50 by feeding skim milk. If the calf were permitted to suck the cow even once the loss

would be many dollars, and if it remained with the cow two or three days, the loss would be from \$10 to \$30 during the year, besides seriously affecting the milk habit of the cow.

Should Cows Go Dry?—Much has been written upon this point, and there is general disagreement because the writers talk from different standpoints. The answer to the question is: Yes and No. If the milk habit has been established and the cow does not want to go dry, milk her all the time. She is the best kind of a cow to have. If the milk habit has not been established you must go gently until it is established. Two or three generations may be necessary to cultivate the milk habit. If she will permit herself to be dried about three or four weeks, let her have a little spell off duty. If you milk her until fresh there will be no milk fever. It certainly is poor management to have a cow dry two or three months each year. Four weeks would be as long as I would permit any cow to be dry, and if there were any danger in drying her at that time I should not dry her. The talk about wear and tear of continuous milking is bosh—inactivity is what kills. -

Where Is a Cow's Home?—Where her last calf is born. In buying cows this fact is very important. When you take her from the birthplace of her last calf she will not do her best until a calf is born. It matters not whether her calf was permitted to be with her, or whether she has never seen it. If you buy a cow that has a young calf and remove both to their new home, the cow will not yield the best results until she has another calf. If you remove her to her new home and she has a calf a few days afterward, that is home. If her former owner takes her and her calf back to her former

home and permits her and the calf to get into the highway, she will most likely go back where the calf was born.

Monthly Yield of Milk.—Frequently you hear of cows that make 15, 20 and 25 pounds of butter in a week—nothing is said of how many weeks. I know of a cow that will average 17 to 18 pounds a week for five weeks, and will not make more than 250 a year. A large yield at any time shows capacity, but not continuity. Many cows will begin the year with four or five gallons of milk a day, and two months afterward will be down to one to two gallons a day and dry in four months. That kind of a cow is worthless as a dairy cow. Some cows begin away up and gradually dwindle to nothing within about eight months—the descent is something like Fig. 1 :

Fig. 1.

Another cow will begin fairly well and hang on a long time—fluctuating a little and descending gradually after she has been milking seven to eight months. See Fig. 2 :

Fig. 2.

This is a fair engraving of my cow, *Carmena*, that produced 10,741 pounds of milk in one year, which churned 859½ pounds of butter, that averaged fully 85 per cent. fat. No churning was done at a temperature above 57 degrees. Another year's record in detail of this cow is given on opposite page—No. 1. Her milk was tested regularly and carefully and the test corresponded very closely to the product of the churn. I have been offered \$1,000 for her and \$150 for one of her calves when it was six weeks old. She had only ordinary care when she produced the 859½ lbs. I am certain that she can be made to reach the 900 lb. mark easily.

The third week after being fresh, she produced 29 lbs. 7 oz. of butter—the fourth week, 30 lbs. 15 oz.—the fifth week, 29 lbs. 3 oz.

Here is the record of four of my best cows, giving the number of pounds of milk each month, the average each day in each month, the total for the year and the month in which the average for the year is found. The first and last months of each cow's year simply include the number of the days in each month remaining, after she is fresh and the number of days in the last month, necessary to make the full year. A milk year is twelve months, whether the cow has been fresh once or twice.

DAIRY FORTUNES.

29

MONTHS.

	1	2	3	4	5	6	7	8	9	10	11	12	13	Totals.
1	45 1035	42 1218	39 1209	33 990	30 930	31 930	24 744	22 682	16 480	11 341	6 90	46 1426	42 218	10,357 7%
2	42 882	38 1140	35 1085	31 930	30 930	26 806	25 750	18 558	15 450	13 403	8 248	5 140		8,420 4.6%
3	36 468	34 986	35 1085	30 900	27 837	23 690	21 651	17 527	12 360	7 217	4 120	35 385	36 576	7,802 5.3%
4	35 245	36 1116	33 957	28 868	27 810	23 713	24 720	25 875	19 589	10 300	4 28	35 1050	34 748	9,019 5.1%

No. 1 averages 863 pounds a month, the average being in the 6th month.

No. 2 averages 701 pounds a month, the average being in the 7th month.

No. 3 averages 650 pounds a month, the average being in the 7th month.

No. 4 averages 751 pounds a month, the average being in the 5th month.

While no rule will apply to all cows I think the monthly average will come about the 6th month with good milkers, and in the 7th month with poor milkers.

I begin a cow's year three days after she is fresh, and end it one year from that date. The time in the year the cow is fresh will change the monthly average. When they are fresh in September or October, and put on good grass in the spring, the monthly average comes earlier than it does when fresh in March or April.

Dehorning.—While dehorning is a cruel operation, dehorned cows produce better results than when they had their horns (although some learned dairymen say not), simply because they are more peaceable and congenial—they do not fear each other, and soon learn that they are harmless. It soothes the nervous system of the herd and the result is a larger and richer yield. The growth of the horns should be stopped when the calves are a few weeks old. A little caustic potash applied to the button will kill it. The button can be removed with the knife without causing the calf anything more than a stinging sensation. To say the least, dehorning is not very agreeable and borders on the brutal.

Young and Old Cows.—"The cow is getting old and is not worth much," is a common remark. How old is she? If properly treated she ought to be a good

milker until sixteen to eighteen years old. Generally she is not at her best until she is ten years old. I get 450 pounds of butter from cows fifteen to seventeen years old. Age brings ease and quiet—less useless exertion. Ease and comfort are necessary to the greatest flow of milk. The old cow requires more feed than the young one, as her system will not utilize feed to the best advantage.

Size of Cows.—Frequently I am asked: "What size cow is the best?" Almost all expert (?) dairy writers have manifested a lack of intelligence upon this point that is amazing. The larger anything is, other things being equal, the greater the power. The largest man, other things being equal, is the strongest man. Throughout all nature this is self evident. The larger the brain, other things being equal, the greater the mental power. The larger the cow, everything being equal, the more milk will she give. The ideal Jersey weighing 1200 pounds is better than the one weighing 1000 pounds. The cow weighing 1500 to 2000 pounds and possessing all the milk and butter points belonging to the milk breeds, is much better than a 1200-pound cow possessing all the other good points of milk breeds. Size, other things being equal, is a measure of power and capacity. A fine Jersey cow weighing 2000 pounds, and possessing the ideal form and make up, would yield 50 pounds of butter a week as easily as the 1000-pound cow yields 25 pounds a week. "But," says the pin-headed crank, "I know big cows that will not make half as much butter as others not half as big." That is true of beef cows, and of many of the milk breeds; but the other things I have spoken about are wanting. If a 1000-pound cow, equal in all other respects, will yield

more than a 600-pound cow, the same law must hold good with the 1200, 1500 and 2000-pound cow. When you can breed a cow that is an ideal dairy cow and weighs 2000 pounds, her frame work will have to be very large and all the internal organs two to three times as large as those of a 1000-pound cow. Size is no measure of capacity unless all other things are equal. About

Exile of St. Lambert.

1000 pounds is the limit for milk breeds, but time and proper breeding will make them much larger. A few years ago cattle, horses, hogs—in fact all domestic animals were much smaller than they are now. Human beings are increasing in size. The largest armor of the early Greeks and Romans is not large enough for medium-size men of to-day. Millions of years ago the human race doubtless was a race of pigmies. The big men of old are the products of lies. Three hundred years ago

the Jersey weighed about 350 pounds, and beef cattle about 800 pounds. However, I do not believe meat, milk and butter will be used two thousand years from now, as the products of the soil will be fed to the human family "direct." One acre can be made to supply food for six to ten persons, while it would not more than supply two cows, and they will not supply one person with food.

Thoroughbreds.

But few persons have any definite knowledge of what constitutes a thoroughbred. There really is no such a thing—thoroughbred means *thorough breeding*, which means that all the offspring from such animals will be equal or superior to the parents. That is not true of what *are termed* thoroughbreds. At least one-third of all the thoroughbred cows and horses are not superior to the scrub. Many so-called thoroughbred cows are bred until they are worthless—not as good as scrubs, because the original, native vigor has been bred out of them. It will require thousands of years to approximate genuine thoroughbreds—until then we shall plod along with what we have.

I doubt whether the genuine thoroughbred can be produced, because there evidently is a limit to advancement. Probably hundreds and thousands of times during the millions and billions of years of the past the tide of human advancement has ebbed and flowed and many times it may have risen far above that of the present.

Were it possible for the human race to continue to advance steadily for the next ten thousand years, the thoroughbred cow at the end of that period of time, doubtless would be yielding five to ten thousand pounds of butter a year—the thoroughbred race horse would be able to run a mile in ten seconds, and the 300-pound dairymen would have advanced to the 400 pound notch. The age of man is limited, so is the age of his advancement. All the evidence that ever has been accumulated concerning the past, tends to prove the continuous rise and fall of nations. The time may not be very distant when the best cow on the face of the earth will not produce seventy-five pounds of butter in a year, and the savage in his dug out will represent the highest human intelligence—that will be the stock from which the thoroughbreds in men as well as in cows will have to come. The highest human intelligence is gradually arriving at that conclusion, and that continuous rise and fall of human advancement is the only excuse we have for not being a thousand times superior in intelligence and in all other respects to what we are. The ideal thoroughbred cow may never come, but as long as the tide flows our way we should row with the current and do our best. Dairymen have not done one-fifth part of what they could have done. Nearly all of our dairy bred cows should be making five to six hundred pounds of butter a year.

Wide Awake Dairymen.

No dairyman is entitled to success unless he exerts himself properly. I am aware that you will say: "Yes, you may be able to do what you claim can be done, but we ignorant and inexperienced fellows can not." In this age of intelligence no dairyman is excusable for being ignorant and inexperienced very long. This book alone should open your eyes very wide and should enable you to get into the front rank of dairymen in a very few months. There are many dairy journals that will cost you from 50 cents to \$2.00 each and will be worth hundreds of dollars to you every year. No dairyman is justified in pleading ignorance and failure, who is not a subscriber to a good dairy journal—there are many of them, and any one of them will teach you ten times as much as you probably know, in two or three issues. There are many good books written about the dairy business, and you can purchase them "cheap"—any one of them will be worth ten to one thousand times what it will cost you. Dairymen should learn to use their heads as well as their hands—they should learn to think, to calculate, to manage successfully; do not be content with scrub cows, get out of the scrub class, get out quickly—quit loafing, quit bumming, keep cows that will be a credit to you—cows

that you will be proud to have your friends see ; have comfortable stables, get a separator, get a milk tester and use it, get what you must have to dairy successfully—do not plead poverty until you have done all within your power and then failed ; throw away your cigars, your tobacco—keep away from saloons when you go to town ; do your business as quickly as you can and go home ; do not loaf about the usual loafing places that are a part of every community ; do not be stingy, but spend no money except what is necessary to add to the comfort of your home ; spend your earnings, your leisure hours at home ; read, think, plan—fall in love with your business and especially with your family ; you can not succeed without being in partnership with your family, in love with your wife and children ; do not forget the cows, they will be an important factor in keeping you in love with your family ; get out of the foggy class, do not keep certain kinds of cows simply because your father or grandfather kept them ; throw away your prejudices, take on new ideas, put on a suit of new habits, new thoughts, new ways, do not be satisfied with anything but success ; keep dairy cows for dairy purposes, beef cows for beef purposes ; be clean, neat, tasty, economical, attentive, prompt, industrious ; learn to manage, to lay your plans and then execute them ; make calculations what you are going to do and then, if possible, exceed them ; make yourself believe you are going to be somebody, and you will succeed and find yourself among the up-to-date dairymen of the country—a believer in new ideas, in successful dairying and will probably thank the writer of this article for making a new man of you, and putting money in your pocket and happiness at your fireside.

Dairy Literature.

Not one dairyman out of fifty reads any dairy literature except, occasionally, some "fool" article in the newspapers. These articles, nearly always, are worse than worthless, because written by some person ignorant of the "simplest" dairy facts. Doctors so frequently write and talk nonsense about cows' milk, etc. One of the most brilliant doctors in the land stated, in an interview, which was published in a daily paper, having a large circulation, that slop fed cows gave milk so thoroughly impoverished that it was no better than water, and that cows must have rich feed to make rich milk. The "fool" editor said a man is a fool to claim that any cow will not give rich milk when fed rich feed. These are articles that keep dairymen in the dark. The worst articles I ever saw, were written by "away up" doctors; they seem to know as little as anybody, except health officers and sanitary experts. It seems strange that dairymen labor so faithfully to make a failure. They will not read as they should, and when they do read it requires a long time to teach them that they must observe, experiment and think. There are many dairy magazines, cheap in price, and no dairyman can afford to be without one or more of them. The first number of *Bro. Hoard's* splendid dairy journal I read, was worth \$1,000 to me, and that number cost $8\frac{1}{3}$ cents—good investment, was it not? What journal do I recommend? I am not advertising any magazine. If you get sample copies you can see for yourself—any of the publishers will send sample copies free. The pure dairy breed journals are the best,

those devoted exclusively to the dairy business. New questions are being asked every day, and the dairy magazines generally discuss them. Dairy books are good, and should be read and studied. In reading, endeavor to sift the kernels from the chaff, remember that you are the dairyman, and the books and magazines your aids.

Farming, Dairying and Brains.

“Anybody can farm and dairy” is a common expression. So can anybody be a lawyer, doctor, teacher, but there are few good ones. There are about five hundred times as many farmers and dairymen in the United States as lawyers, and yet there are more first-class lawyers than first-class farmers and dairymen. It requires large brain capacity and much education and training to be a first-class farmer and dairyman. The complaint about hard work and no pay among farmers and dairymen is due to inability rather than to the occupation. A good, capable man, who understands farming, dairying and gardening, is difficult to find. Our dairy and agricultural schools are doing a grand work, but very few if any of the graduates can farm and dairy successfully until they have eaten the bitter but wholesome fruit of experience. Only about one man out of four can make a success out of anything after he has received all the education and training that can be absorbed by him. Farmers, dairymen, lawyers, doctors, merchants and so

on, are born, not made. How many cows in the United States will produce four hundred pounds of butter a year? Probably one out of five can be made to yield that much. No amount of feeding, care and training can make anything but scrubs out of the other four. Four-hundred-pound cows are born, not made. Do you suppose men greatly differ from cows in respect to capacity? There is good stock and poor stock in men as well

Dairying Don't Pay.

as in cows—thoroughbreds and scrubs. You can not make a man strong mentally unless he has the prenatal foundation for it, any more easily than you can make him six feet tall when he was designed to be only five feet. A great deal of "popydoodle" is written about what education will do.

Education will do much to assist in utilizing brain power, but it will not make brains. Some men might be

educated forty years in the best dairy college in America and then would not be able to rise above the 200-pound cow, just upon the same principle that some cows can not be made to produce more than two hundred pounds of butter a year. Any man properly educated and trained is superior to what he would be uneducated and untrained. Most men are failures upon the same principle that most cows are failures—lack of capacity or quality, or both. Facts are facts, and the editor of any dairy paper in the country knows that the statements I have made are true. He knows that most men are not capable of utilizing the information placed within their reach. The educated farmer is not necessarily the farmer, who can read Latin and Greek as easily as pigs squeak; he is not necessarily the man who has what is termed a fine college education—he is the man who has learned to think, to act, to produce results. Book learning may be a great aid to him provided he has the capacity and quality to prevent it from converting him into a *tail*. Our distinguished dairymen are men whom “book learning” develops, because they have the foundation upon which to build—they are the dog and the “book learning” the tail. I expect *Dairy Fortunes* to be read by tens of thousands of dairymen, but I do not expect all of them to become *expert* dairymen. Many will read it as they do the dairy papers, when sent a sample copy, and exclaim: “What does them editors and book writers know about dairying? No man can learn me nothin’ about cows!” These are the fellows that keep the cows that produce one hundred pounds of butter a year, and prefer skim milk to forty per cent. cream. These are the fellows that farm and dairy in the moon, “chaw terbacker,” drink whiskey, and call their wives the “ole ’oman,”

and their children "brats." Successful dairying depends as much upon thoroughbred dairymen as it does upon thoroughbred cows. There are millions of intelligent, capable dairymen who simply need the necessary information to make them successful. The books that have been written have done much, but about three-fourths of the dairymen are without dairy literature of

There's No Money in Cows.

any kind. Books are good, but the dairy paper is indispensable, as it always is up-to-date, or ought to be. This article is written in a spirit of kindness, and I hope it will bear abundance of juicy fruit. Most of my life and many thousands of dollars have been spent to assist humanity in the struggle for happiness, and I learned long ago that many persons trudge along through life unconscious of the fact that they could do something if they would—could plant roses instead of thorns.

Weights of Milk, Feed, Etc.

Water	8.333	pounds, a gallon.
Milk	8.6	" "
Skim Milk . . .	8.7	" "
Butter Fat . . .	7.5	" "
Cream, 20 per cent.,	8.46	pounds, a gallon.
" 25	8.4	" "
" 30	8.34	" "
" 40	8.22	" "
" 50	8.1	" "

No. 1 Butter, 7.8 pounds a gallon (approximately).

To avoid fractions I have used 8.4 pounds as the weight of a gallon of 20 per cent cream. Sometimes a gallon will weigh more than 8.4 pounds, and sometimes it will not. Weights are approximately correct.

You will observe that 30 per cent. cream is slightly heavier than water—31 per cent. is slightly lighter than water, weighing 8.238 pounds to the gallon.

A gallon of seven per cent. milk weighs about 8.58 pounds.

Bran, fine	24	pounds a bushel.
Bran, coarse	20	" "
Cotton Seed Meal, about	50	" "
Linseed Meal, about	60	" "
Gluten Meal, about	55	" "

Gluten Feed, about	28	pounds a bushel.
Corn and Cob Meal, about	40	“ “
Oats	32	“ “
Corn	56	“ “
Ears [of corn for a bushel (before shelled)	70	“ “
One ton of oats	62½	bushels.
One ton of corn	35½	“
One ton of hay, about	500	cubit feet.

Does It Pay to Dairy?

The Kind of Cows to Keep, Etc.

The first and most important thing to be considered in successful dairying is the selection of cows. Conclude to keep nothing but good cows—keep no cow for butter that will not produce 350 pounds a year, and no cow for milk that will not produce 6,500 pounds, testing not less than 4.4 per cent. I do not recommend these cows, but place the limit low to satisfy dairymen of small expectations. I am aware that many so-called dairymen will exclaim: “Bosh!” That is not argument. You can get the cows if you want them. There are millions and millions of 350-pound cows in the United States, and more than a million of 450-pound cows, if properly fed and handled. I bought more than a dozen cows, within a mile of where I live, that would produce more than 400 pounds of butter each, and did not pay more than \$50 for any one of them.

Comparison.—Let us compare a 450-pound cow and a 350-pound one, counting butter at 20 cents a pound,

skim milk at 15 cents a 100 pounds, and the calf of the 350-pound cow at \$6.00 and that of the 450-pound cow at \$20 when five weeks old.

450 pounds of butter at 20 cts. a pound.....	\$90.00
Calf.....	20.00
6,000 pounds of skim milk, after feeding calf....	9.00
	<hr/>
Amount.....	\$119.00

350 pounds of butter at 20 cts. a pound.....	\$70.00
Calf.....	6.00
4,500 pounds of skim milk, after feeding calf....	6.75
	<hr/>
Amount.....	\$82.75

The cost of feed, labor, interest, rent, liability of death, etc., is not less than \$50 a year. This is a low estimate.

\$119 less \$50 equals \$69—profit on 450-pound cow.

\$82 less \$50 equals \$32—profit on 350-pound cow.

\$69 divided by \$32 equals $2\frac{1}{8}$. Thus you see the profit on the 450-pound cow is more than two and one-sixth times as much as on the 350-pound cow.

A fair price for a cow that will make 350 pounds of butter is about \$40.

If a 450-pound cow produces two and one-sixth times as many dollars profit, she certainly should be worth two and one-sixth times as much, or \$86.66. The difference between the two cows is too small. The difference in the net production of the two cows (\$37) is 6

per cent. interest on $\$616\frac{2}{3}$, but it is not fair to say that the 450-pound cow is worth $\$616\frac{2}{3}$ more than the 350-pound cow, because if the value of cows were calculated on that basis, the 350-pound cow would be worth $\$533\frac{1}{3}$ —the money necessary to produce $\$32$, at 6 per cent. interest. Liability of death, of accident and the limited age of usefulness, are very important in determining the value of a cow.

$\$40$ is a fair price for the 350-pound cow, but $\$86.66$ is too low for the 450-pound cow. I should value her at about $\$110$. Value in cows does not increase in proportion to increase in product. A cow that would produce 12 per cent. milk and make 2,000 pounds of butter in a year, would sell for tens of thousands of dollars, although less than $\$500$ worth of cows would produce 2,000 pounds of butter in a year.

After the most careful investigation and study, I have become satisfied that the following estimate of the value of cows is not far from being correct:

Cows that will make 300 lbs. of butter and less, beef value.

"	"	"	"	325	"	"	.....	\$	30	00
"	"	"	"	350	"	"	.....		40	00
"	"	"	"	375	"	"	.....		50	00
"	"	"	"	400	"	"	.....		65	00
"	"	"	"	425	"	"	....		85	00
"	"	"	"	450	"	"	.....		110	00
"	"	"	"	475	"	"	.....		150	00
"	"	"	"	500	"	"	.....		200	00
"	"	"	"	550	"	"	.....		275	00
"	"	"	"	600	"	"	.....		375	00
"	"	"	"	650	"	"	.....		500	00
"	"	"	"	700	"	"	...		650	00

Cows that will make 750 lbs. of butter.....	\$ 825.00
“ “ “ “ 800 “ “	1,050.00
“ “ “ “ 850 “ “	1,400.00
“ “ “ “ 900 “ “	2,000.00

The breeding properties of the cow affects her value—if she is in the 850-pound class and imparts her milking powers to her calves, she is much more valuable than if less of her power is transmitted. I have a cow in this class, and although she is not quite a thoroughbred, I have been offered nearly \$1,000 for her, and refused \$80 for her calf when a week old. The value of a cow is what she will bring at a fair, forced sale, attended by good judges of cows, and who have the money to buy a fine cow, and want her. The majority of dairymen would not pay \$100 for a cow that would make 1,000 pounds of butter in a year, because they could not be induced to believe in anything higher than a 250 to 300-pound cow. Many cows that will not make 300 pounds of butter in a year, can not be bought for \$100, because the owners think they are the best cows ever born.

Profits.—In the dairy business, where cows are kept that will make 450 pounds of butter each, profits are large enough to yield a handsome income. Suppose a dairyman keeps twenty such cows on 50 acres of good land, which will be sufficient to raise all the feed required, or its equivalent, besides sufficient feed for horses, hogs and other small stock on the farm.

Allowing \$20 each for calves five weeks old, and 18 cents a 100 pounds for skim milk, or about \$30 for calf and skim milk, after feeding calf. Allowing a loss of two calves each year, the calves and skim milk for the

twenty cows would bring \$540. Twenty cows making 450 pounds of butter each would produce 9,000 pounds a year.

For calves and
skim milk.

12 cts. a lb. net,	\$1,080,	plus \$540	.....	\$1,620
13 " " "	1,170,	" 540	.....	1,710
14 " " "	1,260,	" 540	.....	1,800
15 " " "	1,350,	" 540	.....	1,890
16 " " "	1,440,	" 540	.....	1,980
17 " " "	1,530,	" 540	.....	2,070
18 " " "	1,620,	" 540	.....	2,160
19 " " "	1,710,	" 540	.....	2,250
20 " " "	1,800,	" 540	.....	2,340
21 " " "	1,890,	" 540	.....	2,430
22 " " "	1,980,	" 540	.....	2,520
23 " " "	2,070,	" 540	.....	2,610
24 " " "	2,160,	" 540	.....	2,700
25 " " "	2,250,	" 540	.....	2,790
26 " " "	2,340,	" 540	.....	2,880
27 " " "	2,430,	" 540	.....	2,970
28 " " "	2,520,	" 540	.....	3,060
29 " " "	2,610,	" 540	.....	3,150
30 " " "	2,700,	" 540	.....	3,240
31 " " "	2,790,	" 540	.....	3,330
32 " " "	2,880,	" 540	.....	3,420
33 " " "	2,970,	" 540	.....	3,510
34 " " "	3,060,	" 540	.....	3,600
35 " " "	3,150,	" 540	.....	3,690
40 " " "	3,600,	" 540	.....	4,140
45 " " "	4,050,	" 540	.....	4,590
50 " " "	4,500,	" 540	.....	5,040

Twelve cents a pound, net, for the kind of butter an intelligent dairyman would make, borders on the ridiculous, but I have given that low a price to satisfy the "kicker." Sixteen cents a pound, at wholesale, is a low price for first-class butter, and nets \$1,980 for the twenty cows. I have been offered *thirty-five cents* a pound, at wholesale, for all the butter I could make—everything to be the best and cleanest. At thirty cents a pound twenty cows would produce \$3,240. At retail, any first-class dairyman can get thirty-five to fifty cents for all the butter he can make. At thirty-five cents a pound twenty cows would produce \$3,690 a year.

"Nonsense," exclaims the narrow guage dairyman, "You can't get thirty-five to forty cents for butter." *You* can not, but the right kind of a dairyman can. If all the persons who use milk, butter and cream, knew absolutely that perfect cleanliness had been observed in the handling of these articles, there would be three times as much dairy products used. Not one person in ten, in cities, eats butter or drinks milk without hesitating and wondering how much filth is being consumed. Not one-thousandeth part of the milk used is clean—nasty cows, nasty stables, nasty milkers, nasty butter-makers, nasty feed, nasty odors, nasty everything. Millions of persons would pay fifty cents a pound for butter and fifteen cents a quart for milk, if they knew perfect cleanliness had been observed.

What is Cleanliness in the Dairy?—A stable as clean as the home in which you live—no disagreeable odors, no foul air, no unhealthy cows, no filthy cows; every cow groomed, washed, cleaned all over, body, udder, teats, tail, head, nose, mouth, legs and feet every day, one or more times. At least one per-

son must be in and around the stable all the time, night and day. Abundance of light and fresh air—floors water tight, no filth in and about the stable ; nothing but clean, wholesome feed and water used ; no cow kept in the stable when ailing in any way ; no cow kept in the stable when in heat, nor her milk used until twenty-four hours after she has returned to her normal condition. No cow should be milked in the stable—have a milking house as clean as a parlor ; all milk pails and cans should be sterilized immediately before use, and a separate bucket used for each cow. The cow should be perfectly clean before milking begins—the milker should be as clean as though he were attending a reception in a drawing-room ; hands, face, feet, head, hair—a clean suit of white muslin, including cap, should be used every day. No spitting, chewing, smoking in the stable at any time. Milk thoroughly cooled and aerated immediately after being drawn. If separated, the cream should be cooled and aerated at once. The creamery should be perfectly clean—milk must not be exposed to any disagreeable odors, and must go to customers in that condition.

When milk and butter have been handled in this manner, there will be no difficulty in acquainting your customers with all these facts and getting fifty cents a pound for butter and fifteen cents a quart for milk. The delicacy of flavor is important, but cleanliness is much more important—cleanliness is paramount in importance. I do not know of any good butter being retailed for less than twenty-five cents a pound, in any city. Thirty cents is the usual price to regular customers. Perfect cleanliness is what sells butter for thirty-five, forty and fifty cents a pound. It would not require much of an effort to retail the product of twenty cows.

The Expenses of a dairy consisting of twenty cows, on a fifty-acre farm, would not be large. It matters not whether the dairyman owns or rents the farm. Assuming that the dairyman has a small family and no other help than himself, the expenses will be about as follows each year:

Rent for fifty acres, about	\$150
Hired man, including board	240
Shipping, delivering, fuel, seed, etc.....	160
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Expenses	\$550

In addition to the products from the cows, the dairyman would get house rent, garden, chicken products—fruit, etc., which would be worth at least \$200 a year, or about enough to pay the grocer bills and for clothing. Nearly everything to eat can be raised on the farm. If the dairyman is close to market a truck patch will add largely to his income. Two men could do all the work in first-class shape easily, and in winter the hired man could almost be dispensed with. If the farmer had one or two children twelve to sixteen years old, no other help would be required.

Deducting the expense of \$550 a year, the dairyman would have remaining at—

12 cts. a pound.....	\$1,070
13 “ “	1,160
14 “ “	1,250
15 “ “	1,340
16 “ “	1,430

17 cts. a pound.	\$1,520
18 " "	1,610
19 " "	1,700
20 " "	1,790
21 " "	1,880
22 " "	1,970
23 " "	2,060
24 " "	2,150
25 " "	2,240
26 " "	2,330
27 " "	2,420
28 " "	2,510
29 " "	2,600
30 " "	2,690

These profits can be made and they are about ten times as large as the ordinary farmer makes on fifty acres. All the feed, or its equivalent, can be raised on the fifty acres. The twenty cows should not cost more than \$2,200, if bought altogether. If three or four splendid cows were selected to begin, it would not require many years to produce a herd of twenty. A little time is necessary to grow, and no dairyman can expect to become full fledged within a few months. While the rent for fifty acres might be a little small for some localities, it is considerably above the average price. Where the rent is higher, the advantages are greater.

As the 450-pound cows will frighten many dairy-men, I shall drop to the 350-pound cow, which is to be found everywhere. Allowing \$15 for calf and skim milk, or \$300 for the twenty cows, we shall have for the 7,000 pounds of butter at—

DAIRY FORTUNES.

For calves and
skim milk.

12 cts. a pound,	\$840,	plus \$300.....	\$1,140
13 “ “	910,	“ 300.....	1,210
14 “ “	980,	“ 300.....	1,280
15 “ “	1,050,	“ 300.....	1,350
16 “ “	1,120,	“ 300.....	1,420
17 “ “	1,190,	“ 300.....	1,490
18 “ “	1,260,	“ 300.....	1,560
19 “ “	1,330,	“ 300.....	1,630
20 “ “	1,400,	“ 300.....	1,700
21 “ “	1,470,	“ 300.....	1,770
22 “ “	1,540,	“ 300.....	1,840
23 “ “	1,510,	“ 300.....	1,910
24 “ “	1,680,	“ 300.....	1,980
25 “ “	1,750,	“ 300.....	2,050
26 “ “	1,820,	“ 300.....	2,120
27 “ “	1,890,	“ 300.....	2,190
28 “ “	1,960,	“ 300.....	2,260
29 “ “	2,030,	“ 300.....	2,330
30 “ “	2,100,	“ 300.....	2,400

Deducting the expense of \$550 a year, the dairyman will have remaining at—

12 cts. a pound.....	\$ 590
13 “ “	660
14 “ “	730
15 “ “	800
16 “ “	870
17 “ “	940
18 “ “	1,010
19 “ “	1,080

20 cts. a pound.....	\$1,150
21 " ".....	1,220
22 " ".....	1,290
23 " ".....	1,360
24 " ".....	1,430
25 " ".....	1,500
26 " ".....	1,570
27 " ".....	1,640
28 " ".....	1,710
29 " ".....	1,780
30 " ".....	1,850

The lowest profit given here, \$590, is more than is made by farmers on fifty acres. Almost anywhere in the United States butter can be sold at wholesale for an average of sixteen cents a pound, or a profit of \$870. Almost anywhere first-class butter can be made to net twenty cents a pound, or \$1,150. Almost anywhere first-class butter, proven to be made in a *clean manner*, can be sold for thirty cents a pound, or \$1,850 a year for the twenty cows. These profits are away up compared to ordinary profits on a fifty-acre farm.

Selling Cream.—By selling cream the profits would be much larger. If the dairy farm were within one hundred miles of a city of 50,000 inhabitants or more, cream could be shipped each day and would command forty-five to sixty-five cents a gallon at wholesale. The twenty cows making 350 pounds of butter each, and 7,000 pounds altogether, would produce about 3,400 gallons of twenty per cent. cream, which would bring, at—

		For calves and skim milk.	
45 cts. a gallon,	\$1,530, plus	\$300...	\$1,830
50 " "	1,730, "	300.....	2,000
55 " "	1,870, "	300.....	2,170
60 " "	2,040, "	300.....	2,340
65 " "	2,210, "	300.....	2,510
70 " "	2,380, "	300.....	2,680
75 " "	2,550, "	300.....	2,850
80 " "	2,720, "	300.....	3,020
85 " "	2,890, "	300.....	3,190

Sixty cents a gallon is a fair price at wholesale, and eighty cents a gallon a low price at retail. The expenses in shipping cream would be little more than in selling butter, and the work a little less. By allowing \$75 extra for expenses, the total expense would be \$625 a year, which being deducted from the receipts at—

45 cents a gallon, would leave.....	\$1,205	profit.
50 " " " "	1,375	"
55 " " " "	1,445	"
60 " " " "	1,615	"
65 " " " "	1,785	"
70 " " " "	1,955	"
75 " " " "	2,125	"
80 " " " "	2,295	"
85 " " " "	2,465	"

These are handsome profits and can be realized almost anywhere. When within one hundred miles of a city of 200,000 or more inhabitants, sixty-five to seventy-five cents a gallon can be had for cream properly handled—even at sixty cents a gallon the profit is \$1,615, which is not very small for a puny farm of fifty acres.

Here are the figures taken from the books of a dairy January 1, 1897. This dairy farm contains 245 acres, and furnishes almost all the feed for a dairy herd averaging one hundred cows. The farm, cows, horses and entire dairy outfit invoice \$15,000, and is situated about sixty miles from a city of more than 300,000 inhabitants. It is owned by two men who are practical dairymen. The cows are not up to the 300-pound class, as a whole.

RECEIPTS.

5,064 gallons of cream, sold at an average of 54c.	\$2,734
33,130 " " milk, " " " " 11c.	3,644
4,275 pounds of butter, at an average of 18c.	769
88 calves	556
Skim milk (hogs, etc.)	782
<hr/>	
Receipts from dairy	\$8,485

EXPENSES.

Two partners, salary	\$2,400
Extra help	1,372
Taxes	147
Insurance	46
Freight and Expressage	517
Feed bought in addition to what was paid out of farm products	221
Losses, stock, bad accounts, etc	221
Incidentals, feed, light, cows, seed, etc., etc.	261
<hr/>	
Expenses	\$5,185

Receipts, \$8,485—expenses, \$5,186, equals \$3,300, or more than twenty-one per cent. interest on the capital invested. Adding to this amount the \$2,400, salaries of the two partners, we have \$5,700, or \$2,850 for each partner. The product of this dairy is much less than it should be, and the farm should furnish all the feed, or its equivalent. Two families lived on the farm and all the milk, butter, cream, etc., used by the families have not been counted—chickens, garden truck, etc., would have amounted to hundreds of dollars, if sold. Sixty good cows would have produced more than these one hundred scrubs, and the expense would have been much less.

Selling Milk.—The profits from the sale of milk are very large in comparison to that of butter. Twenty cows, on fifty acres, and giving 6,800 pounds of four and one-half per cent. milk, each will be employed as a basis for calculation. This production is not large, and is equivalent to 350 pounds of butter. Allowing 200 pounds of milk for the calf, there would be 6,600 pounds for sale, or 132,000 pounds for the twenty cows, or 15,348 gallons. Deducting 1,348 gallons for loss, milk unsold, that would have to be made into butter and sold at a reduced price, there would remain 15,000 gallons, or 60,000 quarts net, full price sales. The allowance for loss is twice what it should be, but I desire to satisfy the most extravagant, and keep within the limit of poor management.

All milk to be four and one-half per cent. and to be drawn and handled in the *cleanest manner*, and the customers to be satisfied as to that fact. Milk to be shipped in bottles sterilized and delivered by a neat, cleanly man, supplied with a clean suit of muslin or linen, every day—the delivery wagon to be a model of taste and cleanli-

ness. All these facts should be set forth in the daily papers, and a certificate of inspection, by a competent person, published weekly. Absolute cleanliness is what sells milk.

Such milk can be sold in any city for ten to fifteen cents a quart, more easily than milk handled in the usual manner, can be sold for five to six cents a quart. Any dairyman who will conduct a dairy in this manner can secure all the customers he wants.

RECEIPTS.

60,000 quarts at ten cents a quart.....	\$6,000
Calves.....	150
	<hr/>
Receipts.....	\$6,150

EXPENSES.

Rent for forty to fifty acres.....	\$175
Extra help.....	340
Shipping, fuel, seed, etc.....	260
Deliveryman, in city.....	600
Delivery horse, wagon, etc.....	175
Incidentals, tickets, bottles, breakage, losses, etc....	200
Extra feed.....	200
	<hr/>
Expenses.....	\$1,950

Receipts, \$6,150—expenses, \$1,950, equals \$4,200. The expense account has been made very large—enough to cover everything in a liberal manner. \$4,200 should

satisfy a dairyman, with a capital of not more than \$3,000.

At 8 cents a quart the profit would be.....	\$3,000
At 7 " " " " " "	2,400
At 6 " " " " " "	1,800

Even at six cents a quart the profits are \$1,800, allowing the same for expenses. They could be reduced \$200 or more, if milk were sold for six or seven cents a quart. But there would be no difficulty whatever in getting eight, ten and twelve cents a quart for milk handled properly. All that are necessary are a little business judgment and the proper neatness and cleanliness.

Milk Yield of Each Cow.—The following table shows the yield of a cow that gives 6,600 pounds of milk after feeding calf. An allowance of \$6 is made for calf-6,600 pounds equals 767 gallons.

				For calf,	
767 gallons at	7 cts. a gallon, plus	\$6.00	.....	\$	59.69
"	"	8	"	"	67.36
"	"	9	"	"	75.03
"	"	10	"	"	82.70
"	"	11	"	"	90.37
"	"	12	"	"	98.04
"	"	13	"	"	105.71
"	"	14	"	"	113.38
"	"	15	"	"	121.05
"	"	16	"	"	128.72
"	"	17	"	"	136.39
"	"	18	"	"	144.06
"	"	19	"	"	151.73

6 acres of corn for ensilage (at least)	72 tons.
8 acres of corn to mature	{ corn.....400 bushels.
	{ stover.....10 tons.
10 acres of oats to be thrashed	{ oats.....400 bushels.
	{ straw.....7 tons.
6 acres of oats for hay	15 tons.

- 3 acres of rye, for fall and spring pasture, to May 25.
 $1\frac{1}{2}$ acres of wheat, fed green, from May 25 to June 20.
 $1\frac{1}{2}$ acres of oats and peas, fed green from June 20 to
 July 10.
 2 acres of sorghum, to be fed from July 10 to Dec. 31.
 $\frac{1}{2}$ acre of mangels.....800 bushels.
 8 acres of millet hay..... 16 tons.
 4 acres of buckwheat.
 3 acres of peas and barley for fall feed.
 About 14 acres for pasture.

The rye ground can be planted in corn after rye is pastured or cut for green feed.

The wheat ground can be used for sorghum or barley and peas.

The oats ground can be used for millet, buckwheat, etc.

The oat and pea ground can be resowed.

The corn can be ground cob and all.

The oats should be ground.

The stover, sorghum, etc., can be fed until Dec. 1 to Jan. 1, before ensilage is opened. There will be an abundance of ensilage for winter, and to fill in during summer; ensilage ground can be used for rye and wheat. One or two acres can be used for trucking and can be made to produce several hundreds of dollars. There will be two or three crops of sorghum.

These are simply pointers and can be varied to suit the section of country, and the whims of the dairyman.

The mangels will be of great value, if properly stored and fed—the cows will relish them and the milk flow will be increased. The quantity of feed that can be

raised on thirty to forty acres of good ground is enormous, every acre will support a cow in good shape.

There is money in dairying, and a little capital, brains, enterprise and the proper information are all that are necessary to a greater degree of success than can be attained in most other industries. Elevate your ideas and then work up to them. Good cows, good business sense and cleanliness, and success is certain to be with you.

Thoroughbred Figures.—The preceding dairy examples apply to the common, every-day dairyman. The thoroughbred dairyman can do many times as much. If he lives within fifty miles of a large city, has a few thousand dollars and is a first-class business man, he can own almost all the land around him, when he has been in business ten to twenty years. If he lives where he has to depend upon butter making altogether he can accumulate a large fortune in less than a score of years. Tens of thousands of farmers in the United States have farms of 400 acres and more. A 400-acre farm will support, in good style, 200 cows besides horses, calves, etc., raised and used on the farm—one and one-half acres, with the present advancement in farming, will keep a cow better than nine-tenths of them are kept. I shall start with the 300-pound cow, the pride of nearly all dairymen. The average price of Elgin butter, for several years, has been about eighteen cents a pound. I shall be liberal in this case and place the price at seventeen cents. Butter properly made and handled will sell several cents above Elgin prices. As I have said, on another page, I have been offered thirty-five cents a pound at wholesale for all the butter I would make, in the proper way. I can do better, besides I have about quit work, except for other persons.

RECEIPTS.

60,000 pounds of butter at 17 cts. a pound.....	\$10,200
About 180 calves at \$7 each.....	1,260
About 960,000 pounds skim milk, 15c. a 100 lbs.,	1,440
	<hr/>
Receipts	\$12,900

EXPENSES.

Foreman.....	\$ 600
Twelve helpers	2,800
Extra feed.....	1,000
Tubs, shipping, etc.....	400
Commission	400
Losses, fuel, etc.	600
	<hr/>
Expenses	\$5,800

Receipts, \$12,900—expenses, \$5,800, equals \$7,100 for the farmer, out of which taxes and insurance are to be paid, although house rent, fruit, garden truck, etc., would more than pay for them. The \$7,100 would represent the farmer's brain work, and the interest on about \$25,000 invested, or nearly twenty-five per cent. net, on the money invested, and a salary to the farmer of \$1,000.

Fifteen cents a hundred pounds is a low price for skim milk, fed, and the extra for feed can be dispensed with—by proper management of the farm, ice can be stored by the farm help. A first-class dairyman and business man can increase this profit considerably. The price of calves is \$1 to \$3 each too low, because many of them can be converted into cows. Where is the four-hundred-acre farm that makes half as much? If this

butter maker lives within one hundred miles of a large city his profits will be larger, as the shipping and other expenses will be less.

If our dairyman lives within 60 miles of a large city and sells milk and cream in the city, his profits will be two to three times as large. By retailing 4.4% milk at six cents a quart and 20% cream at ten cents a pint, the following will be the result: 200 cows, giving 6,000 pounds of milk each, equals 1,200,000 pounds; allowing 20,000 pounds for loss, reduced price, for unsold milk, etc., there will remain 1,180,000 pounds; by using 180,000 pounds for cream, it would make 37,268 pints; the remaining 1,000,000 pounds of milk would equal 465,111 quarts.

RECEIPTS.

37,268 pints of cream, at ten cents a pint.....	\$ 3,726
465,111 quarts of milk at six cents a quart.....	27,906
180 calves at \$7 each	1,260
	<hr/>
Receipts	\$32,892

EXPENSES.

Foreman	\$ 600
Twelve helpers	2,800
Extra feed	900
Eight deliverers	4,000
Horses and wagons	500
Shipping.....	800
Losses, feed, etc.....	1,000
	<hr/>
Expenses	\$10,600

Receipts, \$32,892—expenses, \$10,600, equals \$22,292, or about 90% on the investment, after paying the farmer a fair salary. If you want to do so, you can drop a few thousand dollars on this estimate, and then have a handsome income. Six cents a quart for milk handled as it should be is a low price; seven, eight, nine and ten cents can be gotten for it. All you have to do is to keep your dairy as I have described under the head of "Clean Dairy." "Great Cæsar!" exclaimed a prominent dairyman when I read this estimate to him; "That would make a man a fortune in a year or two." As much can be done, and more, if the proper man undertakes it.

Why do not more dairymen make these large profits? Because they are not first-class business men, or do not desire to assume large responsibilities. I have considerable money invested in the dairy business, and it is yielding me from twenty to forty per cent. interest, and nearly all of the management is in the hands of very ordinary business men. Do you know that most men do not expect success beyond an income of a few hundred or a few thousand dollars a year? If you explain to them how they can make \$10,000 to \$20,000 a year, they will exclaim: "I don't want to make that much. All I want is a good living, and if I don't have much left when I am gone, my children will have to hustle for themselves." There is no reason why there should not be as many millionaires among farmers as among any other class of persons.

Butter Hungry.

Butter Substitutes, Etc.

About 1,000,000,000 pounds of butter are made, in a year, in the United States, or about fourteen pounds to each person. The product of most of the cows, is consumed by the families that own them. Several millions of our population do not eat an ounce of butter, each, in a year—they cannot afford it. It is safe to assert that 10,000,000 persons, in the United States, do not consume 10,000,000 pounds of butter in a year—they have to spend their money for something to keep the babies from starving. The poorest, axle grease butter, will cost ten cents a pound, and ten cents will buy ten pounds of wheat, containing five times as much nutriment as one pound of butter. Not one tenth of the persons get one half the butter they want, and they could not get it if they had the money to pay for it, because the product is not large enough to supply more than one-fourth of our population. Is it strange that butter substitutes are made? They will be made, and the product will continue to increase; temporarily, the industry may be crippled by law, but necessity will revive it.

We should be fair, and not permit our selfishness to warp our judgments. Poverty and lack of products

demand butter substitutes. Paid experts declare that butter substitutes are not wholesome, and other paid experts declare that they are more wholesome than butter. The uninterested, unprejudiced scientific investigator says they are in no way injurious. The \$ is the basis of nearly all objection to the substitutes. Hundreds of thousands of pounds of cheap, rotten butter are taken from the cities every year, into the country, worked over, and sold to unsophisticated city people as fine, fresh, country butter. Butter substitutes must be made, or about half of our population do without any kind of butter. Good butter substitutes are much more palatable, cleaner and more wholesome than most of the butter made. There is not, and cannot be any objection to first class butter substitutes, from a hygienic stand-point. If nothing but pure, clean fat is used, and manufactured in a clean manner, it is as clean as any butter can be made, and will cost almost as much as first-class butter. I am willing to admit that butter substitutes made from dirty, filthy material, and in a dirty, filthy manner, are not fit to eat—neither is most of the butter made, fit to eat. I cannot understand why a benevolent, kindly-disposed, intelligent person should oppose first-class butter substitutes, and I believe no other person living has investigated this subject more carefully than I have.

Poor butter substitutes are not wholesome, neither is poor butter. I am not ready to admit that the price of butter is lower on account of butter substitutes. If it is, ten persons are benefited by low prices where one is injured. Poor, rotten, musty butter is the principal cause of butter being low in price. Probably the average price paid for all the country butter in the United States by

grocerymen and general storekeepers will not exceed eight cents a pound, cash.

There are substitutes for almost every article of food. *At least two-thirds* of all the *honey, maple sugar* and *maple syrup* are not genuine. The bees do not make the honey, and but little of the maple sugar and syrup has any of the real juice in it. It is almost impossible to get pure buckwheat flour. There is not as large a proportion of the genuine article in these products as there is of milk product in oleomargerine. Most of the tea sold is a tea substitute. Your coffee is manufactured, and soaked in a weak solution of *copperas*; rosin is in all beer; strychnine in whiskey, and millions of pounds of butter mixed with oleomargerine by the most radical, away up dairymen who bribe the poor food commissioners. The position of health officer in a city of 200,000 inhabitants and above, is generally worth from \$25,000 to \$50,000 a year. Why? Any man who has investigated knows why. Nearly all dairymen who live within the jurisdiction of the health officer pays the monthly bribe necessary for a clean dairy report. He pays it whether his dairy is clean or dirty. He gets it back by fooling his customers. He has paid the blackmail price, and is as guilty as the blackmailer, consequently cannot squeal. I could fill a book larger than this one, upon this subject, including all branches of business, from the Presidency of the United States to the position of road supervisor. In the face of the thousands of facts that can be adduced to show that adulteration and trickery are common as leaves in autumn, butter substitutes that are demanded by poverty do not cut much of a figure. How many creameries are engaged in buying axle grease butter, working it over, and passing it as the genuine

article? It is either sold to strangers at the full price, or a reduction of one cent a pound is made, because it is a little "off." If all butter made were good the price would be $33\frac{1}{3}\%$ higher than it is. Let us begin at home, and after we have been engaged a few years in reforming our own methods, it will be time to seek new fields. There are greater evils in dairymdom than butter substitutes, which should be sold for just what they are, and for nothing else. Strict laws should be enacted to prevent the sale of butter substitutes for butter. I know of nothing better than to prohibit the coloring of butter substitutes: let them be sold upon their merits.

Our Foreign Market.—It is both amusing and disgusting to hear our dairy friends talk about our foreign trade and how to develop it. We do not have any use for a foreign trade, as we do not make one-fourth enough butter to supply our home population. Give our own people all the butter they want, and we shall be compelled to produce many times the quantity we do, or import butter. When we become slightly civilized, we shall dispense with poverty, which is not as much the result of the poor themselves as it is of the rich. When we become a little more civilized we shall realize that it is just as much our duty to assist the poor, and needy, and helpless as it is to pay a note for borrowed money. Every other human being is a partner in our prosperity. He helped us make what we have. Substitute "DUTY" for the fraud *charity* and all will be rich, and much happier. Substitute *humanity* for dishonesty, and there will be a market that cannot be supplied.

Milk and Cream Testing.

It is foolish to buy a cow without testing her carefully. It is foolish to keep cows unless you know that they pay. Test them carefully and find out which pay and which do not. There is nothing difficult about testing. A testing outfit consists of the following articles :

A centrifugal machine.

Milk, cream and skim milk bottles.

Pipet.

Acid measure.

Acid.

Milk testing outfits are cheap—they can be bought as low as \$2. A good, four bottle machine can be had for \$4 ; an eight to twelve bottle machine for \$6. To test successfully the bottles should be whirled 700 to 1,000 revolutions a minute. Within ten minutes any dairyman can attach a treadle to these machines, and by using his foot the speed can be increased and the labor reduced to pleasure.

Test Bottles.—The accompanying test bottles are necessary, to successful and simple testing :

The milk bottle is scaled from one to ten per cent.
 The cream bottle is scaled from one to thirty per cent.

The skim milk bottle is scaled from one-tenth to six-tenths per cent.

The Sample.—To get a good sample of milk for testing, it is necessary to have the milk from which you

take the sample thoroughly mixed. The best time to get the sample is when the milk is fresh—just from the cow. The milk should be poured from one vessel to another, two or three times. Then put the end of pipet in your mouth, and draw it nearly full of milk; place your finger over the upper end, quickly, and by admitting a little air, let the milk run down, gently, until the *A* mark is reached; empty the milk in pipet into milk bottle; blow in the pipet to expel all the milk adhering to the sides.

Sulphuric acid should be used. Many dairymen use the commercial acid; I prefer the refined acid. It should not be too strong nor too weak; its specific gravity should be 1.82 to 1.83. Fill acid measure to the mark at *B* and empty into milk bottle in which you have put the pipet of milk. In pouring acid into milk bottle, incline bottle to an angle of about forty-five degrees, to prevent acid from falling directly into milk in bottle. It should run down the side of the neck of the bottle. If acid falls directly into milk it is liable to scorch it. If any milk adheres to neck of milk bottle, turn the bottle gently while the acid is being poured in, and the neck of bottle will be washed clean.

Neat Milk Test Machine.

Opened and closed. Shows inclination of bottles when in motion. They incline to prevent milk from being thrown out when in motion.

Shake the bottle thoroughly, giving it a rotary motion, until the milk and acid are well mixed. Do not shake "up and down," or you are liable to get your fingers burnt. Do not be afraid of shaking too much. If you have several bottles to fill they should be ready for the machine as quickly as possible.

Place the bottles in the machine and turn rapidly, (at least 700 revolutions a minute), four or five minutes, when each bottle should be filled to the neck with boiling water; this can be done by use of pipet, by sucking the boiling water into pipet and emptying into bottles. For reasons that are too hot for explanation, do not suck the water into your mouth. Turn the machine again about a minute; fill the bottles with boiling water to the seven or eight per cent. mark, and turn again a minute or more and you will be ready to read the measure of fat on neck of bottles. If the test is a good one, the acid will be a bright golden color. If the fat in the neck of bottles is a little stiff, set bottles in boiling water a few minutes.

Color of Butter Fat.—If butter fat in neck of bottles is dark or mixed with scales, the acid is too strong; if it is a pale yellow color, the acid is too weak. When acid is too strong, use a little less of it; reducing the temperature of the milk to forty-five to fifty degrees will assist you. It is claimed that diluting acid spoils it, but some of the best tests I ever made were made with diluted acid. I poured the acid measure about one-fifth full of water and then filled with acid. When acid is too weak, warming milk to 100 degrees will help somewhat.

Cream Testing is done the same as milk testing, except that it is necessary to use just a little more cream

than milk. A pipet holding 18 c c should be used; the milk pipet can be used by filling with cream to a point about three-fourths of an inch above the 17.6 c c mark. The principal reason for using more cream than milk, is because the cream, being thicker than milk, does not enter the small opening in the pipet as freely as milk, consequently in drawing the pipet full of cream, too large a proportion of the skim milk, in the cream, enters the pipet. When the cream is measured without using pipet, 17.6 c c of cream seem to be about right.

Skim Milk is tested same as milk and cream, except two pipet measures of skim milk and two measures of acid are used.

Temperature of milk and cream for testing should be about sixty-five degrees; a few degrees higher or lower will not affect the test perceptibly.

Why Some Tests Disagree.—Samples taken from fresh milk and cream nearly always test somewhat higher than samples taken from milk and cream several hours old; because it is almost impossible to mix them thoroughly after the cream and skim milk have separated, and because the cream becomes stiff and will not enter pipet in its proper proportion. The customer in the city or at the creamery frequently gets the long end of the butter fat bargain on account of this test condition of milk and cream. By heating to 90 to 100 degrees and stirring thoroughly, a good sample can be procured.

Composite Test.—The composite test is very convenient. Instead of testing every day, samples of milk can be taken every day for ten days to two weeks, and all tested at one time. Potassium Bichromate will preserve milk and cream a long time—a month or longer,

without spoiling; corrosive sublimate can be used, but it is much more poisonous and more dangerous. A small fruit jar or large neck bottle can be used for each cow. Place in each jar a small quantity of potassium bichromate—one-half of what will lie on a five cent piece, and put in a sample of milk each day, or at each milking; one to two ounces will be sufficient for a sample. Shake the jar and mix contents well before putting in a new sample. Keep in a cool place. There should be enough of the preservative to keep the milk in a perfectly liquid state. It will make the milk slightly yellow. You can test when convenient—the samples will keep a month or longer. Be sure to keep samples in a cool place, and use enough preservative to prevent souring. When ready to test, mix contents of each jar thoroughly and test in the usual way. Beware of poison!

Some Frauds are to be found among the tests used by many dairymen. Quantity of cream is not a measure of quality; the height of a column of cream is very changeable. It is customary for customers to fill a glass tube about ten inches long with milk or cream and guess at the quality by the comparative height of the cream column in the tube. Scores of tests have demonstrated that this is not a fair test, and that frequently four per cent. milk will show more cream than six per cent. milk, and fifteen per cent. cream less skim milk than twenty per cent. cream.

My first experience was with milk set in deep cans, equal in height and in diameter, and an equal quantity of milk in each can. Milk in cans was not equal in quality:

Cream in can No. 1 measured $\frac{1}{4}$ in. in depth and tested 24%										
"	"	"	2	"	$3\frac{7}{8}$	"	"	"	"	$23\frac{1}{2}$ "
"	"	"	3	"	$4\frac{1}{2}$	"	"	"	"	$22\frac{1}{2}$ "
"	"	"	4	"	$4\frac{1}{4}$	"	"	"	"	26 "
"	"	"	5	"	$3\frac{1}{5}$	"	"	"	"	$23\frac{1}{2}$ "
"	"	"	6	"	$4\frac{3}{4}$	"	"	"	"	$21\frac{1}{4}$ "
"	"	"	7	"	$3\frac{1}{2}$	"	"	"	"	$24\frac{1}{4}$ "
"	"	"	8	"	$3\frac{7}{8}$	"	"	"	"	$21\frac{1}{2}$ "
"	"	"	9	"	4	"	"	"	"	22 "
"	"	"	10	"	3	"	"	"	"	$25\frac{1}{5}$ "

Here are some queer results ; No. 1, four inches deep showed twenty-four per cent. cream, while No. 7, three and one-half inches in depth showed twenty-four and one-fourth per cent. cream. In No. 9, four inches in depth showed twenty-two per cent. cream.

Five cans of milk, thoroughly mixed before put in cans, so that milk in all the cans would be equally rich, equal in temperature, equal in quantity, and set at the same time showed the following results :

Cream in can No. 1 measured $4\frac{1}{2}$ inches, and tested 24 %										
"	"	"	2	"	$4\frac{1}{4}$	"	"	"	"	$24\frac{2}{5}$ "
"	"	"	3	"	$4\frac{5}{8}$	"	"	"	"	$23\frac{1}{8}$ "
"	"	"	4	"	$4\frac{1}{8}$	"	"	"	"	$26\frac{1}{10}$ "
"	"	"	5	"	$4\frac{3}{4}$	"	"	"	"	$22\frac{3}{5}$ "

The variation in this case is considerable.

Different systems of raising cream produce different results. Twenty per cent. separator cream frequently shows more skim milk and less cream in the glass tubes than fifteen per cent. gravity cream. One day twenty per cent. separator cream will show more skim milk than

it will another day, although the quality of the cream is the same, the length of time after separation equal, and all the other conditions the same, as nearly as it is possible to have them. The quality of cream that rises on milk or on cream will vary ten to twenty-five per cent.

Testing Butter.—Fill three-fourths full, glass tube, ten inches high and three-fourths of an inch in diameter, with butter, packing it in with a round piece of wood nearly the size of the hollow in the tube; put the tube in hot water about ten minutes, letting the water reach as high as butter in tube; do not use boiling water. Pour in about twenty-five drops of sulphuric acid, and place in hot water again until the fat and brine are separated. Measure exactly the length of the column of fat and also the length of the column of brine. As the brine contains the acid which is about one-fifteenth part of the brine column, subtract one-fifteenth from the length of brine column to get the exact length of brine.

Multiply the length of fat column by .3, and the length of the brine column by .4. Divide the product of the fat column multiplied by .3, by the product of the brine column multiplied by .4 and subtract the quotient from 100, and you will get the per cent. of fat in the butter.

Example.—Suppose fat column is 6 inches and brine column $1\frac{1}{2}$ inches; subtract $\frac{1}{15}$ from $1\frac{1}{2}$ and the remainder is $1\frac{13}{30}$ inches, the length of brine column.

Fat column, 6 inches by .3 equals 1.8 inches.

Brine column, $1\frac{13}{30}$ by .4 equals .5733 inches.

.5733 divided by 1.8 equals .318.

100 minus .318 equals .682 per cent. fat in butter.

Watered Milk.—If you have six per cent. milk and guarantee to sell your customers four per cent. milk, it matters not whether you put in two per cent. clean water or two per cent. skim milk to reduce it to four per cent. In most of the states there are laws regulating the sale of milk. A certain per cent of fat is necessary—generally not less than three per cent. Milk, testing less is condemned, and the seller liable to prosecution, whether the milk is watered or naturally is below the standard. The price of milk should be governed by the quantity of fat it contains. Do not worry about water as long as the milk tests high enough:

Cheese Testing.—Get a fair sample by cutting a slice from center to circumference; cut it fine, and put about five grains in milk test bottle and add about three-fourths of a pipet of hot water, and shake frequently, until cheese is soft and liquid; keep it warm or it will not dissolve properly. Let the contents of bottle cool to about sixty-five degrees; add acid, same as in milk testing; shake until cheese is dissolved, and complete test same as with milk. Multiply per cent. of fat shown by test bottle by eighteen, and divide the product by the number of grains of cheese used, and you will have per cent of fat in cheese.

Feed for Cows.

Rations, Ensilage, Etc.

The proper way to feed cows and the kind and quality of feed, are very important to the dairyman. Much has been learned by experiment, and rapid strides have been made in the right direction, but the subject of feeding is a difficult one to handle, and it will be a long time before anything like perfection will be attained—chemical analysis and scientific experiments have aided in solving the feed problem. The jump from the foggy methods, to the best that are known, seems to be a little too much of a leap for the ordinary dairyman to attempt, without much fear and trembling.

There is a right and a wrong way to do nearly everything, and a majority of dairymen are disposed to the wrong way. The most difficult thing to overcome is prejudice; every person should endeavor to improve upon what his ancestors thought and did. The man who is content with simply equaling his father in intelligence and morals, is not a good citizen. A certain quantity of feed is necessary to sustain life properly, and if that is all a cow gets, she can not be expected to furnish any milk.

Rations.—It has been demonstrated that a cow will not produce the best results unless she is fed all she will eat, greedily of such feed as will supply all the constituents, in proper proportion, necessary to sustain life and to produce the largest quantity of milk. You can not build much of a house out of brick, iron, stone, mortar, wood or glass, but by using all of them in proper proportions, a good house can be built. You can not produce good milk results by feeding a cow corn, bran or hay, but by a proper combination of these articles she will yield a large quantity of milk if she is a good cow. A wagon may have three strong wheels, but if the fourth wheel is puny and weak, the wagon will be almost worthless. A properly balanced ration is strong in all its parts.

Balanced Rations.—The first analysis of feed is into *ash, water and organic matter*. If an article of feed is thoroughly heated and dried, all of the water will be expelled. If the remaining dry matter is burned, a small quantity of ash will remain. *The organic matter* is what is left after the water and the ash have been subtracted from the whole feed, and contains all the nutrients found in the feed, while the water and the ash are partly or wholly utilized by the animal organism, it hardly can be claimed that they are necessary nutrients.

The organic matter can be subdivided into *protein, carbohydrates and fat*.

Protein is that part of the organic matter necessary to form the lean meat, hair, horns, skin, blood, muscles, ligaments, nerves, and especially the casein and albumen of milk. It comprises the nitrogenous elements of food.

Carbohydrates are the fuel for running the animal machinery and comprise the sugar, starch and gums of feeds.

Fat is simply what its name implies, and evidently supplies the fat of the milk and assists in furnishing steam to run the animal machinery. The relation between Fat and Protein, in the production of milk, is not as clearly understood as some experts claim. The relation seems to be very close. They seem to sympathize with each other. Fat is more powerful in supplying animal heat than carbohydrates—it is about two and one-fifth times as powerful.

It is impossible for the animal organism to utilize all of the *protein*, *carbohydrates* and *fat* in the organic matter—part of these articles is not digested—consequently the totals of protein, carbohydrates and fat in a ration are not equal in weight to the organic matter in the ration. A ration simply contains the *digestible nutrients* of the organic matter. The *Nutritive Ratio*, as it is termed by some dairy writers, is obtained by dividing the amount of the carbohydrates and fat by the protein. The fat must first be multiplied by two and one-fifth to reduce it to the equivalent of carbohydrates. This nutritive ratio is of no importance to the dairyman, and is entirely superfluous dairy information. The standard ration tells you how much organic matter, protein, carbohydrates and fat necessary, and without these harmonious proportions a ration is not good.

Hundreds of times have I been asked this question: "If all the nutrients of the food are contained in the protein, carbohydrates and fat, what difference does it make whether or not any attention is given to the number of pounds of organic matter in a ration?" A cow must have quantity as well as quality of feed. It is very important to her whether she must eat twenty or sixty pounds of organic matter to get the required supply of

digestible nutrients. Experiments show that there is a close relation between the quantity of organic matter and digestible nutrients.

Careful Experiments have demonstrated that a thousand-pound cow, not in milk, and kept where she can not get any exercise, will neither gain nor lose in flesh, if fed a daily ration of about seventeen and one-half pounds of organic matter containing about seven-tenths pounds of digestible protein, eight pounds of digestible carbohydrates and fifteen hundredths pounds of digestible fat. A larger cow requires more—a smaller cow less. This is what is called a *maintenance ration*.

If the cow is in full flow of milk she will require about twenty-five pounds of organic matter, containing digestible nutrients about as follows: Two and one-half pounds of protein, thirteen pounds of carbohydrates and seven-tenths pounds of fat. If the cow is larger and gives a very large quantity of milk, this ration must be increased to suit the circumstances. If she is smaller, or gives but little milk, less feed will be necessary.

A cow that gives rich milk requires a larger portion of protein and fat than the cow that produces poor milk, and the dairyman must exercise good judgment in feeding, or he will not be successful.

A cow giving twelve pounds of three per cent. milk a day could get along very well on a ration of digestible nutrients about as follows:

1.8	pounds	protein.
11	"	carbohydrates.
.5	"	fat.

A cow giving fifty pounds of six per cent. milk a day would require at least :

3 pounds protein.
 14 " carbohydrates.
 .8 " fat.

The nutritive ratio would be about one to five and one-fourth.

Standards for Rations for 1,000-Pound Cows.—The following table generally has been accepted as representing good dairy intelligence. They differ considerably and all can not be correct, and all are simply approximately correct. Great men will differ and experts *never agree*.

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
Maintenance.....	17.5	.7	8	.15
Wolff.....	24.	2.5	12.5	.4
Woons & Phelps.....	25.	2.5	12.5	.65
Woll	24.5	2.2	13.3	.7

All agree very nearly on the organic matter. Woll is too low in protein and Wolff is entirely too low in fat.

Long and careful experimenting induces me to believe that the best results can only be obtained by a ration rich in protein and fat. A fluctuation of one or two pounds in organic matter and carbohydrates, is not always greatly important, but a drop in protein and fat is disastrous to the milk flow.

Woll's ration is about right in fat, but the protein should not fall below 2.5 pounds for cows in full flow of milk. A one-thousand-pound cow, giving forty pounds of five per cent. milk, should have at least 2.6 pounds of protein and 2.8 pounds if she gives fifty pounds of five per cent. milk.

For one-thousand-pound cows, giving forty pounds of five per cent. milk, I prefer the following ration :

Organic matter.....	25 pounds.
Protein.....	2.6 “
Carbohydrates.....	13 “
Fat.....	.7 “

A twelve-hundred-pound cow, giving six per cent. milk, should have a larger ration—about as follows:

Organic matter.....	27 pounds.
Protein.....	2.8 “
Carbohydrates.....	14 “
Fat.....	7.5 “

Poor, bony cows will utilize a larger quantity of protein and fat than cows that fatten more readily.

Variety.—There are many important things besides balanced rations to be considered in feeding. The cow loves variety, and her feed should be changed often. She must relish her feed, and she will not do well if she does not like the feed she gets. Jucy, succulent feed in the winter, although it may not contain much nutriment, if fed in connection with rich feed, will produce grand results—it assists digestion and assimilation, cools the system and stimulates the nervous forces.

Quantity is necessary—a cow must not feel empty, consequently she must have a large quantity of light feed—too much concentrated feed and a scarcity of fodder will make her nervous and fretful.

Bugbear.—The construction of ration tables is a bugbear that frightens the ordinary dairyman. To him there is an awful mystery about it, which causes him to believe that none but superior minds can grasp it. This is all a mistake—any person with ordinary intelligence can unravel the ration mystery and formulate his own rations.

RATION TABLE.

The following table shows, approximately, the per cent. of organic matter and digestible nutrients in each article given:

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	per cent.	per cent.	per cent.	per cent.
Clover silage	.254	.010	.135	.010
Corn silage.....	.220	.012	.140	.007
Sorghum silage.....	.228	.006	.149	.002
Corn fodder.....	.620	.003	.380	.012
Corn Stover.....	.565	.020	.334	.006
Alfalfa hay.....	.842	.076	.378	.013
Blue grass hay.....	.802	.058	.384	.016
Marsh hay.....	.869	.035	.447	.017
Millet hay.....	.863	.045	.464	.010
Mixed grasses hay.....	.794	.036	.427	.810
Pea hay.....	.785	.076	.400	.015

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	per cent.	per cent.	per cent.	per cent.
Prairie hay.....	.813	.035	.418	.014
Red clover hay.....	.785	.065	.349	.016
Red top hay.....	.867	.066	.488	.013
Timothy hay.....	.824	.030	.439	.012
Timothy and clover.....	.804	.047	.394	.014
Oat hay.....	.849	.043	.464	.015
Sheaf oats.....	.715	.040	.360	.017
Oat straw.....	.857	.016	.414	.007
Rye straw.....	.897	.008	.427	.004
Wheat straw.....	.862	.008	.379	.005
Carrots.....	.104	.010	.071	.003
Mangels.....	.080	.010	.048	.002
Potatoes.....	.201	.014	.161	.001
Red beets.....	.105	.009	.076	.001
Rutabagas.....	.102	.009	.071	.002
Sugar beets.....	.126	.011	.093	.001
Sweet potatoes.....	.279	.009	.222	.003
Turnips.....	.087	.006	.055	.002
Barley.....	.867	.095	.661	.012
Brewers' grains, dry.....	.887	.162	.355	.053
Brewers' grains, wet.....	.233	.039	.095	.013
Malt sprouts.....	.845	.198	.362	.017
Buckwheat.....	.854	.077	.492	.018
Buckwheat bran.....	.865	.074	.304	.019
Buckwheat middlings.....	.822	.220	.334	.054
Corn.....	.876	.063	.648	.050
Corn and cob meal.....	.834	.065	.563	.029
Corn bran.....	.896	.095	.598	.046
Germ meal.....	.860	.090	.612	.062

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	per cent.	per cent.	per cent.	per cent.
Gluten meal.....	.005	.295	.396	.128
Gluten feed.....	.908	.186	.483	.111
Cottonseed.....	.796	.098	.279	.169
Cotton seed hulls.....	.872	.010	.262	.018
Cotton seed meal.....	.846	.369	.181	.123
Flax seed.....	.872	.185	.260	.274
O. P. oil meal.....	.851	.283	.328	.071
N. P. oil meal.....	.841	.272	.329	.027
Cleveland oil meal.....	.846	.321	.251	.026
Oats.....	.860	.091	.447	.041
Peas.....	.869	.180	.560	.011
Rye.....	.865	.083	.655	.012
Rye bran.....	.848	.097	.480	.019
Sunflower seeds.....	.843	.138	.246	.186
Wheat.....	.877	.093	.558	.018
Wheat bran.....	.824	.126	.441	.029
Wheat middlings.....	.845	.122	.472	.030
Wheat shorts.....	.836	.116	.454	.032
Sorghum.....	.580	.024	.380	.012
Wheat hay.....	.810	.032	.430	.011
Oat and pea hay.....	.820	.060	.440	.015
Rye hay.....	.800	.030	.430	.014

To find the organic matter and digestible nutrients, multiply the number of pounds of feed by the per cent. after each article of feed in the table and point off the decimals and you will have the pounds and fractions of a pound.

By the aid of the Ration Table any dairyman can prepare his own ration formula. Suppose a dairyman has bran, cotton seed meal, corn and cob meal, clover hay and corn stover, how will he construct a balanced ration from these ingredients? The most expert ration artist will be compelled to experiment a little before he can produce a well balanced ration. He may have to make two or three rations before he gets the best one.

Example: Suppose you want to feed twelve pounds of clover hay, you multiply as follows:

12 lbs. by	.785—9.42	lbs., Organic matter.
12 " "	.065—.78	" Protein.
12 " "	.349—4.18	" Carbohydrates.
12 " "	.016—.19	" Fat.

The ciphers can be omitted as they are of no value, except to enable you to place your point. For practical purposes the third decimal figure can be dropped.

For Convenience of Dairymen I have prepared a table showing the number of pounds of *organic matter*, *protein*, *carbohydrates* and *fat* in a given number of pounds of feed. This table will save multiplications in constructing rations.

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
20 lbs. Ensilage.....	4.40	.24	2.80	.14
25 " "	5.50	.30	3.50	.18
30 " "	6.60	.36	4.20	.21
35 " "	7.70	.42	4.90	.25
40 " "	8.80	.48	5.60	.28
10 lbs. Corn fodder.....	6.20	.30	3.80	.12
12 " " "	7.44	.36	4.56	.14
15 " " "	9.30	.45	5.70	.18
20 " " "	12.40	.60	7.60	.24
22 " " "	13.64	.66	8.36	.26
10 lbs. Corn stover.....	5.65	.20	3.34	.06
12 " " "	6.78	.24	4.01	.07
15 " " "	8.47	.30	5.01	.09
18 " " "	11.17	.36	6.01	.11
20 " " "	11.30	.40	6.68	.12
22 " " "	12.43	.44	7.35	.13
25 " " "	14.12	.50	8.35	.15
8 lbs. Alfalfa hay.....	6.73	.61	3.02	.10
10 " " "	8.42	.76	3.78	.13
12 " " "	10.10	.91	4.54	.16
15 " " "	12.63	1.14	5.67	.20
18 " " "	15.13	1.37	6.80	.23
20 " " "	16.84	1.52	7.56	.26

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
8 lbs. Millet hay.....	6.90	.36	3.71	.08
10 " " "	8.63	.45	4.64	.10
12 " " "	10.36	.54	5.57	.12
15 " " "	12.95	.68	6.96	.15
18 " " "	15.53	.81	8.35	.18
20 " " "	17.26	.90	9.28	.20
8 lbs. Mixed grass hay,	6.35	.29	3.42	.08
10 " " " "	7.49	.36	4.27	.10
12 " " " "	9.53	.43	5.12	.12
15 " " " "	11.91	.54	6.41	.15
18 " " " "	14.29	.65	7.69	.18
20 " " " "	15.88	.72	8.54	.20
8 lbs. Pea hay.....	6.28	.61	3.20	.12
10 " " "	7.85	.76	4.00	.15
12 " " "	9.42	.91	4.80	.18
15 " " "	11.78	1.14	6.00	.23
18 " " "	14.13	1.37	7.20	.27
20 " " "	15.70	1.52	8.00	.30
8 lbs. Prairie hay.....	6.50	.28	3.34	.11
10 " " "	8.13	.35	4.18	.14
12 " " "	9.76	.53	5.01	.17
15 " " "	12.21	.53	6.27	.21
18 " " "	14.63	.63	7.52	.25
20 " " "	16.26	.70	8.36	.28
22 " " "	17.89	.77	9.20	.31
25 " " "	20.35	.88	10.45	.35

	Organic mater.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
6 lbs. Clover hay	4.71	.39	2.09	.10
8 " " "	6.28	.52	2.79	.13
10 " " "	7.85	.65	3.49	.16
12 " " "	9.42	.78	4.19	.19
15 " " "	11.78	.98	5.24	.24
18 " " "	14.13	1.17	6.28	.29
20 " " "	15.70	1.30	6.98	.32
8 lbs. Timothy hay	6.59	.24	3.46	.10
10 " " "	8.24	.30	4.32	.12
12 " " "	9.89	.36	5.18	.14
15 " " "	12.36	.45	6.48	.18
18 " " "	14.83	.54	7.78	.22
20 " " "	16.48	.60	8.64	.24
8 lbs. Timothy and clover,	6.43	.38	3.15	.11
10 " " " "	8.04	.47	3.94	.14
12 " " " "	9.65	.56	4.73	.17
15 " " " "	12.06	.71	5.91	.21
18 " " " "	14.47	.85	7.29	.25
20 " " " "	16.08	.94	7.98	.28
6 lbs. Oat hay	5.09	.26	2.78	.09
8 " " "	6.79	.34	3.71	.12
10 " " "	8.49	.43	4.64	.15
12 " " "	10.19	.52	5.57	.18
15 " " "	12.74	.65	6.96	.23
18 " " "	15.28	.77	7.15	.27
20 " " "	16.98	.86	9.28	.30

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
6 lbs. Oat straw.....	5.14	.10	2.48	.04
8 " " "	6.85	.13	3.31	.06
10 " " "	8.57	.16	4.14	.07
12 " " "	10.28	.19	4.97	.08
15 " " "	12.86	.24	6.21	.11
6 lbs. Wheat straw....	5.17	.05	2.26	.03
8 " " "	6.90	.06	3.03	.04
10 " " "	8.62	.08	3.79	.05
12 " " "	10.34	.10	4.55	.06
15 " " "	12.93	.12	5.69	.08
6 lbs. Rye straw.....	5.38	.05	2.56	.02
8 " " "	7.17	.06	3.42	.03
10 " " "	8.97	.08	4.27	.04
12 " " "	10.76	.10	5.12	.05
15 " " "	13.41	.12	6.41	.06
8 lbs. Oat and pea hay,	6.56	.48	3.52	.12
10 " " " "	8.20	.60	4.40	.15
12 " " " "	9.84	.72	5.28	.18
15 " " " "	12.30	.90	6.60	.23
18 " " " "	14.76	1.08	7.92	.27
20 " " " "	16.40	1.20	8.80	.30
8 lbs. Wheat hay.....	6.48	.25	3.44	.09
10 " " "	8.10	.32	4.30	.11
12 " " "	9.72	.38	5.16	.13
15 " " "	12.15	.48	6.45	.17
18 " " "	14.58	.58	7.74	.20
20 " " "	16.20	.64	8.60	.22

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
8 lbs. Sorghum hay	4.64	.19	3.04	.10
10 " " "	5.80	.24	3.80	.12
12 " " "	6.96	.29	4.56	.14
15 " " "	8.70	.36	5.70	.18
18 " " "	10.44	.43	6.84	.22
20 " " "	11.60	.48	7.60	.24
6 lbs. Carrots	.62	.06	.43	.02
8 " "	.83	.08	.57	.02
10 " "	1.10	.10	.71	.03
12 " "	1.25	.12	.85	.03
15 " "	1.56	.15	1.07	.04
18 " "	1.87	.18	1.28	.05
20 " "	2.08	.20	1.42	.06
8 lbs. Mangels	.64	.08	.38	.02
10 " "	.80	.10	.48	.02
12 " "	.96	.12	.58	.02
15 " "	1.20	.15	.72	.03
20 " "	1.60	.20	.96	.04
8 lbs. Potatoes	1.61	.11	1.29	.00
10 " "	2.01	.14	1.61	.01
12 " "	2.41	.17	1.93	.01
15 " "	3.02	.21	2.42	.02
8 lbs. Turnips	.70	.05	.44	.02
10 " "	.87	.06	.55	.02
12 " "	1.04	.07	.66	.02
15 " "	1.31	.09	.83	.03
20 " "	1.74	.12	1.10	.04

		Organic matter.	Digestible Nutrients.		
			Protein.	Carbo- hydrates.	Fat.
		lbs.	lbs.	lbs.	lbs.
1 lb.	Barley.....	.87	.10	.66	.01
2 "	"	1.73	.19	1.32	.02
3 "	"	2.60	.29	1.98	.04
4 "	"	3.47	.38	2.64	.05
5 "	"	4.34	.48	3.31	.06
6 "	"	5.20	.57	3.97	.07
3 lbs.	Bran.....	2.47	.38	1.32	.09
4 "	"	3.30	.50	1.76	.12
5 "	"	4.12	.63	2.21	.15
6 "	"	4.94	.74	2.65	.17
7 "	"	5.77	.88	3.09	.20
8 "	"	6.59	1.01	3.52	.23
9 "	"	7.42	1.13	3.97	.26
10 "	"	8.24	1.26	4.41	.29
2 lbs.	Brewers' grains, dry,	1.77	.32	.71	.11
3 "	" " " "	2.66	.49	1.07	.16
4 "	" " " "	3.55	.65	1.42	.21
5 "	" " " "	4.44	.81	1.78	.27
6 "	" " " "	5.32	.97	2.13	.32
7 "	" " " "	6.21	1.13	2.49	.37
8 "	" " " "	7.10	1.30	2.84	.42
6 lbs.	Brewers' grains, wet	1.40	.23	.57	.01
7 "	" " " "	1.63	.27	.68	.01
8 "	" " " "	1.86	.31	.76	.02
9 "	" " " "	2.10	.35	.86	.02
10 "	" " " "	2.33	.39	.95	.02
11 "	" " " "	2.56	.43	1.05	.02
12 "	" " " "	2.80	.47	1.14	.03

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
13 lbs. Brewers' grains, wet	3.03	.51	1.24	.03
14 " " " "	3.26	.55	1.33	.03
15 " " " "	3.50	.59	1.43	.03
2 lbs. Buckwheat.....	1.71	.15	.98	.04
3 " " " " " "	2.56	.23	1.48	.05
4 " " " " " "	3.42	.31	1.97	.07
5 " " " " " "	4.27	.39	2.46	.09
6 " " " " " "	5.12	.46	2.95	.11
3 lbs. Buckwheat bran,	2.60	.22	.91	.06
4 " " " " " "	3.46	.30	1.22	.08
5 " " " " " "	4.33	.37	1.52	.10
6 " " " " " "	5.19	.44	1.82	.11
7 " " " " " "	6.06	.52	2.13	.13
8 " " " " " "	6.92	.59	2.43	.15
9 " " " " " "	7.79	.70	2.74	.17
10 " " " " " "	8.65	.74	3.04	.19
2 lbs. Buckw't middl'gs,	1.64	.44	.67	.11
3 " " " " " "	2.47	.66	1.00	.16
4 " " " " " "	3.29	.88	1.34	.22
5 " " " " " "	4.11	1.10	1.77	.27
6 " " " " " "	4.93	1.32	2.00	.32
7 " " " " " "	5.75	1.54	2.34	.38
8 " " " " " "	6.58	1.76	2.67	.43
9 " " " " " "	7.40	1.98	3.00	.49
10 " " " " " "	8.22	2.20	3.34	.54

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
2 lbs. Corn	1.75	.13	1.30	.10
3 " "	2.63	.19	1.94	.15
4 " "	3.40	.25	2.59	.20
5 " "	4.38	.32	3.24	.25
6 " "	5.26	.38	3.89	.30
7 " "	6.13	.44	4.54	.35
8 " "	7.01	.50	5.18	.40
3 lbs. Corn bran	2.69	.16	1.79	.14
4 " " "	3.58	.21	2.39	.18
5 " " "	4.48	.27	2.99	.23
6 " " "	5.38	.32	3.59	.28
7 " " "	6.27	.38	4.19	.32
8 " " "	7.17	.43	4.78	.37
2 lbs. Corn and cob meal,	1.67	.13	1.13	.06
3 " " "	2.50	.20	1.69	.09
4 " " "	3.34	.26	2.25	.12
5 " " "	4.17	.32	2.72	.15
6 " " "	5.00	.39	3.38	.17
7 " " "	5.84	.46	3.94	.20
8 " " "	6.67	.52	4.50	.23
9 " " "	7.51	.59	5.07	.26
10 " " "	8.34	.65	5.63	.29
2 lbs. Peas	1.73	.36	1.12	.02
3 " "	2.61	.54	1.68	.03
4 " "	3.48	.72	2.24	.04
5 " "	4.35	.90	2.80	.06

DAIRY FORTUNES.

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo- hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
6 lbs. Peas.....	5.21	1.08	3.36	.07
7 " "	6.08	1.26	3.92	.08
8 " "	6.95	1.44	4.48	.09
2 lbs. Rye	1.73	.17	1.31	.02
3 " "	2.60	.25	1.97	.04
4 " "	3.46	.33	2.62	.05
5 " "	4.33	.41	3.28	.06
6 " "	5.19	.50	3.93	.07
7 " "	6.06	.58	4.59	.08
8 " "	6.92	.66	5.24	.10
2 lbs. Rye bran.....	1.70	.19	.96	.03
3 " " "	2.64	.29	1.44	.05
4 " " "	3.39	.39	1.92	.06
5 " " "	4.24	.49	2.40	.08
6 " " "	5.09	.58	2.88	.10
7 " " "	5.94	.68	3.36	.11
8 " " "	6.78	.78	3.84	.13
2 lbs. Sunflower seed..	1.69	.28	.49	.37
3 " " " ..	2.53	.41	.74	.56
4 " " " ..	3.37	.55	.98	.74
5 " " " ..	4.22	.69	1.23	.93
6 " " " ..	5.06	.83	1.48	1.12
2 lbs. Wheat.....	1.75	.19	1.12	.04
3 " "	2.63	.28	1.67	.05
4 " "	3.51	.37	2.23	.07
5 " "	4.39	.47	2.79	.09
6 " "	5.26	.56	3.35	.11

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
2 lbs. Wheat middlings,	1.69	.24	.94	.06
3 " " "	2.54	.37	1.42	.09
4 " " "	3.38	.49	1.89	.12
5 " " "	4.23	1.61	2.36	.15
6 " " "	5.07	1.73	2.83	.18
2 lbs. Malt sprouts,....	1.69	.39	.72	.03
3 " " "	2.54	.59	1.09	.05
4 " " "	3.38	.79	1.45	.07
5 " " "	4.23	.99	1.81	.09
6 " " "	5.07	1.19	2.17	.10
7 " " "	5.92	1.39	2.53	.12
2 lbs. Gluten meal,....	1.81	.59	.79	.26
3 " " "	2.72	.89	1.19	.38
4 " " "	3.62	1.18	1.58	.51
5 " " "	4.53	1.48	1.98	.64
6 " " "	5.43	1.77	2.38	.77
2 lbs. Gluten feed,....	1.82	.37	.97	.22
3 " " "	2.72	.56	1.45	.33
4 " " "	3.63	.74	1.93	.44
5 " " "	4.54	.93	2.42	.56
6 " " "	5.45	1.12	2.90	.67
1 lb. Cotton seed,....	.80	.10	.28	.17
2 " " "	1.59	.20	.56	.34
3 " " "	2.39	.29	.84	.51
4 " " "	3.18	.38	1.12	.68
5 " " "	3.98	.49	1.40	.85

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.
1 lb. Cotton seed meal,	.85	.37	.18	.12
1½ lbs. " " "	1.27	.55	.27	.18
2 " " " "	1.69	.74	.39	.25
2½ " " " "	2.11	.92	.45	.31
3 " " " "	2.54	1.11	.54	.37
3½ " " " "	2.99	1.29	.63	.43
4 " " " "	3.38	1.48	.72	.49
1 lb. Oil meal, O. P. . .	.85	.28	.33	.07
1½ " " " " . .	1.28	.42	.49	.11
2 " " " " . .	1.70	.57	.66	.14
2½ " " " " . .	2.13	.71	.82	.14
3 " " " " . .	2.55	.85	.98	.18
3½ " " " " . .	2.98	.99	1.15	.25
4 " " " " . .	3.40	1.13	1.31	.28
1 lb. Flax seed.	.87	.19	.26	.27
2 lbs. " "	1.74	.37	.52	.55
3 " " "	2.62	.56	.78	.82
4 " " "	3.49	.74	1.04	1.10
2 lbs. Oats.	1.72	.18	.89	.08
3 " "	2.58	.27	1.34	.12
4 " "	3.44	.36	1.79	.16
5 " "	4.30	.46	2.24	.21
6 " "	5.16	.55	2.68	.25
7 " "	6.02	.64	3.13	.29
8 " "	6.88	.73	3.58	.33

Wherever the fractions were $\frac{1}{2}$ they have been counted 1. From this table the dairyman can construct any ration required. "Add together" enough of such kinds of feed as will make the most convenient ration, which should be as nearly as possible, like the standard balanced ration, which is :

$$24.5 \text{ lbs. organic matter, } \begin{cases} 2.5 \text{ lbs. protein.} \\ 13.3 \text{ lbs. carbohydrates.} \\ .7 \text{ lbs. fat.} \end{cases}$$

Cows will eat from twenty to twenty-five pounds of stover a day. Suppose we say twenty-two pounds, and five pounds of clover hay, about six pounds of bran, two and one-half pounds cotton seed meal, and two pounds corn and cob meal.

FORMULA NO. 2.	Organic matter,	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
22 lbs. corn stover.....	12.43	.44	7.34	.13
5 " clover hay.....	3.92	.32	1.74	.08
6 " bran.....	4.94	.75	2.64	.17
2 $\frac{1}{2}$ " cotton seed meal .	2.11	.92	.45	.30
2 " corn and cob meal	1.67	.13	1.12	.05
Totals.....	25.07	2.56	13.29	.73

This is a splendid ration, and a milk producer.

From these five articles, several rations can be constructed. Here is another :

FORMULA No. 3.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 lbs. corn stover.....	8.37	.30	5.01	.09
10 " clover hay	7.85	.65	3.49	.16
7 " bran	5.76	.88	3.08	.20
1½ " cotton seed meal .	1.26	.55	0.27	.19
2 " corn and cob meal	1.66	.13	1.12	.06
Totals.....	25.00	2.51	12.97	.70

Another splendid ration.

FORMULA No. 4.

15 lbs. clover hay	11.77	.97	5.23	.24
10 " corn stover.....	5.65	.20	3.34	.06
4 " bran	3.29	.50	1.76	.11
2 " cotton seed meal .	1.69	.73	0.36	.24
3 " corn and cob meal	2.50	.19	1.69	.08
Totals.....	24.90	2.59	12.38	.73

FORMULA No. 5.

20 lbs. corn stover.....	11.30	.40	6.68	.12
10 " clover hay	7.85	.65	3.49	.16
5 " bran.....	4.12	.63	2.20	.14
2 " cotton seed meal.	1.69	.73	0.36	.25
1 corn and cob meal..	0.83	.06	0.56	.03
Totals.....	25.79	2.47	13.29	.70

You will observe in making calculations that when the third figure is more than one-half, I call it one.

FORMULA No. 6.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
8 lbs. corn stover.....	4.52	.16	2.67	.05
15 " clover hay.....	11.75	.97	5.23	.24
10 " bran.....	8.24	1.26	4.41	.29
2 " corn and cob meal	1.66	.13	1.12	.06

Totals..... 26.17 2.52 13.43 .64

In this ration the cotton seed meal is omitted.

FORMULA No. 7.

6 lbs. corn stover.....	3.39	.12	2.00	.04
12 " clover hay.....	9.42	.78	4.18	.19
11 " bran.....	9.06	1.38	4.85	.32
3 " corn and cob meal	2.50	.19	1.68	.09
Totals.....	24.37	2.47	12.71	.64

FORMULA No. 8.

18 lbs. clover hay.....	14.13	1.17	6.28	.29
8 " bran.....	6.59	1.00	3.52	.23
5 " corn and cob meal	4.11	0.33	2.81	.15
Totals.....	25.83	2.50	12.61	.67

The stover is omitted in this ration.

FORMULA No. 9.

20 lbs. corn stover.....	11.30	.40	6.68	.12
4 " oat straw.....	3.43	.06	1.66	.03
7 " bran.....	5.76	.88	3.09	.20
3 " peas.....	2.61	.54	1.68	.03
2 " gluten meal.....	1.81	.59	0.79	.26
Totals.....	24.91	2.47	13.90	.64

FORMULA No. 10.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
10 lbs. corn stover	5.65	.20	3.34	.06
12 " clover hay	9.44	.78	4.18	.19
7 " oats	6.02	.64	3.12	.29
5 " peas	4.35	.90	2.80	.06
Totals	25.46	2.52	13.44	.60

FORMULA No. 11.

35 lbs. ensilage.....	7.70	.42	4.90	.24
10 " alfalfa hay	8.42	.76	3.78	.13
3 " buckwheat midlings	2.48	.66	1.00	.16
7 " oats	6.02	.64	3.12	.28
Totals	24.62	2.48	12.80	.81

FORMULA No. 12.

15 lbs. clover hay.	11.77	.98	5.23	.24
7 " corn stover.....	3.95	.14	2.34	.04
10 " bran.....	8.24	1.26	4.41	.29
2 " corn and cob meal	1.67	.13	1.12	.06
Totals	25.63	2.51	13.10	.63

FORMULA No. 13.

20 lbs. corn stover.....	11.30	.40	6.68	.12
6 " clover hay	4.71	.39	2.08	.10
8 " bran.....	6.59	1.01	3.53	.23
2½ " oil meal.....	2.97	0.70	0.82	.17
Totals... ..	25.57	2.50	13.11	.62

FORMULA No. 14.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
18 lbs. clover hay	14.13	1.17	6.28	.29
5 " corn and cob meal	4.17	0.32	2.82	.15
8 " bran	6.59	1.01	3.53	.23
Totals	24.89	2.50	12.63	.67

FORMULA No. 15.

20 lbs. prairie hay	16.27	.70	8.36	.28
8 " bran	6.59	1.01	3.53	.23
2 " cotton seed meal.	1.69	.73	0.36	.24
Totals	24.54	2.44	12.25	.75

FORMULA No. 16.

30 lbs. ensilage	6.60	.36	4.20	.21
10 " oat hay	8.49	.43	4.64	.15
8 " bran	6.59	1.01	3.53	.23
2 " oil meal	1.70	.57	0.65	.14
2 " corn and cob meal	1.67	.13	1.12	.05
Totals	25.05	2.50	14.14	.78

FORMULA No. 17.

10 lbs. pea hay	7.85	.76	4.00	.15
10 " clover and timothy hay	8.04	.47	3.94	.14
8 " bran	6.59	1.01	3.53	.23
4 " corn and cob meal	3.33	.26	2.25	.11
Totals	25.81	2.50	13.72	.63

FORMULA No. 18.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
18 lbs. corn stover.....	10.17	.36	6.01	.10
8 " oat hay.....	6.79	.34	3.71	.12
7 " bran.....	5.76	.88	3.09	.20
3 " gluten meal.....	2.41	.88	1.18	.38
Totals	25.13	2.46	13.99	.80

FORMULA No. 19.

35 lbs. ensilage	7.70	.42	4.90	.24
10 " oat straw.....	8.57	.16	4.14	.07
8 " bran.....	6.59	1.01	3.53	.23
3 " oil meal.....	2.55	.86	.98	.21
Totals	25.41	2.45	13.55	.75

FORMULA No. 20.

20 lbs. clover hay.....	15.70	1.30	6.98	.32
5 " barley	4.33	.47	3.30	.06
5 " bran.....	4.14	.63	2.20	.15
1 " oil meal.....	.85	.28	0.32	.07
Totals.....	25.02	2.68	12.80	.60

FORMULA No. 21.

30 lbs. ensilage ...	6.60	.36	4.20	.21
15 " corn stover.....	8.48	.30	5.01	.09
4 " bran	3.29	.50	1.76	.11
4 " malt sprouts.....	3.38	.79	1.44	.06
2 " gluten meal.....	1.81	.59	.79	.25
Totals.....	23.56	2.54	13.20	.72

FORMULA No. 22.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 lbs. corn stover	8.47	.30	5.01	.09
10 " clover hay	7.85	.65	3.49	.16
8 " bran	6.59	1.01	3.53	.23
2 " oil meal	1.70	.56	.65	.14
Totals	24.61	2.52	12.68	.62

FORMULA No. 23.

10 lbs. corn stover	5.65	.20	3.34	.06
12 " millet hay	10.35	.54	5.56	.12
9 " bran	7.41	1.13	3.96	.26
2 " cotton seed meal.	1.70	.56	.65	.14
Totals	25.11	2.43	13.51	.58

FORMULA No. 24.

25 lbs. corn stover	14.12	.50	8.35	.15
8 " bran	6.59	1.01	3.53	.23
2 " cotton seed meal.	1.69	.73	.36	.24
3 " corn cob meal....	2.50	.19	1.67	.09
Totals	24.90	2.43	13.93	.09

FORMULA No. 25.

15 lbs. clover hay	11.77	.98	5.23	.24
10 " corn stover	5.65	.20	3.43	.06
5 " peas	4.34	.90	2.80	.06
5 " oats	4.30	.45	2.23	.21
Totals	26.06	2.53	13.60	.57

FORMULA NO. 26.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
35 lbs. ensilage	7.70	.42	4.90	.24
10 " millet hay	8.63	.45	4.64	.10
10 " bran	8.24	1.26	4.41	.29
1 " cotton seed meal	.84	.37	.18	.12
Totals	25.41	2.50	14.13	.75

FORMULA NO. 27.

40 lbs. ensilage	8.80	.48	5.60	.28
9 " oat straw	7.71	.14	3.72	.06
9 " bran	7.41	1.13	3.97	.26
2 " cotton seed meal	1.69	.73	.36	.24
Totals	25.61	2.48	13.65	.84

FORMULA NO. 28.

14 lbs. millet hay	12.08	.63	6.49	.14
10 " corn stover	5.65	.20	3.34	.06
5 " peas	4.34	.90	2.80	.06
4 " gluten feed	3.62	.74	1.93	.44
Totals	25.69	2.47	14.56	.70

FORMULA NO. 29.

10 lbs. clover hay	7.85	.65	3.49	.16
12 " millet hay	10.35	.54	5.56	.12
8 " dry brewers' grains	7.09	1.30	2.84	.42
10 " mangels	.80	.10	.48	.02
Totals	26.09	2.59	12.37	.72

FORMULA No. 30.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 lbs. cow pea hay.....	11.77	1.14	6.00	.23
12 " millet hay.....	10.35	.54	5.56	.12
3 " gluten meal.....	2.71	.88	1.18	.38
Totals.....	24.83	2.56	12.74	.73

FORMULA No. 31.

20 lbs. red top hay.....	17.34	1.32	9.76	.26
9 " bran.....	7.41	1.13	3.97	.26
Totals.....	20.75	24.45	13.73	.52

FORMULA No. 32.

20 lbs. pea hay.....	15.70	1.52	8.00	.30
15 " clover hay.....	11.77	.98	5.23	.24
Totals.....	27.47	2.50	13.23	.54

No grain used in this ration.

FORMULA No. 33.

20 lbs. timothy hay.....	16.44	.60	8.78	.24
6 " buckwheat midd'gs	4.93	1.32	2.00	.32
4 " bran.....	3.29	.50	1.76	.11
Totals.....	24.66	2.42	12.54	.67

FORMULA No. 34.

20 lbs. oat hay.....	16.98	.86	9.28	.30
5 " buckwheat midd'gs	3.11	1.10	1.67	.27
5 " bran.....	4.12	.63	2.20	.14
Totals.....	24.21	2.59	13.15	.71

FORMULA No. 35.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 lbs. pea hay.....	11.77	1.14	6.00	.22
10 " timothy hay.....	8.24	.30	4.39	.12
4 " gluten feed.....	3.62	.74	1.93	.44
2 " peas.....	1.73	.36	1.12	.02
Totals.....	25.36	2.54	13.44	.80

FORMULA No. 36.

10 lbs. oats.....	8.60	.91	4.47	.41
10 " bran.....	8.24	1.26	4.41	.29
25 " Potatoes.....	5.03	.33	4.03	.02
Totals.....	21.87	2.50	12.91	.72

No fodder used in this ration.

FORMULA No. 37.

22 lbs. tim. and clover hay	17.69	1.03	8.67	.30
7 " bran.....	5.76	.88	3.09	.20
1½ " cotton seed meal.	1.27	.55	.27	.18
Totals.....	24.72	2.46	12.03	.68

FORMULA No. 38.

18 lbs. pea hay.....	14.13	1.37	7.20	.27
12 " oats.....	10.32	1.09	5.36	.49
Totals.....	24.45	2.46	12.56	.76

FORMULA No. 39.

10 lbs. red top hay.....	8.67	.66	4.88	.13
15 " millet hay.....	12.96	.68	6.96	.15
3 " cotton seed meal.	2.54	1.11	.54	.37
Totals.....	24.17	2.45	12.38	.65

FORMULA NO. 40.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 lbs. oat hay.....	12.74	.65	6.96	.23
10 " bran.....	8.24	1.26	4.41	.29
2 " peas.....	1.74	.36	1.12	.03
20 " mangels.....	2.00	.25	1.20	.05
Totals.....	24.72	2.52	13.69	.60

I Believe in Strong Rations.

The reader will observe that I believe in strong rations, especially in *protein* and *fat*. A ration as low as two pounds in protein is all right for a stripper, or a cow that gives about a gallon of milk a day. I am aware that thousands of dairymen are satisfied with one and three-fourths, two, and two and one-half pounds of protein, but they are satisfied with poor success. I believe in the same success in dairying as in other lines of business. Can not expect much from the dairy as long as dairymen are satisfied with 300 and 350 pound butter cows.

To balance a ration it is very important to have some highly nitrogenous feed. It is as important to have the right kind of feed as to have the right kind of cows. Bran, cotton seed meal, oil meal, gluten meal and feed, clover hay and all the choice milk feeds should not be fed to dry cows, bulls, calves and other stock not in flush of milk; stripping cows do not demand much of these feeds.

Oil Meal (Linseed Meal.)

While oil meal is an excellent milk feed, generally, it should not be fed except as a bowel regulator and to keep a cow in proper condition when she comes fresh. Nine times in ten cotton seed meal is cheaper by the ton, and is worth at least twenty-five per cent. more as a milk producer. When cost and results are considered, cotton seed meal is worth thirty-three and one-third per cent. more than oil meal. I have used oil meal in some of the rations constructed, but I did it to cover the field more thoroughly. I would not be without oil meal as a system regulator. It saves physic. Permit me to suggest that cows do not produce the best results when the bowels are too lax; when a cow slightly tends to costiveness she gives best results. This is true of the entire animal world. A laxative condition tends to impoverish secretions and weaken nervous energy.

Rich milkers must have an abundance of rich feed. From the rations I have constructed the dairyman can find one or more that will suit his case—at least by a little alteration. Any dairyman can construct his own rations by the aid of the ration table and a little good sense.

Wheat Bran.

For all purposes, coarse wheat bran can not be excelled for milk cows—it is an all around feed. It possesses quantity as well as quality, and is rich in protein, the part of a ration that is lacking in nearly all feed. A cow must have bulk as well as quality; her stomach must be filled or she is not satisfied. Coarse bran is the best; it is richer, and the cow relishes it more than she

does fine bran. The cow likes it, there is nothing about it to injure flavor, it keeps the cow healthy, and is cheap. It can be purchased almost any place, and greatly assists in balancing a ration.

Cotton Seed Meal.

As a milk producer, cotton seed meal excels all other kinds of feed, as far as we know. In protein it is the highest, and as all fodder, hay, etc., are low in protein, cotton seed meal is the best article to build up the protein column. Dairymen know how quickly the flow of milk can be increased by cotton seed meal, and how readily it decreases when they cease to feed it. As it is very fine and solid, it must be mixed with coarse feed. About four parts of coarse bran to one part of cotton seed meal makes a good mixture. It will pack in the stomach, if fed by itself, and will not be properly digested. It is a good idea to mix it with cut hay or fodder of some kind. It can not be fed in large quantities for several reasons; but few cows relish it, and feed must be eaten greedily to produce the best results. Too much of it will injure the flavor of milk and butter, and will make the butter so hard that it will be difficult to work and handle it. Too much of it tends to give butter a rank or old flavor. It is a splendid article for making hard, solid butter in summer. Churning can be done at a higher temperature when cotton seed meal is fed. Two to three pounds a day can be fed without any danger of any kind; that is about all cows will relish. I have fed four and five pounds without producing any serious results. It will pay any dairyman to feed it, if not more than one pound a day. It possesses a magic power for

opening the milk fountains. It has a tendency to age butter sooner than other articles of feed. Cotton seed meal should have a bright, golden color; if dark, it is not good. It tends to constipation, and should be fed with some laxative feed.

Gluten Feed and Meal.

Gluten *meal* is bolted and the *feed* has the bran in it, and the difference between them is about the same as between coarse bran and middlings. They are rich in protein and fat, and are splendid articles to feed to poor, bony cows. If a cow fattens readily, gluten should be fed sparingly. It can be fed in large quantities and is slightly laxative and tends to make soft butter. It is a splendid article to balance a ration, cows eat it greedily. I prefer the gluten feed to meal, as it is coarse and more easily handled by the stomach. For cows that are thin and poor, gluten is an excellent feed. It does not affect flavor of milk and butter.

Cotton Seed Hulls.

Cotton seed hulls are low in protein and fat—a poor feed—difficult to digest, and I know of no other feed that is as nearly the opposite of cotton seed meal as cotton seed hulls. If you want to dry a cow, cotton seed hulls will assist you. I have experimented with this feed until I am satisfied that it does not belong in a well regulated dairy.

Corn, and Corn and Cob Meal.

Corn is a universal feed in the United States. It is fed to almost all farm animals, and most cow owners believe it to be the ideal cow feed for milk and butter.

As a rule it is fed whole, and the cow is permitted to use her jaws and stomach to the best of her ability. If she can not crush it, she swallows it whole, and she not only feeds herself but two or three hogs. There is one advantage in feeding whole corn in winter; it gives her exercise, and keeps her from freezing. When the thermometer registers zero it is not unusual to see a cow steaming with heat from the effort necessary to crush her whole corn feed. Cows may be able to eat "nubbins" or ears cut in several pieces and get along fairly well and give a quart of milk twice a day, but it is economy to have a hog accompany them. Whole corn is not fit for cows. Ground corn is about thirty per cent. better for fattening than whole ears. For milk, ground corn is too fattening, and fat cows are only good for the butcher. Poor, bony cows can utilize corn much better than any other kind. It should not be fed to milk cows in large quantities—three to four pounds a day will be sufficient. There is a great difference between corn meal and corn and cob meal. The fattening tendency of corn and cob meal is less than corn meal. As a milk producer a pound of corn and cob meal is a much better feed than a pound of corn meal. A bushel of corn meal weighs fifty-six pounds, while a bushel of corn and cob meal weighs seventy pounds; consequently the corn and cob meal is worth fully twenty-five per cent. more as a milk producer than corn meal. There is almost no nutriment in cobs, but the assistance they afford the digestive apparatus in disposing of the corn is considerable. Five to eight pounds of corn and cob meal can be fed to advantage. The ground cob stimulates the flow of gastric juice, prevents packing in the stomach, and greatly assists in the assimilation of the food. When a foot-ball, weigh-

ing one pound is thrown at you it is not difficult to catch, but to catch an iron ball weighing a pound is not an easy matter. Rather than feed large quantities of corn to cows, it is better to exchange some of it for bran.

Oats.

Ground oats can be fed to cows successfully when not worth more than twenty-two cents a bushel. Sixty-two and one-half bushels of oats make a ton; at twenty two cents a bushel equals \$13.75. A ton of ground oats is worth a little more than a ton of good bran—eight to ten per cent. more. The reader can readily determine when it is cheaper to feed oats. Generally oats are fifteen to forty per cent. higher than bran, while the feeding difference does not exceed ten per cent.

Rye and Rye Bran.

Rye and rye bran, in some respects, are preferable to oats—not quite as fattening. Rye should be ground and fed with some coarser feed. It takes about thirty-six bushels to make a ton, and generally a ton of it costs about as much as oats. When not more than thirty-five cents a bushel, it can be fed to cows profitably.

Wheat Middlings.

Wheat middlings are no better than bran for cows, and nearly always cost more. On account of greater solidity, they tend to fatten more than bran. For poor, bony cows they are good—their fattening properties exceed corn, and when fed in connection with corn, the greatest fattening results can be obtained.

Buckwheat.

Buckwheat makes a good winter feed, on account of its heating properties, but as a milk producer it is from twenty-five to thirty per cent. inferior to wheat bran. Buckwheat middlings are rich in protein and fat, and are an excellent feed and a milk producer. Generally buckwheat is much costlier than bran, and can not be fed with economy. It is better to feed it with coarser feed. Its tendency is to make hard, crumbly butter. Buckwheat straw is worthless as cow feed. Buckwheat does not produce sores and scabs, as claimed by some persons.

Barley.

Barley is about equal to rye as a cow feed, and in feeding it the price must be considered. By comparing it with wheat bran the reader can determine its feeding qualities.

Malt Sprouts.

Malt sprouts make an excellent cow feed, and generally are cheap. There is not much danger about "off flavor." When it is convenient, it will pay to feed malt sprouts.

Brewers' Grains.

Dry brewers' grains are fully as good as malt sprouts, but can not be recommended for flavor when fed in large quantity. The dry feed is best every way, especially as to flavor. When convenient, and the highest quality of milk and butter is not expected, it is economical to feed brewers' grains.

Peas.

Peas are rich in protein, and are milk producers. They can be raised in large quantities, and when ground and mixed with bran and coarser feed, they make excellent milk producers. They are low in fat, but high in protein, and assist greatly in balancing a ration.

Potatoes, Turnips and Cabbage.

Potatoes and turnips, when cooked, are relished by cows in winter, and the effect upon the milk flow is perceptible. The flavor from turnips is not best, and they should be fed sparingly. Cabbage is "away off" as to flavor, and should not be fed to milkers.

Mangels.

I am a believer in mangels as a winter dessert for cows. They are not very nutritious, but are succulent, and are relished by cows, when properly fed. They have a similar effect to that of apples, but in less degree, and dairymen who have fed cows apples in winter know how they are relished and how readily they will increase the flow of milk. Mangels should not be fed until they have been buried or stored in the cellar six weeks to two months. They retain their succulent properties better when buried. 2000 to 2500 bushels can be raised on an acre of first-class soil. The mammoth red mangel is the best. I have raised some that would weigh twenty to twenty-five pounds. Do not cook them; cut in small pieces and feed ten to twenty-five pounds a day. Rich soil is necessary to produce a large yield.

Ensilage.

Probably no other cow feed has been talked about more than *ensilage*—it has many friends and some enemies—it has been “cussed” and discussed, and doubtless will be as long as ignorance and cranks continue to exist. You can not convince a dairyman, who has used ensilage, that it is not a splendid feed. The dairyman who uses ensilage has at least thirty per cent. advantage over the dairyman who does not use it.

By comparing an acre of ensilage with an acre of corn, allowing fifteen tons of ensilage to the acre, and fifty bushels of corn and 2,500 pounds of stover.

	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
15 tons of ensilage				
30,000 pounds..	6150.	360.	3600.	210.
50 bushels corn and				
cob meal 3,500 lbs.	2919.	227.	1970.	101.
3,000 lbs. stover...	1625.	60.	1002.	18.
	4614.	287.	2972.	119.
Excess of ensilage				
over corn and stover,	1536.	73.	628.	91.

This estimate is about an average and shows the per cent. of feeding matter in ensilage over corn and stover to be about as follows :

Excess of organic matter about	33	per cent.
“ “ protein	25	“
“ “ carbohydrates	21	“
“ “ fat	76	“

There is another advantage gained by the use of ensilage—its succulent quality makes the difference much greater than indicated by the foregoing per cents. Generally there is some waste in ensilage, but the juicy, succulent quality of the feed greatly overbalances that.

When a cow has been fed first-class ensilage during the winter and you cease to feed it, a decrease in the flow of milk is the result, and it is almost impossible to prevent her from drying rapidly. The change is similar to the change from rich, juicy grass to dry feed, but not as great. Cows eat it greedily, and the effect upon the system is cooling and healthful. It keeps the bowels in excellent condition, and enables the cow to handle a large ration to the best advantage. It is not in the least injurious to flavor, if fresh; moldy ensilage is like any other moldy articles, it is not fit to be fed to milk cows. It furnishes green feed when all other feed is dry, and the space that it occupies is only about one-fifteenth of that of any other fodder, and is much cheaper.

The Silo.—Ensilage must be kept in a bin or *silo* that is “air tight,” to keep it from molding and spoiling. Height is an important factor in building a silo, as it is necessary to take a little ensilage from the entire top surface of the silo every day—not less than one and one-half inches in depth. The object of this is to prevent molding—the hot, steaming ensilage will mold if exposed to the atmosphere more than a day—it is better to remove

it twice a day. The size of the silo should be made to suit the stock that is to be fed from it. About seven square feet of ensilage, one and one-half inches deep will make about thirty-five pounds of ensilage, or enough for one cow each day. A silo twelve feet square would have a top surface of 144 square feet, and feeding one and one-half inches in depth each day would be enough for about twenty cows.

If the silo were twenty-four feet deep and twelve feet square, how long would it last twenty cows? Twenty-four feet equals 288 inches in depth; 288 divided by $1\frac{1}{2}$ equals 192 days. This silo would hold about seventy-five tons, and would require about five acres of good corn to fill it, and would last twenty cows 192 days, or about six and one-half months. It is better to have more than one silo, and each one small enough to enable you to feed three to four inches in depth each day. For ten cows a silo should be about ten feet square and twenty four feet deep—it would be large enough to feed the cows and such other stock as it is necessary to keep. It would hold about forty-eight tons, and would require two and one-half to three and one-half acres to fill it.

How to Build a Silo.—In shape, silos generally are three kinds—*square, round and octagonal*. The round silo is the best, because there is less surface and no corners and angles, which are favorable mold centers. It is difficult to prevent mold at the corners. The octagonal is better than the square silo, as it has no right angles. As the square silo is the easiest to build, and the one generally in use, I shall speak of it first.

Decide where you want to build the silo. If the barn is large enough build it in one corner of the barn.

Cut a hole in the floor a little larger than the silo to give you room to put in the joists without being cramped. You can start on top of the ground or can make an excavation as deep as desired. I prefer to have the bottom of silo about five feet below the barn floor, as the height above floor will be less. If you build a silo twenty-four feet above floor much more power will be necessary to carry the cut corn over the top than if five feet of the silo are below floor and only nineteen feet above. When you have the excavation the desired depth, begin with the frame work. For a silo for twenty cows I would use hard wood joists 2 x 6 x 14 feet long, which would make silo about twelve feet nine inches square when completed. If soft wood joists are used and you are a "heavy weight," 2 x 8 inches by 14 feet may be used—that would make the silo about twelve feet five inches square inside. I am satisfied that soft wood 2 x 6 inches will be strong enough, but to prevent worry and bad dreams, you can use the larger joists.

The 2 x 6 x 14 feet hard wood joists should be spiked at the corners with twenty-penny wire nails and clinched, five nails should be used at each corner.

Place at the bottom of excavation a layer of joists—no foundation is necessary, except probably a small flat stone under each corner, and one under the middle of each joist. Put in your second layer of joists (nailed like the first), about two and one-half feet above first layer, and so on until you get the frame as high as you want it. The frame can be held in its place by boards placed on end at the corners and nailed to each layer of joists. When frame is up, get boards one inch thick and twelve inches wide—for a silo twenty-four feet high, I should use boards sixteen feet long and saw in the middle when necessary. If matched boards are used it is only necessary to use them for the first coat of weatherboarding. Begin at the corner of your silo on the inside and stand your boards on end, pressing them down on the ground at the bottom—put on a sixteen foot board and an eight foot board on top of that, making the twenty-four feet in height. Now put on at the bottom an eight foot board and on top of it a sixteen foot and so on, all around inside of silo. The joists must be so arranged that the end of the boards will lap half way over the edge of the joist. After the first coat of boards is on, line with heavy tar paper—which is cheap—about \$3.00 worth will line the silo. The paper is in rolls and a yard wide. Cut paper long enough to reach the depth of silo—twenty-four feet. Use large carpet tacks. Put the first strip “up and down” at the corner, so that one-half extends on one side of silo and the other half on the other side, and the edges will reach to the middle of the second board from the corner—let the paper lap about an inch—never have the edges of two strips of paper meet where the boards do, so the air will get through. After the second strip of paper is put on

begin with the second coat of boards—if you paper the entire side before putting on boards it will be difficult to hit the joist with nails used in boards. It is important that all board nails should be driven into joists, to prevent making air holes. Never keep more than two widths of paper ahead of weatherboarding. Begin in a corner with second coat of boards—begin with a board six inches wide, so as to “break joint” with first coat of boards. You also want to “break joint” at ends of boards also. Use no knotty boards. It will be impossible to prevent a little mold in the corners. This can be remedied by putting in extra joists about two and one-half feet long, at the corners, as represented by accompanying engraving :

Use as many of these corner pieces as there are sets of joists, and then line as before, being careful to have paper extend onto the side walls several inches, to prevent air from getting in at the intersection of corner pieces and sides of silo. In the beginning this frame can be made octagonal shape if you prefer it. It is a good idea to fill the triangular spaces with chaff or saw dust to better keep out the air. In building silo, two or three doors should be put in the side where ensilage is to go in and

be taken out. These doors can be made perfectly air tight by being careful and by lining well with tar paper. Dish center of bottom of silo a little and cement, letting cement extend well up at the edges to exclude all air—bank up on outside of silo and it will be completed. If silo is built outside of barn, outside weatherboarding and a roof will be necessary.

The octagonal silo can be built about as easily as the square one. The cost of a square silo, such as described, will be about as follows :

48 joists—640 feet, equals	\$10.50
2,700 feet boards	44.00
Tar paper.....	2.50
Nails.....	1.00
Cement	1.00
Total.....	<hr/> \$59.00

Any farmer can put it up in less than a week, and as nearly all farmers waste at least one-third of their time during the year, there will be no extra expense for labor. A very ordinary farm hand put up my silo in less than a week. Any farmer ought to be able to put up all his farm buildings.

Silo Pressure.—Much has been written about the strength of silo timbers and the immense pressure against the walls of a silo. The square silo I have described could be filled with water without any danger from lateral pressure. When the square silo I have described, twenty-four feet high, is full of ensilage, the greatest lateral pressure at any point will not exceed five pounds to the square foot. 2 x 4 timbers would be strong enough for a silo less than fourteen feet square.

Round Silo.—The round silo is best, because there are no angles and corners for mold centers. The round silo can be made by using two inch staves and hoop with iron rods $\frac{5}{8}$ to $\frac{3}{4}$ inch in diameter, with proper tightening nuts on the ends of the rods. Hoops should be about two and one-half feet apart. Staves should be four to eight feet long and four to eight inches wide. Doors can be put in where needed. The round silo is not costly. White lead can be used at the end of staves to make the joint air tight, or ends of staves can be grooved and narrow strips of iron used. Such a silo, if properly

cared for will last twenty years, and will more than pay for itself the first year.

Ensilage Machinery.—A good ensilage cutter is essential for preparing corn or other products for ensilage. There are a great many ensilage cutters made and you can get any size you want. All manufacturers over estimate the capacity of their cutters about fifty per cent. When they claim their machine will cut five to six tons an hour—divide the capacity by about 2, and you will have it. Be sure to get a cutter large enough—a

capacity of fifteen to twenty tons a day, without straining the machine is a good size—you can buy such a one, to cut one-half inch or longer, for about \$30.

Power is an important factor—a small engine is best. You can get a four horse power gasoline engine at a moderate price, and it can be used for so many things about a farm and will be so safe that you would not do without one after using it a few months. Before purchasing one figure on having to use about three times as much

gasoline as the manufacturer claims it is necessary to use in a day. Sweep power is good, but your horses nearly always are in use when you want them. If you have a special grudge against your horses, cows or bulls, generally used for such purposes, get a tread power—if you want a two horse one as good as new, costing about \$80, I know where you can get it for \$10. It will not be many years until the making of tread powers, as they are made now, will be prohibited. Humane societies are discussing the matter already. It is surprising that dairymen who make *such a fuss* about the abuse of cows, do not have something to say about tread powers. But there is no accounting for tastes—the kindest dairyman to his cows,

that I have ever known is the meanest and most cruel to his horses and family. I am aware that a storm of rage will be hurled at this article, but the rage will spring from the almighty dollar and not from a human heart. If you have a large size cutter, a thrashing engine can be used to good advantage. You want plenty of power—if the manufacturer says two or three horse power, “figure on” about eight. If possible get a cutter that will run at a high rate of speed and not injure it—1,000 to 1,200 revolutions a minute is much more satisfactory than 400 to 500. For silo work you will need an extra piece of carrier to be attached, when silo is nearly full.

Corn for Ensilage should be the largest and best field corn that grows best in your neighborhood—it should be drilled in rows, nearly twice as much in a row as when you plant it to be husked—plant as early as possible. When it is too hard for roasting ears or to be eaten (as many persons use green field corn on their tables), cut it. It is best to cut it while in the dented stage, before glazing. Some persons cut it earlier and others later; if earlier, it will be less nutritious; if later, it will be more liable to spoil and will have to be watered in the silo to make it pack solid. Do not fail to have it juicy enough to be heavy, in order to pack well. I would prefer cutting a little earlier than later. When ready for cutting, cut low, so you will get all the fodder. A farm wagon can be used—couple it as long as the coupling pole will permit, then by using two scantlings you can make a drop body that will be very convenient. You can make it in less than an hour.

This will be sufficient for almost a ton of green fodder. It will be best to have two of these wagons—they will be enough to haul in twenty to thirty tons a day.

Time of Filling Silo.—It is not particularly necessary that a silo should be filled quickly, as there is no danger to the ensilage; you can fill it in two or three days, or in two weeks, if no ensilage is put in for two or three days no damage will be done, provided you sprinkle the ensilage in the silo thoroughly before you begin to fill it again. Generally it is better to fill it as soon as possible, so that your corn will not get too dry. Unless the corn is very green, I think it is best to sprinkle the ensilage as it starts up the elevator. This can be done by having a barrel or large milk can of water placed above the lower end of the carrier, so that a small pipe or rubber hose can be used to convey the water just where you want it—a sprinkler can be attached to the end of your pipe or hose. The sprinkler of an ordinary sprinkling can is a splendid thing. You can get one fine or coarse to suit—the dryer the corn the more water needed. Do not be afraid of wetting too much. When you begin filling the silo in the morning sprinkle the silage in the silo thoroughly. If you have a large silo and a cutter large enough to put in twenty to forty tons a day, it is better to have a man in the silo nearly all the time you are cutting, to scatter the silage and to tramp around the edges and corners thoroughly—no matter how much wetting your corn gets in the elevator; if you use a hose or large sprinkling can to wet the ensilage thoroughly at the corners and along the edges, you will have no moldy and spoiled ensilage. I have a square silo, without the corner protection and have not lost 500 pounds of spoiled silage in any one season. It is best to cut corn fine, one-half inch is a good length, but one-fourth inch is much better—it not only keeps better when cut fine, but the cow eat it more greedily. When your silo is full, if you have

been a week in filling it, there will be no room for much settling, if it has been properly watered and tramped. A silo twenty-four feet deep will not settle six inches. After your silo is full, run a lot of straw through the cutter and cover the top of the ensilage from four to eight inches—thickest in the corners and at the edges—chaff is better, and then water it until it is soaking wet and tramp until it is solid. When you get ready to begin feeding, remove the chaff or straw and begin to feed. You may find your ensilage moldy to a depth of an inch or two, and that will not be fit for use.

Quantity of Silage to the Acre.—If your corn is large and planted as it should be you will have from fourteen to twenty-five tons to the acre. The corn in Ohio and Indiana is larger than most of the corn in other States. I cut three and one-fourth acres of corn that filled an eighty-ton silo, the average height was nearly twelve feet. If you have plenty of silage left when grass comes and you wish to stop feeding it, cover it two or three inches with chaff, straw or whatever is most convenient, and sprinkle thoroughly. In feeding ensilage in warm weather, it is necessary to feed two and one-half to three inches from the silo each day to prevent spoiling, it molds more rapidly in warm than in cold weather.

How Much to Feed?—Twenty-five to forty pounds of ensilage can be fed each day to a cow. For a one-thousand-pound cow, thirty pounds will be enough.

Red Clover makes good silage, but it is too expensive when corn can be raised. **Crimson clover** is good, but it is an uncertain crop. **Sorghum** can be used, but it is not as good as corn. Almost any green fodder can be used, but corn is the best and cheapest.

Red Clover.

Red clover, green or cured, is a good cow feed. Clover pasture is a milk producer, and while cows get it in abundance, the milk flow will not decrease much. If cows are watered before they are turned into the pasture, and not left out too long, there is no danger of bloating. Clover hay is, at least, twice as valuable for cow feed as timothy hay. It should be cut before too ripe—better cut it a little green and see that no dew or rain touches it when partly cured. All hay for cows should be cut a little green, to preserve, as much as possible, its succulent qualities. Clover hay is much dearer than ensilage, as an acre of good corn will produce \$40 to \$50 worth of feed as ensilage, while the hay from an acre of clover is not worth more than half as much.

Mixed Hay.

As it is difficult to prevent clover from freezing and burning out, I prefer to sow clover and timothy together—it makes a good hay and the yield is larger, while the liability to freeze or burn out is greatly lessened. Cut it when the clover is ripe, and although the timothy will be a little green, it will not be particularly objectionable as cow feed.

Oat Straw.

A little oat straw is relished by cows, and while not much of a milk producer, it is an agreeable change for a cow and assists in keeping up the milk flow.

Oat Hay.

Oat hay is a good cow feed, and as a milk producer, is only about twenty per cent. below good clover hay, and much above timothy hay and better than mixed clover and timothy hay. Two to four tons can be raised on an acre and nearly always it is a sure crop. It should be cut just before it begins to turn yellow, and should be thoroughly salted.

Pea Hay.

Pea hay is a better milk producer than clover hay, and a much larger quantity of it can be raised on an acre. It is rich in protein and cows relish it. Cow peas should be sowed and plowed under about two inches, or put in with a wheat drill two to two and one-half bushels to the acre.

Oat and Pea Hay.

Oat and pea hay is not quite as good feed as pea hay, but fully as good as clover hay. The oats assist in holding up the peas and keeps them free from dirt. Sow in equal parts, about one and one-half bushels of each. Drill the peas or plow under and sow oats in the usual way. Better sow peas a week before you sow the oats. Cut while peas are in the milk state and cure well. The yield will be large.

Sorghum.

Sorghum is the best all around dry weather crop of which I have any knowledge. One hundred to two hundred tons can be raised on an acre—two to three crops; the second and third crops make better feed than the

first crop. All talk about being dangerous feed for cows, is without foundation. The cows relish it and it is a good milk producer, better than green corn fodder. Prepare ground early by plowing, harrowing and working until in good condition. Sow one to one and a half bushels to the acre and harrow. The first crop will be about five feet high by July 10th to 15th—mow as needed and feed. A second crop will start within a few days. When frost comes cut and shock, same as corn and feed when dry. It can be drilled thickly in rows two feet apart. Feed the cows all they will eat, after two or three days, light feeding.

Millet.

Millet hay is worth about fifteen per cent. less than clover hay as a cow feed, and at least twenty per cent. more can be raised on an acre. It can be sowed after the oat crop is harvested, and with a favorable year a large quantity can be raised. The objection to millet hay by some persons has but little weight.

Alfalfa Hay.

Alfalfa hay is a good cow feed and fully as good as clover hay. Large quantities of it can be raised on an acre, as it grows luxuriantly. It should be run through the feed cutter before fed, and should be harvested before it gets quite ripe.

Corn Stover.

Corn stover is the fodder after the corn has been husked. Before the corn is husked, it is corn fodder. It is folly to feed corn fodder or stover unless run through the feed cutter first. In fact, it is not good pol-

icy to feed corn fodder at any time as so much of the corn is wasted when not ground. Corn stover, cut fine (one-half to one-fourth inch), is a good, rough feed, and cows will eat all of it, if fed properly

Salt.

Cows should have all the salt they want. Should give them salt three to four times a week. They will not eat more than is good for them unless you mix it with their feed and compel them to eat it.

Wet and Dry Feed.

Many dairymen believe that the feed must be wet to get the largest milk flow. They are mistaken. Dry feed is better than wet feed, provided, of course, that the cow gets all the water she wants. Dry feed is more thoroughly masticated—is not eaten so quickly, and the cow has more time to enjoy her feed—the saliva and gastric juices are stimulated more. Too much slop in the stomach decreases the flow of gastric juices. A cow's teeth are made to use, and will decay and drop out if not used.

How Much Feed?

If cows are in full flow of milk, give them all they will eat and relish. "Oh, my!" exclaims the narrow gauge dairyman, "I have a cow that would eat twenty-five cents' worth of feed a day." What of it? If a cow yields four pounds of butter a day, or \$1.50 worth of cream, will it not pay to give her twenty-five cents' worth of feed? Better give her twenty-five cents' worth of feed and get \$1.00 for her milk than to feed ten cents' worth of feed and get fifteen to twenty cents' for her

milk. It does not pay to feed most cows twenty-five cents' worth of feed a day, because their product is not worth that much. Do not keep that kind of cows—keep the kind I have described and you will have no occasion to complain about feeding them all they will eat.

How to Cure Corn Fodder.

If you have no silo and must depend upon fodder or stover, make your shocks from sixteen to twenty hills square, cut one-third of each shock, let it stand a day or two to cure a little; cut another third and air again and complete the shock. Tie in two places, the second tie being above the usual tie, this will assist in keeping rain out. Husk early and house stover at once. Cut corn early to preserve as much of the succulent properties as possible.

Does Rich Feed Make Rich Milk?

Probably nine-tenths of our dairymen will say "Yes." Educated men, like doctors, nearly all believe that rich feed makes rich milk. They simply are mistaken. Whether cows are fed straw or the richest nitrogenous grain feed, there will be no perceptible difference in per cent. of fat in their milk. The quantity can be increased by feed, but not the quality. If a cow gives three per cent. milk she will give that quality, rich feed or poor feed. Hundreds of experiments have demonstrated this fact. The per cent. of fat in a cow's milk will vary, but the variations are due to other causes than feed. Continuous care for years doubtless may improve quality slightly, but the improvement during any generation will not be marked. It requires thousands of years of care and breeding to produce thoroughbreds.

Cold and Feed.

All successful dairymen fully realize the importance of protecting cows from cold. The old way is to let cows run out in the snow and storm and freeze. The foggy seems to be impressed with the idea that good sense is not applicable to successful dairying. This class of would-be dairymen never subscribe for a dairy paper, nor read any kind of dairy literature. They never succeed in dairying, consequently are opposed to the "new fangled notions" of good cows, protection from cold, balanced rations, etc. The cows they keep produce about seventy-five pounds of butter a year and are a bill of expense to the owner. Hogs and "hosses" are their specialty, and they never keep anything but scrubs in that line. Frequently you will see cows browsing around among dry corn stocks, left standing in the field, while the January winds play a "tattoo" on their scrawny and withered forms. Better keep the cows in the barn, and feed them warm water. No dairy cow that is in milk should be permitted to remain out in any kind of disagreeable weather—cold, rainy, chilly weather cuts off the milk flow, and one day of such weather will decrease the flow of milk from ten to twenty-five per cent. Under no circumstances would I permit cows to remain out during any kind of chilly or disagreeable weather. The cool, chilly days and nights of September, April and May are very frequent, and unless cows are housed in a good warm place the flow of milk will be seriously affected. I believe it is much better to keep cows housed in winter all the time, not even turning them out to water. No quantity or quality of feed will overcome the effects of exposure to cold.

I have experimented until I am thoroughly convinced. Ten cows that were giving about two hundred pounds of milk a day, (sometimes they would run five to six pounds over two hundred, and other days five or six pounds under), were turned out in the barn yard from one p. m. until 4 p. m., five days in succession, when the temperature ranged from twenty to thirty-five degrees above zero. Their feed was increased about twenty per cent. and the results were as follows :

1st evening after being out. . . .	89 lbs.
2nd day	175 "
3rd "	170 "
4th "	167 "
5th "	164 "

Then they were kept in as before.

6th day	171 lbs.
7th "	176 "
8th "	182 "
9th "	184 "
10th "	188 "
11th "	189 "
12th "	191 "
13th "	190 "
14th "	193 "
15th "	194 "
16th "	193 "
17th "	191 "
18th "	194 "
19th "	196 "
20th "	195 "

The extra twenty per cent. of feed was kept up until the seventh day, two days after we ceased to turn them out.

About a month afterward they were averaging about one hundred and eighty-two pounds a day. We turned them out from 9 a. m. until 1 p. m., one day and when the thermometer ranged from twenty to thirty degrees, with the following results, with the same feed

1st evening.....	81 lbs.
2nd day.....	168 "
3rd "	173 "
4th "	178 "
5th "	179 "
6th "	180 "
7th "	180 "

In both instances there was no particular difference between the number of pounds of milk evening and morning. So you see in the first instance the loss the first evening was about ten pounds and about nine pounds the second instance. The second days in both instances dropped off—twenty-five pounds in the first and fourteen pounds in the second. If we had turned them out every day for six weeks, I think the milk would have dropped to one hundred pounds a day, while as you will see, six weeks after the first experiment, they were giving over one hundred and eighty pounds.

When these ten cows were giving about two hundred and twenty-five pounds of milk a day, we experimented a little more. We had been watering them in the barn and giving them water that was warmed to about seventy degrees—we gave them cold water as it came from the cistern—it being about forty degrees. This was continued five days, with the following result:

1st day.....	217 lbs.
2nd "	216 "
3rd "	214 "
4th "	212 "
5th "	209 "

Returned to warm water

6th day	215 lbs.
7th "	217 "
8th "	217 "
9th "	219 "
10th "	223 "

The following five days they were turned out in the barn yard to water, heated to seventy degrees—the temperature was about twenty-eight degrees above zero, and they were let out twice a day, about twenty-five minutes each time, and watched to see that they drank all the water. They seemed to drink fully as much as when in the barn. The result was as follows :

1st day	218 lbs.
2nd "	217 "
3rd "	215 "
4th "	214 "
5th "	211 "

Within three days afterward they were up to two hundred and twenty pounds. I could give you many more instances and facts to verify the necessity for warmth and comfort for cows, but the case is so nearly self-evident that I think enough has been said.

It is claimed by some that cows get tired of standing and require exercise, but the most careful experiments proved that much exercise is not favorable to a large milk flow. If stables are kept clean and cows properly bedded, they will get along all right without any more exercise than they get from eating, drinking, getting down and up, etc. It would probably be better to have a large enclosure as warm as the stable, in which cows could be permitted to walk about a little, an hour or two during the day. A cow is a machine, and any particular exercise beyond eating, drinking, getting up and down, decreases milk flow. Milking is a peculiar exercise and if properly attended to, is a pleasure to the cow, and especially equalizing to the nervous forces. I have found it a paying investment to groom each cow at least once a day—using a gentle curry comb and brush—it keeps the cow in better condition, gives her exercise, equalizes nervous forces and increases the appetite, consequently the flow of milk. “Oh, well,” says the foggy, “I can’t afford to fool around my cows as though they were a lot of babies—I have something else to do.” What you say is true of every man who has made a failure in life. A man may be worth tens of thousands of dollars and yet be a failure. Why? Because he could have been worth ten times as much had he pursued the best way instead of a poor one. Any man is a failure who does not do about all that it is possible for him to do.

Value of Feed Combinations.

From two to five times as much milk can be produced from a properly balanced ration as from feed of equal value, but improperly fed. For example :

FORMULA X.	Organic matter	Digestible Nutrients.		
		Protein	Carbo-hydrates.	Fat.
15 lbs. Corn stover.....	8.47	.30	5.01	.09
12 " Timothy hay.....	9.89	.36	5.18	.14
9 " Corn	7.88	.57	5.83	.45
Totals.....	26.24	1.23	16.02	.68

FORMULA Y.	Organic matter	Digestible Nutrients.		
		Protein	Carbo-hydrates.	Fat.
15 lbs. Corn stover.....	8.47	.30	5.01	.09
12 " Clover hay.....	9.42	.78	4.19	.19
6½ " Bran	5.36	.82	2.87	.19
2 " Cotton seed meal. .	1.69	.74	.36	.25
Totals.....	24.94	2.64	12.43	.72

The cost of these two rations is about equal, if any difference, X costs the most. Almost anywhere timothy hay costs from ten to twenty per cent. more than clover hay, and corn costs from fifteen to thirty per cent. more than bran—this will more than balance the extra cost of cotton seed meal. Formula X contains one-half lb. more grain feed than formula Y. As milk producing feed, Y is worth at least twice as much as X, which is too deficient in protein to produce much milk. No ration containing only 1.23 pounds of protein will produce milk in paying quantities. Here is another :

FORMULA A.	Organic matter.	Digestible Nutrients.		
		Protein	Carbo-hydrates.	Fat.
25 lbs. Corn stover.....	14.12	.50	8.35	.15
10 " Corn.....	8.76	.63	6.48	.50
Totals.....	22.88	1.13	14.83	.65

FORMULA B.	Organic matter.	Digestible Nutrients.		
		Protein.	Carbo-hydrates.	Fat.
20 lbs. Tim'y & clover hay	16.08	.94	7.89	.28
8 " Bran.....	6.59	1.01	3.53	.29
2 " Gluten meal.....	1.81	.59	.79	.26
Totals	24.48	2.54	12.21	.83

The cost of each of these rations is about the same—the difference is not worth considering, while the milk feeding value of formula B is, at least, three times as great as that of A, which is so low in protein, it can not be of much value as a milk producer. B is a balanced ration, while A is so weak in one of its legs, (protein), it would make the milk pail sick. I hope the reader has discovered that the value of feed for milk depends upon the proportions and combinations.

Cow Stables.

Cow stables should be roomy, airy and light—the more sunshine the better. All manure, solid and liquid, should be removed from the stable, several rods—the field is the best place for it. The stable floor should be water tight, and gently slope toward one end, or from the cen-

ter each way, if the stable is very long. I do not believe in the ditch usually behind the cows. The floor on which the cows stand should be raised about five inches above the floor back of them. Back of this five-inch rise, about fourteen inches, place a 3 x 3 scantling—nail it to the floor securely, placing a layer of oakum or some other packing under it, to make the trench water tight. Make the platform on which the cows stand, five feet wide at one end and four and one-half feet at the other end, and place the longest cows at the widest end, and the next in length, and so on—the shortest cow being at the narrow end.

Place a 2 x 3 scantling in front of the cows' hind feet, about one foot from the back end of the platform. Put this scantling down so that the water will not pass under it. When the cow lies down she will get in front of this scantling, away from all filth. She will not lie on the scantling. The deep sink back of the cows is dangerous.

The stable should be thoroughly lighted and all the windows screened in warm weather to keep out flies. The manure should be wheeled or hauled out of the stable. Unless the cows are too numerous, a sheet iron wheel barrow will suffice. The urine should be drained into a cistern several rods from the stable. The stable should be whitewashed often, at least once in two months. The ceiling should be dust and dirt tight.

Stanchions, Ties, Etc.—Ties are more comfortable for the cows than stanchions, but with them it is more difficult to keep the cow out of her filth. The rigid stanchion, if properly made, is not very objectionable. The best tie, for my use, I invented in about twenty seconds, the accompanying cut represents it:

The opening should be about ten inches. One of the rods can be drawn back at top to enable cow to enter. The rods can be made of iron pipe.

Cow Stanchion.

The opening into manger is ten inches wide and boarded up nine inches from the platform on which the cow stands. This tie gives the cow freedom of the head and neck, and is roomy and comfortable when she is lying. The uprights on each side of her neck should be one and one-fourth inch iron rods, and the iron rings around them should be about two and one-half inches in diameter, to enable them to be moved upward and downward freely, to accommodate the cow. The tie should be a heavy strap so as not to rub the cow's neck. She can not get backward far enough to pull her head out of

the stanchion, and there is not room enough for her to go forward beyond her shoulders. The manger on each side of the iron rods should be boarded, to prevent dust and filth from manger from working into the stable.

Temperature in the stable in winter should be about fifty-five degrees, not lower than forty degrees, nor higher than sixty-five degrees. If the stable is properly constructed—almost air tight—there will be no trouble in keeping it warm during the coldest weather. Cracks and broken windows are not the proper avenues for ventilation. Have the stable arranged so you will have perfect control of the ventilation. Fresh air is a good thing, but more animals are killed by an over dose than from a lack of it. To keep a stable clean and warm in winter and properly ventilated, it should not open into the barn as it generally does. There should be a feeding alley in front of the cows, not more than eight to ten feet wide, and it should be separate from the other parts of the barn and dirt and dust proof. The feed should not be kept in this room, at least any of it possessing any disagreeable odors. I believe in a separate milk room, where the greatest cleanliness can be observed while the milking is being done. Horses and other stock should not be kept in the building—disagreeable odors from horse manure are the most objectionable to which milk can be exposed. Frequently cows are permitted to eat the straw and other bedding mixed with horse manure, and the milk stinks as though it were rotten after it has stood for a few hours, and the butter from such milk is nauseating. Cleanliness everywhere should be the pass word in dairying.

Milk Preservatives.

Milk preservatives, such as *salicylic* and *boracic* acids, will prevent milk from spoiling a certain length of time, but they are adulterations and in most States there is a penalty for using them. But very little of either can be used without being perceptible to the taste. From a hygienic point of view, all these preservatives are to be condemned, and the dairyman who uses them is liable to get into trouble. They can not be recommended, and the safest way is to let them alone. Nothing but ice and cleanliness have been found to increase the keeping qualities of milk, without injuring it. Pasteurization and sterilization destroys flavor in a greater or less degree, while chemical preservatives are poisonous. Under no circumstances should babies and small children be fed milk containing salicylic and boracic acids. *Ice* is the best preservative.

Bacteria.

Bacteria may be divided into two classes for practical discussion :

Pathogenic—disease producing.

Non-pathogenic—non-disease producing.

The word *bacteria* is a great bugbear to most persons—it suggests disease, horror and death. While the *pathogenic bacteria* are disease producing, they are small in number compared to the harmless ones, many of which are necessary to health, and are indispensable to fermentation. With milk, the object is to keep under control the putrefying and disease producing bacteria. This part of the subject is discussed under sterilization, Pasteurization, cleanliness, etc. Reproduction of bacteria

is so rapid that a *single bacterium* under favorable conditions will multiply into thousands of billions in twenty-four hours. Bacteria are so small that it requires more than 25,000 billions to equal a cubic inch. Bacteria are of vegetable origin and are to be found almost everywhere and in all diseased organism, animal or vegetable. It is generally believed that animal organism of all kinds is swarming with bacteria—such is not the case, as healthy animal and vegetable organisms are entirely free from bacteria.

Milk from a healthy cow is sterile, and if it could be drawn without becoming impregnated with bacteria and kept in an air tight, sterilized vessel, it would keep several years, pure and sweet. Frequently bacteria collect in the teats and work their way into the udder and contaminate more or less of the milk—generally they are all expelled when a few ounces of milk is drawn. It is impossible to draw the milk free from bacteria—they are in the air, on the hands of the milker, in the milk pail, on the cows, in fact everywhere.

Lactic Acid Bacteria are the ones necessary to the ripening of cream and impart to butter the delicate flavor. As I have shown in another chapter these bacteria can be cultivated in the preparation of your *starter*, by ripening the starter in the light, which is unfavorable to the pathogenic bacteria. When any special kind of bacteria largely predominates others are driven out, or prevented from multiplying.

Light is not favorable to the development of most bacteria, and bright sunlight kills nearly all of them. Darkness is the nursery, and dark milk rooms and foul air are most favorable to rapid production.

Temperature.—They are all killed at a temperature of 240 to 250 degrees, and most of them at a lower temperature. It requires a temperature of more than 100 degrees below zero to kill some of them. They live in ice, but generally do not reproduce at such a low temperature. The ordinary water filter does not remove them

Cultures—for milk and beer fermentations the proper bacteria have been cultivated and will produce the kind of ferments desired—uniform in strength, quality, flavor, etc. Milk cultures can be purchased from any dairy supply house, and will keep for months.

The spores or eggs will endure a very high temperature; much higher than the bacteria, consequently intermittent sterilization is necessary to destroy them, unless you heat the milk to a very high temperature—270 to 280 degrees. By heating until all the bacteria are killed, then cooling to about 100 degrees, letting the milk remain at that temperature thirty or forty minutes, or long enough for the spores to develop into bacteria, and reheating will destroy the spores, without heating to such a high temperature. The heating and cooling process may be repeated several times. The bitter taste in milk and cream seems to be caused by the butyric acid bacteria, and the nasty, rotten color to some of the putrefactive bacteria. Cleanliness, sunlight and a low temperature are the principal enemies of bacteria. The gastric juice kills many of the bacteria that go into the stomach. The danger of inhaling them is much greater than from taking them into the stomach.

Pasteurization.

There are two objects in Pasteurizing milk—to preserve it longer and to free it from some of the bacteria that are in it. Most of the pathogenic or disease producing bacteria, are killed or rendered inactive at a low temperature. A temperature of 190 degrees will kill nearly all of them in milk. The spores or eggs endure a much higher temperature. Many of the cholera bacteria and typhoid bacilli are killed at a temperature of 170 to 180 degrees, but the spores in these bacteria are not killed. Nearly all of the lactic acid or fermenting bacteria are killed at a temperature of 160 degrees. As lactic acid fermentation generally precedes all other bacterial fermentation, the milk will keep several hours longer if none but the lactic acid bacteria are killed. To kill the spores of lactic acid bacteria it is necessary to heat to about 160 degrees—let it remain at that temperature about twenty minutes—then cool quickly to about 100 degrees, to give the spores an opportunity to hatch. At the expiration of about half an hour reheat to 160 degrees where it should remain about twenty minutes, then cool quickly to about 40 degrees, where it should be kept until it is to be used. It is better to heat and cool two or three times, as more spores will be developed and killed.

By this heating process most of the lactic acid bacteria will be killed and many of the disease producing and putrefactive bacteria, while nearly all others will be stupefied to such a degree as to check fermentation and putrefaction many hours. Further than preserving the milk twelve to twenty-four hours longer, I can see no real benefit to be derived from Pasteurization, as it never

kills all the injurious bacteria, nor all the spores. Pasteurized milk is not as easily digested as fresh milk, notwithstanding the opinions of some experts. As soon as the Pasteurized milk is warmed and taken into the stomach, the stupefied bacteria immediately become active again.

Pasteurization at a temperature of 175 to 180 degrees is more effective, but imparts to the milk more of the disagreeable, burnt taste, and renders it more difficult to digest and unfit for babies, as the casein is partly cooked.

Pasteurization for butter frequently is practiced and adds much to its keeping qualities. It is much better to Pasteurize the cream than the milk as the cooked taste is much less noticeable. The more quickly milk and cream are cooled, after being heated, the less will be the cooked taste. Family milk can be Pasteurized readily by the use of the ordinary glass fruit jar. Put the milk in the glass jar and set it in a vessel containing warm water and heat the water to whatever temperature desired—remove the vessel from the fire and let the milk remain in it for twenty minutes, when the glass jar can be cooled quickly and kept until used. It can be cooled to 100 degrees, and heated several times if desirable. Always the milk should be stirred while being heated. For persons older than two years, milk heated to the boiling point can be digested readily, but for babies it is not good.

The best precaution in the world is ice, and when milk is kept at a temperature of 40 degrees from the time it is drawn until it is used, there is nothing gained by Pasteurizing.

Sterilization.

Sterile milk is free from micro-organisms. Milk from a healthy cow is perfectly sterile unless bacteria have entered the milk basin through the opening in the teats, which is a common occurrence. They may all be expelled after a few drops of milk have been drawn, and then it may be necessary that half or more of the milk may be drawn at a milking to free it of all of them. If milk is perfectly sterile when drawn, almost instantly it will be infected with bacteria, and in a few minutes it may contain millions of them.

Sterile milk will keep for all time without souring or decomposing. Sterilization of milk consists in heating it to a temperature necessary to kill all the bacteria and the spores. Generally this can be accomplished at a temperature of 240 to 250 degrees. Killing some of the most tenacious spores requires a temperature of 280 degrees, dry heat. Milk has been sterilized at a temperature as low as 220 degrees, but this is an exceptional case. Intermittent sterilization at 240 degrees generally will kill all bacteria and spores. Milk heated to this temperature has a burnt taste and the caseine is cooked, which makes it difficult to be digested. The milk properties are changed and the flavor ruined. Extra and special machinery is necessary for sterilization, and to make the best of it, the result is very unsatisfactory. It is *not fit for babies* and small children. The delicious flavor and the delicate properties of the milk, so necessary for babies, are destroyed, while it is too difficult for them to digest. I can see no advantages to be gained by sterilization as the milk is deprived of the flavor and qualities that make it a luxury.

Most of the bacteriologists disagree about the temperature necessary to sterilize milk, because very few if any of the milk samples contain the same kind of bacteria. The heat that will sterilize one sample of milk may not sterilize another.

Condensed Milk.

It has been thoroughly demonstrated that there never will be a general demand for condensed milk, because the condensing process alters and destroys all of the delicate properties of the milk. A better name would be "milk syrup." It is partly a substitute for milk, and the demand for it will be confined, principally, to milkless regions. The heating, evaporating and sterilizing necessary to condense and preserve it, cooks the casein and makes it more difficult to digest than fresh milk. For babies it certainly is an unsafe article of diet, and should not be used. The burnt taste is not palatable to most persons—the delicate milk flavor is gone. Babies demand milk possessing the delicate and soothing properties it contains when pure and fresh—they can not successfully digest and assimilate cooked food of any kind.

For invalids, condensed milk is inferior to fresh milk, and should not be used only as a substitute for milk, when the latter can not be obtained. Of course doctors and chemists can be found who will certify that it is as good as fresh milk, provided they are well paid for their opinions. Just as many experts can be found to give testimony on one side of any subject as on the other side, provided it is to their interest to do so. Condensed milk is all right in its place—simply as a substitute for milk in milkless districts. In the manufacture of condensed

milk about three-fourths of the water is removed from the milk by evaporation, the product is bottled and sterilized. Some manufacturers add sugar, but it is better to permit the consumer to sweeten it to suit the taste. Thousands of unsophisticated persons buy condensed milk, believing it is some kind of a mysterious cure all, instead of simply a poor substitute for the genuine article. milk.

Dairy and Creamery Butter.

In cities, it is generally claimed that creamery butter is the best—nearly all creamery butter is good, but the best butter is made in private dairies. As good butter can not be made from hundreds of cows owned by a score or more of patrons, as can be made from a few choice cows, where the greatest cleanliness is observed and none but healthy cows milked. A separator and a little dairy apparatus and a competent dairyman are all that are necessary to make No. 1 butter. A large quantity of such butter is made and sold from 20 to 80 per cent. above the best creamery butter. I was offered 35 cents a pound at wholesale for all the butter I would make, the year round. That is more than 50 per cent. above the average price of the best Elgin creamery butter sold in many sections of the country. I can do better than 35 cents a pound, and so can almost any other up-to-date dairyman.

Most dairy butter is not good and never will be, until dairy knowledge increases and better business qualifications are manifested by dairymen. Whenever you can satisfy the trade that your brand of butter is excellent, and the greatest care and cleanliness are manifested

in producing it, there will be no trouble about the price. Large creameries have a great many obstacles to overcome in making butter—patrons will be careless and dirty, milk will persist in being “off” in flavor; some sick cows always will be found—cows are milked in and out of season, etc. The dairyman who has enough cows to enable him to churn two or three times a week has the advantage of any creamery in making fine butter. In nearly every city hundreds and in some cities thousands of customers are paying from 30 to 35 cents a pound for very ordinary country butter, while the best creamery butter is being sold at about 20 to 25 cents.

If this can be done with butter that will not grade higher than third-class, what about first-class butter? These private customers pay 30 to 35 cents for this butter because they believe that most creamery butter is dirty. It is absolutely impossible under the present management of large creamers to avoid a large quantity of filth. In a certain city in the Ohio valley is a large milk, butter and cream supply house, using the products of scores of dairies, and they guarantee to their patrons that all their milk and cream is from dairies conducted in the cleanest manner. I have visited many of these dairies and would not use their milk, nor permit it to be used except as the last resort, to prevent starvation. As much can be said of most of the dairies in the United States. I have seen enough of filth in the dairy and creamery to prevent me from using any dairy products when I am away from home.

Sweet Cream Butter.

Sweet cream butter must be made from cream that is absolutely sweet and free from any kind of disagreeable taint and odor, as they are much more marked in sweet cream than in sour cream butter. Its keeping qualities are poor, consequently the milk should be drawn quickly in a clean room and in the cleanest manner, and separated and cooled to 35 to 40 degrees as quickly as possible—then heated quickly to the proper temperature and churned at once. Not much of it is made in this country for two reasons—its keeping qualities are poor and but few persons have become accustomed to sweet cream butter and do not like it. Doubtless it is better than sour cream butter, but our taste for it must be cultivated before its delicate qualities can be appreciated. There are separators and butter extractors, combined, that will turn out this butter without churning. Many of the Hebrews in this country prefer it to sour cream butter.

Gravity Cream.

While the gravity system of creaming is not as successful as the separator system, there is a right and a wrong way. The Cooley system is a good one, much better than the "shot gun" or tall cans, that have to be skimmed. It is almost impossible to use a dipper and skim clean—a strainer skimmer should not be used as it mixes cream and skim milk, and prevents you from getting all the cream. With the Cooley system the skim milk is drawn off at the bottom of the can and there is no danger of mixing again the skim milk and cream.

The crock or shallow pan system is poorest, although very thorough creaming can be done by this system. Milk should be set as soon as it comes from the cow, as cream rises best and more readily while milk is cooling. For shallow pans, the temperature of the milk room should be below 60 degrees, and milk should stand until the cream is all up. It is far better to have your pans in ice water, and after milk has stood ten or twelve hours warm it up to 60 or 65 degrees and cool the second time, allowing it to remain 12 to 15 hours, or longer, if the skim milk is not sour. To get the best results it should be warmed and cooled three to four times—the cream will be very thick and can be poured off the skim milk. A low temperature is necessary for successful

Deep-setting Can.

**Cooley Can,
with Adjustable Cream Spout.**

creaming. All milk that is set in Cooley or "shot gun" cans should be cooled and aerated first, to prevent disa-

greeable odors and souring too quickly. The cooling and warming can be applied to this system also. I can see no occasion for the "shot gun" cans, as the Cooley cans are so much better and as cheap. It is impossible to get anything nearly all the cream from pans set in a room

**Conical
Skimmer.**

**Refrigerator Box, filled with Bottles, closed
with Wood Fiber Cap.**

where the temperature is 50 to 60 degrees or higher, unless the milk is permitted to remain thirty-six to forty-eight hours before being skimmed. Remember that milk should be skimmed when ready, whether twelve, twenty-four, thirty-six or forty-eight hours.

Separators.

A good separator is necessary to successful dairying—there are many kinds made—some good, some not very good. It is an easy matter to find out which ones are good. Separators are not costly, and within ten years they will not cost half as much as they now do. It is useless to say you can not afford to buy one. If you can

afford to keep four or five cows you can afford to buy a separator. If you have five good cows a separator will pay for itself in a year, as you will get from fifteen to twenty per cent. better results from the milk. A separator must be bolted to a block or frame that will not shake—must be level, must be kept well oiled, thoroughly cleaned and run at uniform speed. The rubber bearings must be properly cared for and the bowl properly adjusted. Milk should be above 80 degrees to be skimmed thoroughly—the best temperature is from 95 to 98 degrees—just as it comes from the cow. The cream gauge could be set to produce approximately, a certain amount of cream. It is impossible to get exact results as there are so many conditions to be observed in separating. The quality of the milk, the condition of the cows, the state of the atmosphere, etc. The best way is to test the milk of your cows carefully and frequently; then you know about how much cream you should get. If you sell cream guaranteed to be a certain per cent. and know what per cent. your cows test, and do not desire to test your cream each day, the best way is to set your separator to produce three to four per cent. richer cream than you want, and add skim milk to reduce to the desired per cent. This will not be exact, but the average will be about right. If you set the separator to produce the per cent. your customer wants, a little decrease in speed, a slight accident or other conditions over which you have no control, may give you several per cent. thinner cream than desired. You can thin cream, but can not thicken it. By testing cows carefully, you can very easily determine the average test.

If the milk of your cows averages five per cent. and you want to get twenty per cent. cream, twenty-five per

cent of your milk should be cream. If you have one hundred pounds of five per cent. milk you should get twenty-five pounds of twenty per cent. cream. Set your separator so you will get about twenty pounds of cream, and add clean skim milk to make the twenty-five pounds. In this way you will not get more cream than desired. While the per cent. of your patron's cream will vary from day to day, the average will be about right—better give full measure all the time. One day he may get twenty-five per cent. cream, the next day twenty-six per cent., the follow day twenty-four per cent., and so on—the extremes being about twenty-three to twenty-seven per cent. and will not be particularly noticeable.

Purifier.—Much has been said about the separator as a purifier.

There is no filth in pure milk, as it comes from a healthy cow. The *filth* and *separator slime*, talked about so much, gets into the milk while being drawn and afterward, and from cows giving diseased milk. Everything taken from pure milk by the separator is an injury to the milk. I never found any of the filth and stench talked about on my separator bowl. The accumulation on the separator bowl from 10,000 pounds of pure milk, will not exceed one ounce of almost tasteless and purely white gummy substance, containing but few, if any, more bacteria than found in an equal quantity of the milk. Separator slime is an awkwardly contrived excuse for filthy cows, filthily milking and filthy handling of the milk. I have experimented in this direction until I am perfectly satisfied that nearly all this separator slime is due to diseased cows and dirty dairymen.

Quality of Milk.—Rich milk is skimmed more thoroughly by the separator than poor milk, and pro-

duces richer cream. By setting separator to produce twenty per cent. cream from six per cent. milk, it will only produce about eighteen per cent. cream from four per cent. milk. Milk from fresh cows separates more easily and more rapidly than milk from strippers.

Separating Milk Before Selling It.—If milk is not pure, it will remove much of the filth by passing it through the separator, but the milk will continue to be saturated with the filth—you can not remove disagreeable odors by separating, filtering, aerating, nor by any other process. The separator should be kept in perfect order.

Separator and Gravity Cream, Ice Cream, Etc.

Separator cream is better than gravity cream, because it is cleaner and “fresher,” and is not as liable to be tainted with disagreeable odors, as gravity cream. Nearly all milk contains, “more or less,” stable and other filth, which is partly removed by the separator. Separator cream can be ripened more satisfactorily, as the bacteria can be kept under better control. It can be kept longer than gravity cream because it can be cooled to a low temperature, immediately after being separated, and before bacteria have developed extensively. Separator cream is smoother than gravity cream and makes smoother, better ice cream. Cream requires age to make the best ice cream—boiling will age it and make it perfect for ice cream making. Gravity cream generally appears to be thicker than separator cream—this is caused by age and because it contains more filth than separator cream.

Number of Pounds of Milk for a Pound of Butter.

For the convenience of dairymen who are not disposed to do much mental work, and for those persons whose mathematical education has been neglected, I give the following table, which is not absolutely correct, as the nearest fractions have been used, but it is sufficiently correct for all practical purposes. I have added to the butter fat fifteen per cent. Some butter contains more foreign ingredients and some less. Frequently one-sixth or sixteen and two-thirds per cent. is added, but I think that too high for good butter. Any dairyman can figure out the number of pounds of milk necessary to make a pound of butter, if he knows how much the milk tests. For instance, if milk tests four per cent. fat, add to it fifteen per cent. of four per cent. and divide 100 by it and you will have the number of pounds of milk for a pound of butter.

4 multiplied by .15 equals .6.

4 plus .6 equals 4.6.

100 divided by 4.6 equals $21\frac{3}{4}$, the number of pounds of four per cent. milk necessary to make a pound of butter.

TABLE.

24 $\frac{3}{4}$ lbs. of 3.5 % milk will make one pound of butter.						
24 $\frac{1}{7}$	"	3.6	"	"	"	"
23 $\frac{1}{2}$	"	3.7	"	"	"	"
22 $\frac{4}{5}$	"	3.8	"	"	"	"
22 $\frac{3}{10}$	"	3.9	"	"	"	"

21 $\frac{3}{4}$	lbs. of	4.0	%	milk will make one pound of butter.
21 $\frac{1}{8}$	"	4.1	"	"
20 $\frac{7}{10}$	"	4.2	"	"
20 $\frac{1}{5}$	"	4.3	"	"
19 $\frac{4}{5}$	"	4.4	"	"
19 $\frac{1}{3}$	"	4.5	"	"
18 $\frac{9}{10}$	"	4.6	"	"
18 $\frac{1}{2}$	"	4.7	"	"
18 $\frac{1}{10}$	"	4.8	"	"
17 $\frac{3}{4}$	"	4.9	"	"
17 $\frac{2}{5}$	"	5.0	"	"
17 $\frac{1}{20}$	"	5.1	"	"
16 $\frac{7}{10}$	"	5.2	"	"
16 $\frac{2}{5}$	"	5.3	"	"
16 $\frac{1}{10}$	"	5.4	"	"
15 $\frac{4}{5}$	"	5.5	"	"
15 $\frac{1}{2}$	"	5.6	"	"
15 $\frac{1}{4}$	"	5.7	"	"
15	"	5.8	"	"
14 $\frac{3}{4}$	"	5.9	"	"
14 $\frac{1}{2}$	"	6.0	"	"
14 $\frac{1}{4}$	"	6.1	"	"
14	"	6.2	"	"
13 $\frac{4}{5}$	"	6.3	"	"
13 $\frac{3}{5}$	"	6.4	"	"
13 $\frac{2}{5}$	"	6.5	"	"

The richer the milk the cleaner will be the skimming, even the separator will leave more fat in the skim milk of poor milk than in skim milk of rich milk—the difference is much greater with the gravity system.

Ripening Cream.

Cream must be ripened properly before it can be churned successfully. If the cream from the shallow pans is skimmed when the milk is sour, it will be ripe and can be churned at once, or kept at a temperature of 35 to 40 degrees several days, and other cream added to it, provided it is equal in richness and at as low a temperature as the former cream—these two conditions must be observed strictly. Cream from the Cooley and “shot gun” cans is supposed to be cold and sweet when skimmed and can be kept at a low temperature several days, especially when all the cream is at the same temperature and of equal acidity.

Separator cream should be cooled and aerated at once, and kept at a temperature of 35 to 40 degrees. Several days cream can be mixed with it, provided it is cooled to the right temperature. Cream for a churning should be ripened in one can or vessel, so as to have but one degree of ripeness when put into the churn. Sixteen to twenty-four hours before churning time, warm the cream to 65 to 70 degrees (I prefer the latter temperature), and keep it at that temperature until ripe enough to churn, stirring it frequently. The best way to keep it at the proper temperature is to put the cream can in a vessel of warm water, or keep it in a room where the temperature is about 70 degrees. If you think it is not ripening fast enough, raise the temperature a few degrees. If it is ripening too fast, lower the temperature a little. You must learn by experience when cream is ripe enough. By the use of acid tests, which can be procured at any dairy supply house, you can determine when there is sufficient acidity in your cream.

Starters.—To ripen cream most successfully starters are necessary—the following can be used:

1. Buttermilk from last churning.
2. Ripened cream from last churning.
3. Buttermilk from a neighbor's churning.
4. New milk, or partly skimmed milk, ripened.

The first three require no preparation, but should be kept at a temperature of 35 to 45 degrees, until you want to use them. The low temperature will prevent the further development of bacteria. These starters should be from churnings that were satisfactory in flavor and acidity.

The fourth should be made by heating to a temperature of 70 to 75 degrees, and held there until fermentation has taken place, when it should be cooled to a low temperature and kept there until used. The object of this kind of a starter is to improve the flavor of the cream and butter. Unless you are satisfied that your new milk starter is better than the cream or buttermilk, better not use it. I have never failed to get a good starter from new milk. This new milk starter must be developed in the light. The lactic acid bacteria (the bacteria necessary for milk fermentation), can endure daylight and will develop freely, while the putrefactive and butyric acid bacteria will not develop in daylight. Your new milk starter can be developed between "sunup" and sundown, and if developed in the light the lactic acid bacteria will be developed in such great numbers that they will crowd out all objectionable ones, when used as a starter.

Fill a glass can or bottle with fresh milk and set in another glass can of water, heated to 70 to 75 degrees and keep in a bright light, where the sun will not touch it. Keep the temperature the same until milk is ripened. If the temperature of the room is 70 to 75 degrees, hot water will not be required. Generally the milk will ripen before night, when the can or bottle should be closed and reduced to a low temperature at once and kept there until used. Should it not be ripened by sundown close can or bottle and cool to 35 to 45 degrees at once and heat to 70 to 75 degrees next morning and complete the ripening.

Quantity of Starters.—Use about three to four per cent. as much starter as you have cream—put starter in cream when ready to begin ripening—sixteen to twenty-four hours before the time you want to churn.

Degree of Ripeness is an important factor in making good butter—a fairly high degree of acidity is preferable to a low degree, as it produces a more delicate flavor. Properly ripened cream should be coagulated and pour like oil. The cream should have a glossy expression and should not run off the stirring paddle in streaks, showing the wood where it runs off. The drippings from the paddle into the cream should make little holes that do not disappear readily. If the cream is not sour enough, the souring process will be completed in the butter, to its great injury.

Pure Culture Bacteria can be obtained and can be kept five to six months; the *solid, pure cultures* are better than the liquid cultures; directions for pure cultures accompany each package.

Tempering for the Churn is the next thing to be done and care should be manifested in heating or cooling

to proper temperature. Decide upon the temperature at which you expect to churn, then heat or cool the cream to that point; in doing this be careful to stir cream frequently. Have churn ready so as to put the cream in it when temperature gets where you want it. Cream should not be exposed to any disagreeable odors at any time.

Churning.

Four important things are to be considered in churning:

1. Condition of cream.
2. Temperature.
3. Washing.
4. Salting and working.

The Barrel Churn.

Always Can be Recommended.

Condition of Cream should be as nearly perfect as it is possible to get it. Should be rich—thirty-five to forty-five per cent—free from disagreeable odors and properly

ripenened. To get first-class butter rich cream is necessary. The thinner the cream, the softer and "sloppier" the butter, and the more the butter left in the buttermilk.

Temperature at which cream should be churned is very important. Rich cream can be churned at a lower temperature than thin cream. Thirty-five to forty-five per cent. cream can be churned at a temperature of 48 to 52 degrees. The more the milk in the cream the higher the temperature required for churning, and the softer and poorer the butter. There will be less grain, less flavor, poorer keeping qualities and it will be poorer in price, and not very good any way. There are so many objections to high temperature churning that first-class butter can not be made; twenty per cent. cream can not be churned below 60 to 65 degrees, and it will require two to three washings and workings, and that will ruin any butter, in grain and flavor. The grain can not be preserved when churned at a high temperature. If you attempt to churn thin cream at a low temperature it will froth, foam and swell until it almost fills the churn. At a temperature of 68 to 70 degrees, churning frequently can be done in ten minutes, while an hour or longer is required when the temperature is 48 to 52 degrees. Always churn at the lowest temperature possible—if you can churn at 50 degrees the butter will be first-class, if other conditions are right. Temperature of churning room should be about the same as that of the cream. It is best to put cream in churn 2 to 3 degrees lower than the temperature at which you expect to churn, as the temperature will rise a little while churning. See that the churn is perfectly sweet and clean—it should be scalded thoroughly and rinsed with clean, cold water. Strain the cream into churn and add the quantity of coloring matter

desired, the quantity will depend upon taste of you trade. About a teaspoonful to six gallons of cream will be sufficient for ordinary trade. Use the freshest and best coloring liquid. If, while churning the temperature rises too much, a little clean shaved or broken ice can be used—if the temperature gets too low, better raise it by raising the temperature of the room to 80 to 90 degrees—stir cream frequently and lower temperature of room when cream is at the desired temperature. Warm water is frequently poured into the cream, but it spoils the butter. A good way is to pour cream in churn, back into cream can and set it in warm water a few minutes. Stop churning as soon as butter is in the granular state.

Washing.—Draw off nearly all of the buttermilk through a strainer. If all of it is drawn off the granules have a tendency to pack and stick to each other. Make a weak brine of clear, cold water, and about one pound of salt to two gallons of water, strain this into churn and turn two to three minutes slowly. Draw off the brine and remaining buttermilk. The brine will harden the granules and drive out most of the buttermilk. Pour in some clean, cold water through a strainer, and turn slowly a few moments; draw off this water, and if the churning is done at 50 to 52 degrees, the granules will be almost free from buttermilk, and will be ready for the salt. If the churning temperature is 60 degrees or above, another washing will be necessary. If the churning is at a temperature of 50 to 52 degrees, the granules will be as large as wheat grains, and when washed as I have described, they will be so hard and free from each other that they will pour out of the churn in a similar manner to that quantity of wheat.

Salting and Working.—If you desire to salt in the churn, let the water drain off thoroughly and then sift into the churn the salt, which should be the best and finest, and free from disagreeable odors—three-fourths to one ounce to every pound of butter will be sufficient. Turn slowly a few minutes, let the butter remain in the churn one to three hours, so that the salt will be thoroughly dissolved; drain off the water if there is any and turn again several minutes. If churned at a low temperature it will be ready to print or pack. If churned at a high temperature a little more salt should be used, as more will be required to expel the buttermilk, and more working will be required. Let the butter stand in churn five to six hours, turning a few minutes every two hours. Salting and working can be done in any kind of a churn, when churned at a temperature of 50 to 52 degrees, but for high temperature churning a combined churn and but-

**A Cheap and Convenient Butter Worker
for Small Dairy.**

ter worker should be used. I do not believe there is any

better place to work butter than in the combined churns and butter workers. If the butter is to be salted and worked outside of the churn, let it remain in churn after being washed, one to three hours; turn a few minutes, take out, salt and work as desired. Butter churned at a low temperature takes the salt readily and does not require as much salt, nor as much working as high temperature butter. Such butter is firmer, better quality, better texture, better flavored—will keep longer and is better in every respect, than butter churned at high temperature. If much cotton seed meal is used, butter can not be churned successfully below 56 to 58 degrees, but at that temperature it will be granular, hard and solid. Soft butter, in which there are no granules, requires a large quantity of salt and much working, and when it is ready for market it is poor stuff that will bring a poor price and keep the dairyman who made it poor.

Cost of Producing Butter.

Much has been written about the cost of producing butter and in nearly every instance the writers have fallen into the same error—simply telling how much it costs when the cow is in full flow of milk. The farmer's estimate nearly always ignores his own labor—it may not count for much sometimes, but if it does not, it is his own fault. In some of the dairy magazines I saw an article in which the cost of butter was placed at seven cents a pound. The cost of butter depends upon how much butter the cow makes. The cow that makes 300 pounds of butter a year will be treated first as she is the ideal of most dairymen :

Feed and pasture (lowest estimate)	\$32.00
Labor	10.00
Interest, taxes, liability of death, etc.	5.00
Total	<hr/> \$47.00
Calf from 300-pound cow	\$ 5.00
Skim milk, after feeding calf	8.00
Total	<hr/> \$13.00
Net cost	<hr/> \$34.00

\$34.00 divided by 300 equals eleven and one-third cents a pound which is the cost. The average cost a pound for butter from a 300-pound cow is fully twelve cents a pound.

"Oh, my!" exclaims the 300-pound dairyman, "where does my profit come in; I don't get that much for my butter sometimes?" The answer is: Often it never comes in—the dairyman never gets any richer nor wiser. If this is true of the 300-pound cow, what about the 250, 200 and 150-pound cow? "But," says some dairymen, "it don't cost \$47.00 to feed and care for a cow." It does, if you get as much as 300 pounds of butter from her.

Let us do a little figuring at way-down prices, assuming that the cow is fresh when the most can be made out of her, about October 1st.

October 1st to May 1st, 212 days :

7 lbs. of bran a day for 212 days—1,484 lbs., at \$9.00 a ton.....	\$ 6.68
3 lbs. corn and cob meal for 212 days—636 lbs., at \$9.00 a ton	2.86
20 lbs. clover hay a day for 212 days—4,240 lbs., at \$8.00 a ton.....	16.96
5 months pasture at \$1.50 a month.....	7.50
Labor	10.00
Interest, taxes, insurance, liability of death, etc.	5.00
Total	<hr/> \$49.00

The price for bran is low almost everywhere—the price for corn is low, and in nearly all parts of the United States clover hay is higher. Timothy and prairie hay could be substituted, so could fodder and some other articles, but there would be a shortage in butter—\$5.00 is too low for interest, taxes, etc. Live stock insurance companies want about \$4.50 for insuring a \$30.00 cow. The price for pasture is away down. As to the \$10.00 for labor, it would be difficult to find a man to care for cows, milk, churn and sell the butter for \$10.00 a head. It would make him hustle to look after more than twenty cows—they would give him \$200 a year. Where can you get a competent man for \$200 a year and board himself? Most farmers pay as much as that for farm hands besides boarding them, and no man can be boarded for less than \$8.00 a month. The ordinary farm hand can not make good butter and properly manage cows.

Butter costs much less a pound when 400, 500 and 600-pound cows are kept. With the 300-pound cow it

requires good management to keep the cost of butter below twelve cents a pound. I have a cow that produces butter at a cost of less than six cents a pound each year, but she is not a 300-pound cow, and her calf is worth from \$80 to \$100 when five weeks old. At least two-thirds of the cows in the United States do not make their owners a cent. A man who does not value his labor worth more than ten cents a day, and who raises corn and hay for amusement, will tell you his butter does not cost five cents a pound to produce, and frequently the butter is dear at that price, when sold. The better the cow, the less it costs to produce butter. Ring up the butcher and climb up a notch

Care of Milk and Cream.

To be a successful dairyman, it is necessary to know how to care for milk and cream properly. They are sensitive to odors of every description, especially the disagreeable ones, and should not be exposed to them. If the cow stable is filthy, while a cow is being milked, the milk will absorb all the filthy odors and never can be free from them. It is very difficult to have a stable sweet and clean all the time, even while milking. I have found it an excellent plan to have a neat, clean, cosy little room, large enough for three or four cows (large enough to accommodate as many cows as you have milkmen). It would not be best to give cows their grain feed until after the milking is done, but always have some choice morsel for them in their trough in the milk room—just tempting enough to make each one anxious to have her turn to be milked, come. If you can not have a separate milk room, do not keep the milk can (or

whatever vessel used to hold the milk), in the cow stable; if you have no adjacent room suitable, better keep the can several rods from the stable rather than keep it in an offensive stable. If milk is to be separated at once,

Cream Can, with Plunger Cover and Jacket.

the cream can be cooled and aerated; if the gravity system is to be used, milk should be aerated—cooling is not necessary; if the milk is to be sold it should be cooled and aerated—it will be sweeter, better flavored, and will keep from twelve to twenty-four hours longer, without souring. The open pan system of raising cream is the most objectionable, because the milk is exposed too much, and will absorb all odors.

Cold and Warm Milk should not be mixed. Fresh milk unless thoroughly cooled and aerated, should not be put in air tight vessels—it will spoil more quickly and the flavor will be bad.

A Great Mistake is made by dairymen by putting fresh, warm milk in a closed can and setting it in cold water, or exposing it to winter temperature of 50 degrees

or below. The cooling of the outside of the column of milk rapidly drives the heat to the center, where there is liability of decomposition. After milk or cream is thoroughly cooled and aerated it should be put in an air tight vessel and kept at a low temperature—35 degrees will not hurt it, *neither will freezing*, although some dairymen claim it will. Milk frozen solid will keep as long as you have any occasion to keep it, but it must not be exposed to any disagreeable odors.

A can full of thoroughly cooled milk or cream will keep longer than a can partly filled.

If I desire to *keep milk or cream several days* I fill the can if possible, and stir often and change to a fresh can once or twice; if left in same can too long, there is danger; it is not best to mix milk or cream until you are compelled to mix it. Each milking or skimming, when kept by itself, nearly always will keep longer than when mixed with other milk or cream. Ice is absolutely indispensable to successful dairying.

“ Hoodooed ” Cream.

Frequently persons tell me their cream will not churn nor whip. Any cream will churn, if you know how. The temperature must be 48 degrees or higher. Sometimes cream will not churn below 65 degrees, especially if it is thin and has been mixed and been shaken much, and is stripper cream. If, after you have heated it to 65 to 70 degrees and it does not churn, cool it to 40 degrees and heat again. If this fails, cool cream to low temperature, let stand a few hours and draw off milk at bottom of cream can; this will make cream rich enough to churn. The milk of a cow in heat may spoil a churning.

The difficulty in churning, frequently is due to this milk. I have had persons tell me their cream was so thin it would not whip. "Nonsense." Skim milk will whip if it is cold enough. All that is necessary to whip any cream is to cool it to 40 to 45 degrees.

Washing Dairy Pails, Etc.

Only a few persons know how to wash a tin pail. If it is scalded while the milk adheres to it, the tin will be given a yellow coating that will resist almost everything except sand paper. The hot water acts as a mordant and sets the color in the milk. At first, only use tepid water and soap until the milk is removed, then you can scald as much as you desire. Always rinse your pails, milk cans and other tinware with clean boiling water and they will dry themselves. Wiping dry with a towel is a dirty habit, unless a fresh towel is used for each vessel, and then wiping is objectionable; no ordinary washing makes a towel clean, the lint of the towel sticks to the vessel. Nearly all wiped vessels or dishes have a disagreeable, dishwater odor about them.

All milk pails, cans, etc., should be rinsed with clean

water before used. The separator requires careful washing and when the parts are put together they should be rinsed in boiling water, cold water will do, but boiling water is better. When convenient, tin pails and cans should be thoroughly exposed to the sun.

Sale and Care of Butter.

Butter is a delicate article and sensitive to every disagreeable odor. After it is made it should be kept free from all its enemies—it is very companionable and forms acquaintance with almost anything that comes along. As soon as butter is made it should be packed or printed and cooled to a temperature of 40 to 45 degrees, and kept there until marketed, which should be as soon as possible after it is made. Every dairyman should aim to market his butter within less than a week after it is made. If packed in wooden tubs or vessels, they should be scalded and perfectly clean—tin pails are sometimes used; they are a little expensive, but you can afford to use them if you have a fine trade. If you retail butter in bulk it

Floating Thermometer.

will pay to have two tin pails for each customer; let him keep one pail until empty. If you send your butter to a reliable commission house, let it be understood that your butter must be sold as first-class. If you have any other class, do not permit your name or stamp to be placed on it, let the commission man sell it upon its own merits,

never claiming it to be first-class. If you make fine butter, it will bring good prices. Your shipping tubs must be neat and clean, and when started on their journey, should come directly from a refrigerator, where the butter has been cooled to a low temperature. Have your commission man keep you posted about your butter; if the trade is not pleased with it, you should know it and find a remedy. Be absolutely honorable with your commission merchant—make good butter and work together, and you will succeed.

Prints.—If you print your butter you should have more for it, provided the prints are what they should be and properly wrapped. Make each package as neat and attractive as possible, one pound prints are the most convenient. Have them twice as long as wide, making two prints on each cake, with a division between them so the cake can be cut in two and each half have on it a perfect print.

One-half pound is enough for the ordinary butter plate. If you retail the prints you should have a clean, neat butter box, with an apartment for ice. When your butter is delivered it should be cold and solid. If possible have shelves in your butter box, high enough for one layer of prints. Always give full weight—remember that your prints will shrink a trifle—if your butter is properly churned and worked it will shrink but little. Never deliver any butter that is not up to the standard. Better sell it for old grease. When your customers learn that they can rely upon you for an excellent grade of butter and even in quality, you will be able to sell ten times as much as you can make, at a high figure. In looking for a retail trade do not conclude that rich customers always are desirable. Most rich people are stingy and buy

cheap butter. Clerks, book-keepers, public officers and what are termed "sporting" men, such as theatrical people, horsemen, speculators. etc., pay the best prices.

Your butter trade will want cream, eggs and other farm and garden products, which must always be the best and absolutely fresh. If your customer asks you whether you have this or that article, tell him the truth. If you have the article wanted, say so, and if it is not the best, tell your customer; also, tell him you will not sell him any article unless it is first-class.

Collections.—Collect promptly. Show your customers that you are in business for profit. Prompt collections in all lines of business assist you in holding trade. If you are easy with your customers they get the idea that you are not much of a business man. Establish a pay day and adhere to it closely. If your customer quits you because you want pay for a first-class article, he is not the kind of a customer you want very long.

Faulty Butter.

Butter should have no faults, but most of it has.

Mottled butter evidently is caused by bacteria. The general impression is that mottled butter is caused by the salt not being properly mixed. An active bacteria certainly is the cause of it. I have seen unsalted mottled butter.

Flavor.—"Off" in flavor means that it lacks flavor, or has a flavor that does not belong to good butter. It is due to filth, improper ripening of cream, bacteria or churning at a high temperature.

Streaked and Striped butter is caused by improperly mixing the salt and by its uneven distribution.

Specked butter generally is the result of too much butter-milk—not washed nor worked enough.

Uneven Color is due to imperfect working.

Moldy Taste is caused by being kept in a close, moldy room, or by mold bacteria.

Sticky, Fatty butter is caused by high temperature churning and by overworking.

White Spots generally are caused by faulty ripening of cream. To avoid them ripen quickly.

Bitter butter nearly always is a cold weather product, and may be caused by some bitter weed that the cow eats, by some peculiar condition of the cow during the early period of gestation, or by a certain combination of bacteria.

Rank, Rotten taste in butter is due to filth and bacteria. Some butter is "rank" as soon as made. This is frequently the result from cream raised in shallow pans, in a dark, filthy room.

How to Hold Your Customers.

To be successful in the dairy or any other business it is necessary to treat your customers properly—must be honest with them; must be accommodating; must be prompt; must do everything you promise—better do more. If you promise to furnish a customer butter, you must do it. It is no excuse to say you did not have it—it is your business to get it, if it costs you \$10 a pound. If you *can not* get it, do the next best thing; give him several pounds for nothing. Tell him you will do it as soon as you can make it—it is your duty to do it, even though he tells you he will be your customer no longer. That is the only way to do business in any line. I have

paid \$2.00 a gallon for cream that I sold for seventy-five cents. Why? Because I promised to furnish my customer so much cream each day, and accidentally I was short; would have paid \$10 a gallon, not simply because I wanted to hold his trade, but because it was dishonorable in me not to make my promise good. This slipshod method of doing business is very common. Frequently you go to a store and leave an order, and when it is delivered you find some articles missing. The excuse is: "Did not have them." That is *stealing*, pure and simple. They should have gotten them, if it cost twenty times what you were to pay for them, or satisfy or offer to satisfy you in some other way. If you discommode another person, it is your duty to pay him for the trouble you have caused him. Tell your customers what you can do and do it. Give them all you promised, round measure, and you will be richly rewarded. The manner in which the business of this country—private, county, municipal, State and National, is done, is not much better than high-way robbery.

Skim Milk, Hogs, Calves, Etc.

The value of separator skim milk depends considerably upon the method of feeding it. It is more valuable when fed in connection with grain feed, corn or wheat middlings. It is more valuable to feed to young animals than to old ones. When fed to pigs until they weigh one hundred pounds its value is greatest, when fed to pigs and mixed with wheat middlings—two parts of skim milk to one part of middlings—it is worth from thirty to fifty cents a hundred pounds, when pork is worth from four to five cents a pound. It is worth about one-

third to one-half less when fed in connection with grain, to large hogs. After pigs get to be two months old, I have found it more profitable to feed it sour. Fed to calves pure and sweet it is worth about fifty cents a hundred pounds. But few dairymen get more than twenty cents a hundred pounds for their skim milk and most of them get from ten to fifteen cents. Twenty cents is a fair price when properly fed. It is relished by calves and can be fed to them profitably until two years old. It is an excellent article for young heifers. To feed it successfully to any animals it is necessary to feed in connection with other feed—corn meal is good, but wheat middlings are much better. Calves require some addition to the milk—a small handful of oil meal is the best; middlings are good. The best way to feed linseed meal, is to boil it until it is converted into a soft jelly. It can be cooled and kept in a refrigerator two to three weeks; thin it with a little hot water and mix with the skim milk; cooking it also prevents it from scouring calves. Skim milk should be kept in clean vessels and the buckets used for feeding calves should be clean—bacteria are active in skim milk. The ordinary swill barrel is the source of much disease in hogs. Skim milk should be clean and fed to hogs in clean troughs, which should be where the sun can reach them during all the day, and they will not be troubled much with bacteria. Always mix the skim milk and grain feed in a clean vessel immediately before feeding it.

Coolers.

To get first-class milk and cream it is necessary to cool and aerate them thoroughly. If you use a separator a cooler an aerator can be used while the cream is passing from separator to cream can, or any time within an hour after cream is separated. There are many good ones. Any tinner can make you one if you are not satisfied with such as you can buy. I use one like engraving

Aerator.

and find it satisfactory for all practical purposes. Ice is indispensable to successful dairying, unless you live in the arctic regions. As soon as cooled and aerated, cream should be cooled to about 40 degrees and kept there until ready for shipment or use.

Milk that is to be shipped, always should be aerated and cooled to make it most palatable, and for butter, to preserve it. By means of a little ingenuity any dairyman can plan and construct his own cooling apparatus. If milk is drawn and handled in accordance with the rules of cleanliness, as described on another page, aerating is not particularly necessary.

Cooling Tank.

The cheapest and best cooling tank is made as follows: In one corner of your creamery cut a hole through the floor, the size you want your tank. Dig deep enough to be about fifteen inches beneath floor, if you have fall enough to drain at that depth—not as deep if there is not enough fall for drainage. Wall with brick or stone high enough for your tallest cans—two feet eight inches is about right—that would reach six or seven inches above the floor. Lay brick or stone in cement—at one end at the bottom, have a little recess in the wall large enough for the stop-cock of drain pipe. Cement bottom thoroughly and the inside of wall all the way up so it will be water tight. Cement around stop-cock thoroughly to prevent leaking. Put a layer of cement about one inch thick on top of wall, making it level and the inner edges straight and even, so that a lid will close it tightly. The tank should not be more than about eighteen inches wide—wide enough for your largest can. This tank will require very little ice, and always will be sweet and clean. The lid can be hung on hinges and made to fit perfectly.

Ice House.

Every dairyman should have an ice house or part of one at least. It is an easy matter to build an ice house large enough for an ordinary dairy. An ice house 12x12-12 feet high is large enough for thirty cows. Several farmers can build one, dividing up the expense. Twenty-five to thirty dollars will furnish the lumber for a 12 x 12 ice house, and any farmer can build it in two or three days. An air space all around, twelve to fourteen inches, filled with sawdust well packed, will be proof against heat. I prefer fourteen inches. The roof can be double, leaving, a space of twelve inches for sawdust or shavings. Chaff is a good insulator. It is a good idea to start ice house two feet in the ground, and bank all around to keep out the water. Such an ice house will hold about twenty-five tons. In putting in ice, it should be cut in square cakes with parallel edges, so it will fit closely—as closely as brick. Set the cakes in edgewise and leave no air crevices. If you do not get a tight fit, fill in with broken ice. When filled it is a good idea to flood it with water. It will freeze and tend to act as a cement. Cover top of ice with chaff or straw a few inches thick. Have a double door and a small vestibule or outer chamber, so it can be closed while you have inner door open to get ice.

Thunder Soured.

Nearly every dairyman believes that thunder and lightning sour milk, and most of them will continue to believe it until they are thunderstruck. It is not very difficult to convince persons who are simply ignorant, often belief is based upon a foundation that excludes rea-

son, consequently precludes all possibility of being convinced by facts. An electrical storm has no tendency to sour milk, beyond the fact that it tends to increase the temperature of the atmosphere and rarifies the air. The same condition of the atmosphere at any other time will sour milk as readily. If the temperature of the milk is kept as low during a thunder storm as when there is no thunder, milk will not sour more quickly. The experiments during severe thunder storms showed that milk kept at a temperature of 40 degrees, remained sweet fully as long as milk when there was no storm. I have kept milk sweet eleven days after a terrific thunder storm—the storm having occurred three to four hours after the milk had been drawn and placed in refrigerator. Milk properly drawn and handled can be kept sweet several weeks without sterilizing. A little experimenting will satisfy any persons except those persons whose ideas are based upon the gauzy fabric of belief.

Strainers.

The ordinary strainer, whether wire or cloth, is a poor article, unless cleaned every time a pail of milk is poured through it. The filth settles in the bottom and is washed through into the milk can every time milk is poured through it. Wire strainers with closed bottom and rim extending up at least one inch before the wire mesh begins, are the best. With this kind of a strainer the filth that accumulates in bottom will not be washed through into can every time extra milk is poured through strainer. Two thicknesses of cheese cloth should be placed over inside of strainer, to assist in catching all the filth from the milk. Strainers should be boiled after use

and scalded just before being used, to free them from all filth and bacteria. Remember that no stench can be strained out of milk.

Sell Milk by Per Cent.

Nearly always milk is sold by the quart or gallon, regardless of quality. Three per cent. milk sells as readily as six per cent. milk. The consumer is as well satisfied with one as the other—quality is not a factor in his purchase. He does not realize that six per cent. milk is worth nearly twice as much as three per cent. milk. It is not worth quite twice as much because there is no more skim milk in six per cent. milk than there is in three per cent. milk—not quite as much. Skim milk is worth something. If three per cent. milk is worth six cents a quart, six per cent. milk ought to be worth eleven cents. Nearly all the milk sold at retail contains less than four per cent. fat, and less than two-thirds of it contains less than three and one-half per cent.

Three quarts of water can be put in one gallon of six per cent. milk and the mixture will be better than three per cent. milk. The price of milk should be regulated by the quantity of butter fat it contains.

Kicking Cows.

A kicking cow, generally, can not be broken of the habit. She will kick as long as she is alive, unless prevented. If she is fastened so she can not kick she will not attempt it, after she has made a few trials and learned that she is fast. A rope or strap around her body in front of udder is dangerous. Put a strap with a ring about two inches in diameter around her ankle. Put a

large staple or wood screw in floor just where you want kicking foot to rest. Have attached to this screw or staple a large steel plate snap. Have it short enough to give the foot almost no friction when snap is attached to ring on ankle strap. A few attempts will satisfy the cow that she is conquered, and ever afterward when the snap is attached to ankle strap, she will be quiet. Let strap remain on ankle. I never knew this arrangement to fail to stop kicking. A scare or abuse causes the kicking habit, which has its seat in the nervous system.

Food Rations for Human Beings.

While much attention has been given to rations for cows, but little has been given to formulating rations for persons. The relative proportions of nutriment in different kinds of food seem to be of little importance to the every day man or woman. In fact there have been but few, if any, careful scientific experiments in this line. For a man of average size the accompanying table is approximately accurate :

	Protein.	Carbohydrates.	Fat.	Calories
	lbs.	lbs.	lbs.	
Average work	.30	1.05	.32	3861
Hard work	.40	1.45	.50	5551
Hand and brain work with light exercise.	.28	.98	.26	3439

The "calories" represent the full heat value of food, one calorie being equal to the quantity of heat necessary to raise the temperature of one pound of water four degrees.

It has been estimated that in the average food :

1 lb. protein equals 1860 calories.

1 " carbohydrates equals 1860 calories.

1 " fat equals 4220 calories.

As fat is the fuel of the body, and is necessary to sustain the temperature of the body and to produce physical power—hard physical labor requires a large quantity of fat. Fat bears a similar relation to fuel and fire in generating steam. Fat acts as fuel to consume the protein and part of the carbohydrates. The following table will give the reader a fair idea of the value of foods. These figures are approximately correct.

Foods.	Water.	NUTRIENTS.				Full value of 1 lb. Calories
		Protein.	Carbo- hydrates.	Fat.	Ash.	
	per ct.	per ct.	per ct.	per ct.	per ct.	
Sirloin of beef, me- dium fat.....	62.5	19.2		17.3	1.	1090
Ham	50.1	15.4	Included in fat.	28.5	6.	1490
Pork sausage.....	38.7	12.8	8	45.4	2.3	2170
Oysters	88.3	6.1	3.3	1.4	.9	235
Eggs.....	74.1	14.7		10.4	.8	710
Oleomargerine ...	9.3	1.3		82.7	6.7	3515
Butter	10.5	1.	.5	8.5	.3	3015
Milk	87.	3.3	5.	4.	.7	325
Cream.....	74.	2.5	4.5	18.5	.5	910
Cheese (full cream)	30.2	28.3	1.8	35.5	4.2	2070
White bread.....	35.4	9.5	52.8	1.2	1.1	1205
Corn bread.....	38.	8.5	47.3	2.7	3.5	1150
Dried beans.....	13.2	22.3	59.1	1.8	3.6	1590
Rice	12.4	7.8	7.9	.4	.4	1630

This table will enable the reader to compare the nutritive properties of dairy products with some of the common articles of food. The fuel properties of butter and cheese are high. With these articles "a little goes a long way," and a very small quantity satisfies the appetite.

The component parts of three and one-half per cent. milk are about as follows :

Water.....	87.7	per cent.
Fat	3.5	"
Casein.....	2.4	"
Albumen.....	.7	"
Sugar	5.0	"
Ash	.7	"
<hr/>		
Total	100	"

Condensed milk contains about 22 per cent. water.

Heifers.

Every dairyman should raise all the heifer calves from his best cows—from the cows that will make four hundred and fifty pounds of butter and more—let the butcher have the other calves. Do not give them much rich grain feed as it will tend to establish the fat habit. Do not permit them to get fat, as it will injure them for dairy cows. A little bran, hay and fodder will do for winter and good grass for summer. Handle them frequently, so they will be gentle when ready to milk. Rub and handle their udders frequently, but never play with nor tease them—pet cows are not the best. Be kind to

them. From twelve to fourteen months is the best time to breed them. Be careful with their feed, several weeks before they are fresh. Feed scantily, giving no grain when on grass, and but little in winter—the pasture should be scant. Attend to this feed matter properly, and there will be no milk fever. The first year, milk at least eleven months, if not all the year. This will tend to establish the milk habit, which is very important to a good cow. Get every drop of milk every time you milk. The year after second calf, if she does not prove to be a good milker, give her to the butcher.

Diseases of Cows.

While I do not believe much in the use of medicines, I am an enthusiast on the subject of preventives.

I shall speak briefly about some of the common diseases of cows, and prescribe such medicines as will not do much harm, if they do no good. The curative properties of medicines are greatly overestimated and generally they “cure” in cases that would recover without outside attempts at assistance. The dairyman that is continually running to the doctor or stuffing his cows with medicines, will be blessed with an abundance of sickness and its attendant misfortunes. The family that always is doctoring, always is sick. Prevention is cheap and always yields a large dividend on the investment. Care and good sense—not common sense, everybody has that—are the prime elements of success.

Tuberculosis simply is consumption, and generally death is the only cure for it in an acute state in man or beast. Tuberculosis in cows does not occur frequently, but with most dairyman “tuberculosis” is about as good

as any other name, when nobody knows what is the matter with the cow. I have examined many cows supposed to be suffering from tuberculosis and never found the symptoms alike in any two cows. Many dairymen confound all diseases of the udder with tuberculosis, although nine-tenths of all the udder troubles are the result of improper milkings and exposure—pulling the teats too much, squeezing the udder, not milking clean, etc., are a source of much trouble. Until in the advanced stages tuberculosis is not easily detected. The following are some of the indications:

1. Yellow brown color of milk in early stages of the disease.
2. Slimy and lumpy milk.
3. Milk coagulates at about 80 degrees.
4. Enlargement or hardening of glands of lower jaw.
5. Hardening of skin over flank.
6. Hardness of glands above udder.
7. Hardness of glands in front of hip bones and in flank.
8. One part of udder may be affected and the other not—affected part will be enlarged, hard and knotty.
9. It is not often that tuberculosis affects the front part of the udder and not the back part. It nearly always begins in the back part.
10. Irregular respiration and inspiration—the latter should be about twice as long as the former. By careful comparison with the breathing of the other cows, the irregularity can be discovered. If, by pressing the wind-pipe, the cow expels any offensive mucous, there is something wrong.

The danger from tuberculosis has been exaggerated

ten fold. A cow with chronic tubercular centers may give pure milk and as beef may be harmless. These centers may not contain any germs of tuberculosis. The use of tuberculin is not absolutely reliable and frequently will not react in case of tuberculosis, but frequently will react where there is no tuberculosis. The indiscriminate use of tuberculin does great harm and by the use of it chronic tubercular centers may be changed into acute tuberculosis, impregnating the milk with tubercular spores and germs, making it poisonous, and killing the cow. The use of tuberculin in treating cows for tuberculosis has been the means of killing or having killed many cows, that would have lived to old age and would have given milk pure and free from tubercular germs. Unless the udder and milk centers are contaminated with tubercle bacilli, there is no danger in using the milk. The effect of tubercle germs is neutralized when the milk is mixed with a large quantity of pure milk. Owing to this fact milk from a dozen cows is less dangerous than that from one cow. In the use of milk for babies, mixed milk generally is best.

The danger from outside filth is a hundred times greater than that from internal disease. The chronic tuberculous condition is not particularly dangerous, in fact, there is no danger worth considering. If, after a careful chemical analysis, it has been established that your cow has acute form of tuberculosis, separate her from the herd at once, and thoroughly disinfect and clean the stable. Millions of human beings, whose lungs contain tubercular centers, live scores of years and die of old age. Do not be too hasty about the use of tuberculin. It should be used only by scientific experts. Filthy, dark, poorly ventilated stables, tend to produce tubercular conditions.

Basement stables should be condemned as unfit for use. In many of these stables the heads of the cows face the wall, and are shut off from ventilation and light. Fresh air, cleanliness and abundance of sunlight are necessary to health. Beware of the indiscriminate use of tuberculin.

Milk Fever.—Many dairymen continually are asking questions about milk fever. "How to cure it?" comes from every quarter.

I never bother my brain about how to cure it, because I do not believe in cures, and do not believe in having milk fever. Cows nearly always die when they have milk fever or become worthless. Many dairymen will tell you they have cured it—their cows did not have it. There is no occasion for milk fever, if cows are properly treated before fresh. You never hear of a poor cow having milk fever—one that had a scanty ration four or five weeks before becoming fresh. The fat, well-fed cows have milk fever. She should have but little if any grain feed and then nothing but bran in winter and a little hay and fodder, and in summer no grain and a scanty ration of pasture. Two months rich grass will cause milk fever. See that her bowels and kidneys are kept free and active. A little oil meal, salts and salt peter will keep these organs active. Grass in summer will suffice. Keep the cow where she will be comfortable and free from drafts of air. See that her stall is not damp and that she has abundance of sunlight. Milk her three or four times a day the first two days, but never milk her clean—follow Nature—the calf never sucks her clean.

If there are indications of fever give her eight to twelve drops of aconite and an equal quantity of belladonna, alternately, every twenty to thirty minutes, in a little warm water. Continue this for a few hours

and if the symptoms disappear, give her several doses of eight to twelve drops of *nux vomica* every twenty to thirty minutes. If she does not improve, call in a veterinary. But as I have said, there is no occasion for milk fever if the cow is properly handled before she becomes fresh. After she has her calf give her a little warm water and warm bran mash.

Garget, or inflammation of the udder is common among cows. In some cows it is periodical, occurring once or twice a month. One part of the udder will be inflamed and caked. The milk will be thick, ropy and full of curd. These conditions may disappear within a day or two and they may continue for weeks and ruin the cow. The cause of this trouble is filth, exposure, bruise, imperfect milking, squeezing the udder in milking. Cows exposed to severe cold, dampness, such as damp floors, stables, cold drafts of air, etc., are subject to inflamed udders. By reducing the feed and giving the cow something of a laxative and cooling nature, such as cow beets — bathe the udder twice a day with strong, hot salt water and rub well with three parts camphor and one of turpentine — generally she will recover. A dose of physic will be good for her.

Abortion.—I have spoken briefly of this trouble in another part of the book, but shall treat it here. It is claimed by many persons that feed produces abortion. Ergot in large quantities may produce it, but I do not believe many cows abort from this cause. Cows in a nice, clean pasture, with clean water to drink and free from abuse and fright are not troubled with abortion. Anything that shocks the nervous system is liable to produce abortion. The smell of blood, fright, cruel treat-

ment, over feed, filth and stench of any kind are dangerous. Lean cows rarely abort.

Sore, Filthy Feet seriously disturb the nervous system of a cow and lessen the milk flow. Clean thoroughly, wash with strong tar soap and bathe twice a day for a week with a quart of water, in which a half teaspoonful of permanganate of potash has been dissolved.

Mange.—Keep clean, wash with tar soap, feed well.

Bloody Milk.—There is no such thing as bloody milk, except in appearance. Give less feed and a little nitre and physic.

Small Teat Opening.—Force a hard rubber tube up the opening of the teat and let it remain there two to three hours. Repeat two to three times a day for a few days.

Protruding Uterus.—Have cow lie and stand with her hips higher than her head. Keep bowels active and bathe with acetic acid one part and water six parts.

Warts on teats can be removed by touching them with nitric acid. Be careful not to touch any other part of the teat with acid. To prevent this, grease the teat all around the wart before applying.

Stoppage of Milk.—Sometimes the milk flow will decrease one-half to three-fourths within a day or two. Physic freely and feed hot bran mash with ginger in it a few days.

Nymphomania.—If you are anxious to experiment, try some of the remedies advertised. If they do not prove effective, turn her over to the butcher. Nymphomania is a nervous disease, and nervous diseases are difficult to handle.

Dose of Physic.—Three-fourths to one and one-fourth pounds epsom salts and two ounces ginger in

quart of boiling water, given at temperature of 100 degrees.

Cheese.

The cheese industry of the United States is not large in comparison with that of some other countries. Canada has taken from us much of our best export trade, principally because Canadian cheese is richer and better. Much good cheese is made in the United States, but most of it is filled, skimmed or hastily cured. The English, demand full cream cheese well cured. To make good cheese, rich milk is necessary, and extra cream added will greatly improve the quality. Skimmed cheese is all right in its place. In this age of boasted enlightenment, where hundreds of thousands of our inhabitants die of starvation each year, and where the majority go to bed hungry almost every night, cheap articles of food of all kinds are a necessity. All skimmed and filled cheese should be marked, and a penalty imposed for selling them for full cream cheese. Most persons do not know the difference by taste. Generally the profit in cheese making is not as large as in butter making. Circumstances, location, etc., govern this point. The time and labor required to make good cheese, will prevent the manufacture of it on as large a scale as that of butter.

The inhabitants of the United States are not cheese eaters. They nibble at it as though it were medicine. In Europe tens of thousands of persons frequently make a whole meal of cheese—eat a pound or more. Most of the cheese consumed in this country, is eaten by our foreign population and by their families. Eaten in large quantities, like any other rich and concentrated food, it

is burdensome to the digestive system. Good cheese, eaten in proper quantity, is nutritious and wholesome. The appetite for old, strong cheese has to be cultivated. Such cheese is not fit for use. Many foreigners prefer this rank cheese, and the appetite for it—similar to that for coffee, tobacco and intoxicants—becomes a disease. Most of the full cream cheese made in the United States is a palatable article and an economic food. Many persons have diseased appetites that demand strong cheese and rancid butter. I know several persons who will not eat butter until it is strong enough to bite the tongue.

Cheese and Butter Fat.—Dairymen have had much to say about paying for milk for cheese, upon a butter fat basis. I have read and heard nearly everything that has been said upon this point and do not know any good reason ever advanced against butter fat, as a measure of value. It is true that six per cent. milk will not make twice as much cheese as three per cent. milk, but the cheese from six per cent. milk is enough better in quality to balance what it lacks in quantity. The richer the milk the less the proportionate loss of fat in the whey. Throughout the entire list of dairy products butter fat is the best measure of value.

How Much Cheese in Milk?—Average milk should make about two and one-fifth times as much cheese as butter. One hundred pounds of four per cent. milk will make about four and one-half pounds of good butter and about ten pounds of cheese. Careless manipulation of milk will decrease the quantity of cheese and butter.

Cheese Making.—It requires considerable skill and care to make good cheese. Experience is the best teacher, although much can be said on paper to assist

the cheese maker who has not learned how to make the article successfully. There are a hundred and two little, though important things, about cheese making that the dairyman who has good sense can arrange and manage to suit himself, consequently I shall not speak of them. The industry of cheese making is in its infancy. Yet, scientific experiments may solve the cheese making problem. There has not been half as much advancement made in cheese making as in butter making, although the art of butter making is in its swaddling clothes yet.

For Cheese Making, milk should be sweet, fresh and free from disagreeable odors. It should be gently heated in the vat, to 85 to 86 degrees. The heat should be applied to the vat in the form of steam or hot water. While being heated the milk should be stirred frequently. When the desired temperature is reached the heat should be turned off and the milk tested for acidity. There are several tests for acidity, but nothing "simpler" than the following:

Put a dram of rennet in eight ounces of milk taken from the vat, and stir a few seconds. If it curdles in thirty seconds, it is ready for the rennet. If it requires longer to curdle it is not quite ripe and should stand longer. If it requires fifty to sixty seconds to curdle, better heat it 90 to 95 degrees, and by the time it cools to the proper temperature, it will be about right. When it has the proper acidity, the coloring should be added. The quantity of coloring matter will depend upon its strength and the degree of color desired in the cheese. It should be diluted with three to five times its bulk of water and thoroughly mixed with water.

Rennet.—Two and one-half to five ounces of rennet extract should be used for 1,000 pounds of milk. No def-

inite rule can be laid down governing the quantity to be used, as it depends somewhat upon the condition of the milk and atmosphere, the degree of ripeness, etc. The rennet should be diluted with several times its bulk of water before adding it to the milk. Mix it thoroughly with the milk in the vat and stir frequently, until within a few minutes of coagulation. Keep the vat covered when not stirring. Coagulation should begin in about eighteen to twenty minutes, and should be ready to cut in forty to fifty minutes. Watch your curd closely. Whenever it splits before the finger without leaving any trace of milk, it is ready to cut.

Cutting the Curd.—For properly cutting the curd, a perpendicular and a horizontal knife should be used. The best knives are made similar to figures 1 and 2.

For convenience cut with the perpendicular knife first, crosswise and lengthwise of the vat. After three

Fig. 1—Horizontal
Curd Knife.

Fig. 2—Perpendicular
Curd Knife.

to five minutes, cut with the horizontal knife. The blades in these knives should be about one inch apart. When the curd is cut it should be stirred gently to loosen all particles of curd from the bottom and sides of the vat.

Heating and Handling the Curd.—The curd should be heated gradually to 98 to 104 degrees. There are many ways of heating. Heating can be applied by steam or hot water surrounding vat, or by removing part of the whey and heating it to a temperature of 135 to 140 degrees, and putting it back into vat—a little at a time until the curd is cooked. The curd should be stirred frequently, to prevent matting, until the acid has sufficiently developed to remove the whey. When the acid shows about a quarter of an inch on the hot iron and pressed curd will fall in pieces readily, the whey should be removed and the curd stirred until it has a shotty appearance and will creak between the teeth.

Drain the curd to each side of the vat, leaving a gutter in the center to draw off the whey. The vat should be tipped a little so the whey will run off. Cut curd in strips, extending from center to side of vat, to assist drainage. Cover vat to prevent rapid cooling. A pail of hot water in each end of vat will keep temperature from decreasing. After the curd has become matted it should be cut in pieces six to ten inches wide and the pieces turned so the cooler side will be under, and the outside pieces put in the center to preserve equal temperature in all the curd. Every fifteen to twenty minutes the pieces of curd should be subdivided and turned, until sufficient acidity develops, the whey is all drained and the curd begins to get dark, when the ripening is about completed.

When the hot iron—not red hot—is pressed against

the curd, if ripe, it will adhere, and when the curd is pulled away, gently, fine silky threads one and one-quarter to two inches long will be formed. If not ripe the curd will not adhere.

Grinding, Cooling and Salting.—Grind the curd and spread it to cool and air. When cooled to 78 to 80 degrees, it should be salted, using two to three pounds to every 1,000 pounds of milk that had been used. Mix the salt thoroughly and let it air until cooled to about 70 degrees. It should be stirred frequently while airing. Generally the salt will be dissolved in twenty to thirty minutes, when the curd will be ready for the press.

Pressing the Curd.—The pressure should be slight at first, and gradually increased. As soon as the whey starts freely let it rest a few minutes before applying any more power. After the curd has been pressed about an hour, it should be removed and the bandages arranged properly, to make the cheese as neat as possible. Ten to fifteen hours after the pressure has been applied the cheese should be turned, to keep the shape as harmonious as possible. Eighteen to twenty-four hours pressure should be enough to prepare the cheese for the curing room. A ten-pound cheese will require about five hundred to seven hundred pounds of pressure and a fifty-pound cheese, two thousand pounds. Less pressure is required during warm weather than cold. The greatest pressure should not be applied until within five to seven hours before the time to remove cheese from press.

The Curing Room should be clean, well ventilated and free from foul air. The temperature should be 65 to 75 degrees, and as regular as possible. A higher temperature is required in spring than in summer and fall. The atmosphere should not be too dry nor too damp. If

too dry the cheese are liable to crack and to mold, if too damp, water sprinkled on the floor will prevent dryness, and a little extra heat and fresh air will prevent dampness. Three tiers of shelves about two feet apart are advisable—they should be wider than the cheese. The cheese bandages should be fully as large as the hoops, or they will rip under pressure, and the cheese be exposed to flies. When cheese are placed on the shelves they should be greased thoroughly to prevent cracking. For greasing, whey butter (cream that rises on whey), or cheap butter can be used. It should be heated to 120 to 130 degrees, and rubbed on with a rag. The cheese should be turned and oiled every day for three or four weeks—two to three times a week after that time. To make first-class cheese it is necessary to keep them in the curing room at least two months—a longer time is better. Cheese should be placed on the top shelf first, as the temperature will be higher than on the lower shelves. Fresh cheese require more heat than cheese partly cured. When the top shelf is filled, or after they have been there for a few weeks, remove to second shelf and afterward to lower shelf, where the curing is to be completed.

It is almost impossible to lay down any iron clad rules for cheese making, as there are so many conditions that require a variation in the method of manufacturing.

The quantity of rennet depends upon the degree of acidity of the milk. Over ripe milk requires more rennet and should be set at a higher temperature—frequently as high as 95 degrees.

Milk from fresh cows require more rennet than from strippers

More rennet should be used for spring than for summer and fall cheese.

Curd should not be cut too soon, as it will not retain enough moisture; the more moisture retained, the more readily will cheese cure, provided other conditions are right.

When the curd is ready to cut, it feels velvety and greasy and smells like fresh butter.

Too much salt prevents rapid curing.

Dairy Suggestions.

Salt does not add to the weight of the butter, unless added after all the buttermilk is expelled, as it expels more than its weight of buttermilk. It does not preserve butter, as unsalted butter will keep as long as salted butter.

Milk from fresh cows, churns more easily than from strippers. When all the cows are strippers, it is difficult to churn at a very low temperature, unless the cream is very rich.

Cream rises more readily from milk from fresh cows than from strippers, and the skimming is cleaner. The loss in skimming strippers' milk is much greater when the gravity system is used than when skimmed by separator.

Aerating improves filthy milk, but is not beneficial to pure, clean milk. The animal heat, as it is termed, is a part of pure milk, and necessary to the most delicate flavor. Aerating should be done in a clean room.

If you have a cow that you want to fatten and sell, it will be cheaper to fatten her while she is being milked. Give her all she will eat of fattening feed. She will take on flesh readily if she is not a good milker.

Do not force a cow dry—if she persists in giving milk, let her have her way about it. If a cow continues to milk freely to within a month to six weeks of calving, do not attempt to dry her. It is much more difficult to dry a cow three to four weeks before she is fresh, than two to three months before. Caked udder, milk fever, etc., are liable to be the result.

Do not buy a smooth, pretty cow except for beef. They are not the best for beef—pretty animals are not a success; pretty persons, not excepted.

It is better to cut hay of all kinds a little early—it retains its succulent properties better than when cut late.

If your milk, cream and butter are poor, do not always blame the cow and bacteria—generally the fault is your own. Nearly all poor dairy products are the result of dirtiness on the part of the dairyman. Can not have good butter, milk or cream without cleanliness.

Good butter should contain about eighty-five per cent. butter fat. The best butter should contain about ninety per cent.

The more you mix and stir milk the more difficult it is for the cream to rise, and the more the fat left in the skim milk.

Never raise a calf for a milk cow unless its mother would produce more than three hundred and fifty pounds of good butter in a year.

If a cow is worth keeping she is worth feeding all she will eat of good milk feed, when in full flow of milk.

Cows that have small bellies are worthless as milkers and not good beef cows.

Butter fat in butter is very unequal in quantity. The best butter, other things being equal, contains about ninety per cent. butter fat; common butter, eighty per cent.; poor butter, sixty-five to seventy-five per cent. Some good butter does not contain more than seventy-five per cent. fat, but the other things are a little extra—that is, cleanliness, handling, etc.

Abortions nearly always are the result of filth, fright and poor care. Poor, boney cows rarely abort.

Decayed teeth frequently cause a cow to throw out her cud. Do not conclude that a loss of the cud will kill the cow, it is not dangerous.

Value of ensilage can not be measured by the nutriment it contains, as its succulent, cooling properties are of great value.

One man in one day can cut, load, haul one-third of a mile, and unload enough corn to make about ten tons of ensilage.

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What suits one cow may not suit another. One cow may require four to six weeks rest each year, and another may not require any. The feed that agrees with one cow may not agree with another.

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ERRORS.

Just before printing the last form we discovered several errors in spelling—a few words substituted and some other slight mistakes not found in the author's manuscript. As not many of these errors are of much importance we shall refer to but few of them:

Page 37.—5th line from bottom, $8\frac{1}{4}$ should be 2—

Page 46.—6th line of reading matter, *nearly* should be *more than*.

Page 67.—14th line from bottom, *pays* should be *pay*.

Page 192.—13th line from bottom, *months* should be *much*.

Page 201.—4th line from bottom, *require* should be *requires*.

Errors in spelling are the result of careless proof-reading and do not affect the subject matter.

Respectfully,

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