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THE FARMERS' INSTITUTE

QUESTION BOX

ON

CATTLE AND THE DAIRY.

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PRICE, 30 CENTS.

THE FARMERS' INSTITUTE

“Question Box”

—♦—ON—♦—

CATTLE AND THE DAIRY.

*A Book of Practical and Authentic Information on Various
Topics Pertaining to Stock and Dairy Management as
Discussed at Farmers' Institutes, Dairy Conventions
and in the Agricultural Press, with an Intro-
duction by Hon. Geo. T. Powell, Director
of Institutes for New York State.*

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INTRODUCTION.

BY HON. GEO. T. POWELL,

DIRECTOR FARMERS' INSTITUTES FOR NEW YORK STATE.

Our dairy interests have always been and will continue to be among the most important in our agriculture. Not only because they furnish a great amount of most excellent and highly nutritive food for the human family, but for the very important relation which they sustain toward the soil in maintaining its fertility.

Without an abundance of bread on which to spread the golden butter, our dairy interests would be seriously crippled and vast acres of land have been abandoned in wheat culture for want of sufficient available plant food or fertility in the soil to grow wheat profitably. With our rapidly increasing population and the steadily increasing demand upon our soil for bread for other nations, much of this abandoned wheat-growing area will again be called into use, and this is one of the strong, underlying causes for the very active interest that is everywhere shown in dairying. Living in an age of progress in so many directions by which cheapness, comfort and even luxury in living are brought within reach of the masses, it is of vital importance that our dairying be well established in this line of progress as affecting the highest interests of the producers and also consumers of dairy foods.

In this volume, especially devoted to the dairy interest, will be found the latest and best thought on this subject as given in the Farmers' Institutes and dairy meetings in discussions by the most advanced and successful dairymen in our country—men of large, practical experience. Old methods will not give satisfactory results in present dairying; conditions have changed, demands are different, and only by the application of a high degree of skill and intelligence can success be achieved.

The dairy cow is a wonderfully intricate piece of machinery for the farmer to attempt to manage. On the one hand she is very responsive to kindly treatment, to judiciously selected food, to all of the conditions of comfort and contentment that can be thrown around her as a maternal

creature, adding largely to her owner's, and the state's, wealth in the amount and value of her products. On the other hand by neglect, by lack of knowledge of how to meet the needs of her being, by insufficient food, warmth and comfort, she will fail to be a satisfactory helper in the solution of the problems of successful agriculture.

The demand of the present is for better fabrics, better furnishings all around, better machinery, better stock, better roads, and all at the least cost, and this is equally true of food products. It makes a vast difference with the producer whether the cow he cares for returns 150 pounds of butter or 300 pounds as her annual product and the consumer is equally interested in the result, for upon the abundance and reasonable cheapness of this food depends its greatest consumption.

The production of fine butter and cheese is not only an art, but a science. That these foods are put in the list of the most costly of luxuries, is verified by the large prices they command for the choicest quality, which is but the result of the highest skill applied to their production. Milk is a food very extensively and increasingly used, and the value is determined by the amount of the solids or food elements it contains, not only when used in its liquid form, but especially in the making of butter and cheese, and the wide variation that exists in these solid elements and their now recognized relation held to profitable dairying, has been a subject of wide-spread interest and discussion, as the public milk-tests made at the Farmers' Institutes and dairy meetings have everywhere demonstrated.

The information and facts collected and herein presented are of incalculable value to every husbandman, for upon his knowledge of these things and the extent to which he puts that knowledge into practice, will depend largely the degree of prosperity that will attend his future efforts in dairy farming.

PUBLISHER'S ANNOUNCEMENT.

We think it will be admitted by all who are familiar with the workings of our Farmers' Institutes that one of their most practical, helpful features, to the farmer, is what is termed "The Question Box." This is true because the man who seeks information and receives it, is the one who is benefitted thereby. Such information is brief and to the point and is given by men who are qualified to do so.

In the compilation of this little book we are simply carrying out the idea of the Institute Question Box, hence we have sought our material in the reports of the very excellent Farmers' Institutes of New York state (many of which have been kindly furnished us by the Director), also in reports of similar Institutes in other states, in the reports of the conventions and dairy schools of the New York State Dairy Association and in the "Query Department" of some of the leading stock and agricultural journals. We claim no originality in the answers to the within queries; our authorities are those mentioned above.

In the following pages we have endeavored to condense the replies to questions in the smallest compass consistent with the end in view. We have endeavored to select those subjects in which every farmer and dairyman would be interested and the discussion of which would be helpful to him. We believe the little work will commend itself, both as to style and matter, to all who examine it. In the hope that it may be so we send it forth to the dairy farmers of America.

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CHAPTER I.

Cattle: Care and Management.

Remedy for Garget.—How should garget be treated? Give remedies!

Chronic cases require different treatment oftentimes. Give 2 oz. spirits turpentine and $1\frac{1}{2}$ pints of raw linseed oil; repeat in 24 hours. Mix in feed or give as a drench three times a day 2 tablespoonfuls of the following powder: Powdered iodide potass, 4 oz.; powdered chloride potass, 6 oz.; powdered colchicum root, 3 oz.; mix. Feed no corn or cottonseed. Another treatment is to apply about 30 drops tincture poke weed in a glass of water, to udder. Another cure is one ounce each of white vitriol and copperas mixed with an ordinary charge of gunpowder in one quart of water. Bathe two or three times a day. For caked bag the following is also recommended: Give cow 12 oz. Epsom salts and the day following 1 oz. salt petre. Bathe udder in warm water and rub it gently until softened. Give bran slop after hardness has gone. Still another garget remedy is this: Give $\frac{1}{2}$ lb. Epsom salts every three or four days, rub the udder with a little iodine ointment once a day. Give the cow an ounce of the following medicine in feed or otherwise three times a day: Bicarbonate of mercury, $1\frac{1}{2}$ dr.; iodide of potass, 4 oz.;

water, 1 qt.; mix. She must not have corn, rye or wheat.

Cow Slobbering.—A small, full-blood cow, 8 or 9 years old, about 5 months in calf, has poor appetite, and slobbers badly. Feed is cut timothy hay with a small per cent. of clover and malt sprouts, corn meal, oat chop, wheat bran and middlings. Hay wet and feed mixed with it; of this, all she will eat. Hair rough, and hide not as loose as it should be.

Take away the clover hay and corn meal. Give her 1 lb. Epsom salts, repeat in four days. Mix in feed twice a day two tablespoonfuls of the following powder: Powdered nux vomica, 1 oz.; powdered wood charcoal, 8 oz.; bicarbonate of soda, 12 oz.; mix.

Warming the Water.—Will it pay to warm water in winter for animals?

It's a question whether all can go to that expense. It is desirable to have all cows watered in the stables from water that is considerably above the freezing point. A dairyman in the Hudson river valley made a gain in the milk of forty cows, of two cans of forty quarts each, by following this plan. The experiment stations have demonstrated that it does not pay to warm water, but to give it to the cow at about the temperature of the earth.

Grain, After Calving.—How much grain should be fed a dairy cow, after calving to secure best results at least expense?

It depends upon the kind of cow you have and her ability to assimilate food and turn it into milk. Some have a much greater capacity to do this than others have. Prof. Robertson of the Ontario Experiment Station found, after making several experiments that the average is about 8 lb. Good judgment is necessary in feeding cows, and the feeder should be cautious in how and what he feeds, and only a test of each cow will give him the desired information.

Saving Manure.—How can manure best be saved and cared for, and how best applied?

By having tight gutters behind the cows, absolutely water tight. These are made by bedding plank in cement. You must also have sawdust or something to absorb the liquids. If the manure is not to be put on the land at once, it should be kept under cover. Prof. Roberts computes that there is a loss of 48 to 54 per cent. in value of manure when left out and exposed to the weather.

Cow not "Cleaning."—A Jersey cow four years old, dropped her calf and was not known to "clean," as we term it. She has not a very good appetite, does not give much milk, and is gradually falling away in flesh. What is the treatment?

Give one of the following powders three times a day, in feed or dissolved in warm water: Powdered sulphate of iron, 8 oz.; powdered nitrate of potash, 6 oz.; powdered anise seed, 10 oz.; powdered gentian, 10 oz.; mix. Make into sixteen powders.

Cow Holding Back Milk.—What shall be done with a cow that persists in holding back her milk?

Sometimes a strap buckled around the body directly in front of the udder will prove effectual. A ration of bran to be eaten during the process of milking, will sometimes effect a cure; but some cows can never be cured of the habit, once they have acquired it. It is best to begin with the calf and train her properly. The first calf may have been left with the mother too long, and when taken away she held back her milk. Never allow a calf to suck more than once, especially if it is the first calf. This habit of holding back the milk is almost incurable, and is largely due to the leaving of the first calf too long with the mother:

Clover or Timothy.—Which is considered the more valuable to feed, clover or timothy hay?

The timothy hay is very deficient in albuminoids, while the clover hay is rich in them. These go to make milk and growth in the young animal, and also contain the greatest amount of fertility to be returned to the soil. Therefore it is of double value.

Crowding the Heifers.—Is it best to crowd heifers at two years, to their full capacity?

Give them what they will eat and assimilate and keep them at work from the first. Often they will not do as well the second year as during the first, but they "get there" the third year. A study of the nature of rations is absolutely necessary, because, as the cow grows older, more carbonaceous food is necessary.

Corn Meal for Calves.—Is corn meal a proper food for young calves?

No; it is too carbonaceous and produces too much fat. Sell the corn and buy nitrogenous foods—linseed meal, cottonseed meal and wheat bran, which feed with sweet milk and nice clover hay, to the young calf. Do not feed more than a teaspoonful of linseed meal at first, which increase as the calf grows older. One great trouble with raising calves comes from over-feeding. A calf four or five days old should not be given more than three quarts of milk at a time which may be increased gradually.

Failure of Appetite.—Cow five years old had had two calves, been now in milk nearly two years, refused to eat or drink for about a week. Had considerable mucous discharge from nostrils, very slight faecal discharge quite thin; no fever discoverable; face and nose cold and muzzle as dry as back of hand.

Give $\frac{1}{2}$ dr. quinine; 1 oz. powdered gentian; 1 oz. nitrate potass, and $\frac{1}{2}$ dr. powdered golden seal twice a day. Mix with pint of hot water and add gill of molasses. Give 2 oz. spirits turpentine and 8 oz. raw linseed oil; repeat in 48 hours.

Best Succulent Foods.—Is ensilage the best succulent food we can give cows?

Perhaps not the best. Some beets are equally good, but we cannot raise them as cheaply as we can corn ensilage and put it into the silo. We have grown sugar beets and mangolds which gave good results, but we prefer good ensilage because we can get more dollars and cents from one acre for the same cost than from any other crop.

Difficult Breathing.—Several fine heifers eat well, and seem in perfect health while lying down; but when they rise and walk around appear to be affected with a cold in the head or windpipe—breathing heavily, closely resembling a horse with the heaves.

Give each a laxative. Put a tablespoonful of the following in mouth two or three times a day: Powdered nitrate of potass, 4 oz.; muriate of ammonia, 2 oz.; licorice root, 8 oz.; fluid extract of belladonna, 1 oz.; tar 1 qt.; mix.

Cows Indoors or Out.—Do you recommend keeping cows in, all winter?

If you are keeping cows for immediate profit—butter and milk only—would recommend you to so keep them; but if you want to keep them to breed from, and wish to have strong, robust, healthy progeny, turn them out and allow them a few minutes out of doors every day when the weather is warm.

The Best Turnips.—What variety of turnips is the most profitable to grow to feed to cattle?

The "Yellow Globe," one of the varieties of Swede turnips. It is a good feeder and very sweet and nutritious. It costs too much to raise carrots; they are, perhaps, better than the turnips for stock purposes, but their extra cost bars them out.

Cow Pox.—Give cure and prevention of cow pox? Is not sulphur considered good?

Use sulphur in a dry form. Vaseline and sulphur mixed is very effective. Mix sulphur with salt, and feed to a cow once a week, enough to have her get a teaspoonful of the sulphur.

Affection of the Brain.—I have a two-year-old heifer that has been ailing for six weeks. The trouble seems to be in her head. She holds her head down, staggers when she walks, and will stand for hours in one place without eating. Her horns are cold and chipping off. Have been told that it is "horn ail," also have read that there is no such disease.

"Horn ail" is a myth. The trouble is evidently some brain affection. This occurs from a variety of causes such as heat of the sun, blows on the head, parasites within the brain, tumors causing pressure on the brain, etc. They also occur in connection with many other diseases, especially with those of the digestive organs. Pressure on the brain may often be relieved in the early stages by a good active purgative, and ice or cold water applied to the head. The trouble mentioned having existed for some length of time, probably an active purgative would do no good; but see that the digestive organs are in as good a state as possible, and give a saline laxative, or purgative, if admissable—about half a pound to a pound of Epsom salts, with a little ground ginger, in a quart of water. The animal should be kept from exposure to the heat of the sun. Apply cold water to the head and give two or three drachms of the bromide of potassium twice a day in a little water as a drench, or give it in the food, if the animal will take it.

Effect of Skim Milk.—Will not sweet skim milk physic calves or constipate pigs?

Yes, if fed in excess. Mix butter milk with skim milk for calves; for pigs mix with it wheat middlings. Feed skim milk before it is sour, and never feed a young pig corn meal.

Bull out of Condition.—A three-year-old bull was a splendid animal when one year old. Since then has never done well; was very lousy the last two winters. Has not grown well, although fed same as the cows, which have done well.

Give four tablespoonfuls of the following powder, mixed with a pint of hot water and a gill of molasses, twice a day: Powdered extract haematoxylon, 4 oz.; powdered gentian, 6 oz.; powdered caraway, 4 oz.; powdered capsicum, 1 oz.; mix. Give gruel and whole flaxseed steeped; these should be bottled down him three times a day in good quantities.

Skim-milk for Calves.—What shall I add to skim-milk to make it the best food for calves?

A little linseed meal made into a jelly. After the calf is four or five weeks old feed half a pint a day of two parts wheat bran and one part linseed meal, increasing the quantity as the calf grows older.

Flies and Wounds.—What is best to keep flies from wounds or other open sores?

A little spirits of turpentine will kill maggots and keep flies out of wounds.

Cottonseed Meal and Health.—What is the effect of cottonseed meal on the health of a cow?

We have fed it to our forty or more cows several years, and without any bad effects. It is highly nitrogenous and should not be fed too largely; three pounds per day to a cow, mixed with some carbonaceous food, such as corn meal, or, if you have it, good rich corn ensilage, will be found profitable, and not injurious to the cow's health.

Sore Eyes.—My cattle are having sore eyes which discharge, and a white bunch forms in one corner; then it spreads all over the eye and becomes a bright pink, and the eye is entirely blind.

Give them a dose of physic and twice a day open the lids of affected eyes and put in some of the following lotion with a camel's hair pencil: Argenti nitras, 20 gr.; fluid extract opium, 1 dr.; fluid extract belladonna, 1 dr.; water, 4 dr.; mix. Your druggist will fill the prescription for you.

Loss of Cud.—What causes a cow to lose her cud?

Sickness, when her normal condition is disturbed. She does not raise her food to be masticated. The natural conditions are arrested for awhile. When they return, or when she is relieved of her sickness, she will raise her cud, which she does at will.

Fits in Cow.—My cow, three years old, had a calf about a year ago, and appeared all right. Early this spring I noticed there was something wrong, and now she has what I call fits, and they grow more frequent and worse. But she eats well and her milk appears all right.

Bleed her at the neck until you get from two to four quarts, according to the size of the cow. After this, put her through the following course of medicine: Powd. belladonna, 1 oz.; powd. nux vomica, 1 oz.; powd. saltpetre, 4 oz.; powd. gentian, 4 oz.; Epsom salts, 2 pounds. Mix the whole thoroughly and give a heaping tablespoonful three times a day. Apply also some turpentine and camphor oil to the spine, beginning at back of horns to middle of the back. Do this daily.

Scours in Calf—A calf, six weeks old, has scours. At first discharge was thin and watery, then slimy with some blood, accompanied with straining. Gave laudanum and catechu with but little effect.

Give 15 gr. chloral hyd.; 1 dr. powdered extract hæmatoxylon; mix with 1 gill of warm molasses; repeat twice a day. The diet should be equal parts of sweet milk and flaxseed tea at proper temperature. After each meal, which should be 4 times a day, give 5 gr. pepsin and 10 gr. sub nitrate bismuth. Another simple remedy for scours is to mix a pint of strong coffee with same quantity of hot milk. Give two or three doses if necessary.

Same Food Without Same Results.—In a herd of cows, will they all produce the same results on the same food?

No; every cow has her individuality. They are not alike constructed. Some cows use more food in support of nervous energy. Nervous animals usually require more food because they waste more energy.

Eruption on Heifer.—A 2-year-old heifer has had an eruption of the skin, which appeared when she was three months old. Her color is black and white. On the white spots the skin is affected, but there is no eruption on the black spots. The hair comes off, and the heifer is greatly annoyed from itching.

White skin, like white horn, is more susceptible to disorder than the darker shades. Apply a little of the following to the affected parts, and wash it off in three days: Fish oil, 1 oz.; whale oil, 1 quart; mercurial ointment, 1 oz.; sulphur, 6 oz.; mix thoroughly. Do not cover more than one-eighth of the animal with the dressing at one time.

Swelled Jaw.—A heifer was taken with severe pain, one side of jaw swelling until eye was closed. With application of bran poultice, eye opened, but jaw continues swollen and hard. This heifer has dried up and appetite is poor. Is it lump jaw?

Rub the swelling once a day with some of the following liniment; rub it in well: Spirits of turpentine, 6 oz.; linseed oil, 5 oz.; aqua ammonia fort., 2 oz.; mix. Apply liniment mornings and poultice nights. As soon as it is fit to open use the lancet, making a good free opening. Then inject equal parts of spirits of turpentine and oil daily, and keep parts clean. Examine her mouth for foreign bodies and decayed or broken teeth.

Period in Milk.—How long should a cow be in milk? Is a long period of rest required?

Let cows go dry only from four to six weeks. There is no necessity for a long period of rest. If a proper system of feeding is adopted it is not necessary for cows to go dry but a very short time. Should recommend four to six weeks, and wouldn't keep a cow that wouldn't milk nine to eleven months out of the year.

Lumps on Leg.—A young cow showed small, hard lumps on right hind leg over femur bone, several months since. The largest is the size of a guinea egg and softer than the smaller ones. They appear to follow a vein; are not painful but disfigures the cow; they number about a dozen, the same as at first apparently, but but much larger in the aggregate.

Apply golden blister externally and give an ounce of the following medicine in feed twice a day: Bichloride of mercury, 2 dr.; iodide of potass, 5 oz.; water, 3 pts.; mix.

"Foul" Foot.—How should cows afflicted with "foul" in their feet be treated?

The best remedy is cleanliness. Once the disease appears it should be attended to promptly. Clean the foot thoroughly, then wash with a solution of carbolic acid and warm water. Supplement it with fine tar and keep the animal in the barn or in a thoroughly dry pasture. The disease comes from wet, miry pastures. Kerosene oil, applied frequently, is also an excellent remedy. Have a can of it always in the stables and examine the feet of the cows often.

Abortion in Cows.—I have had three abortions in my herd of cows within the last six or seven months. If I keep a cow that has had an abortion from the herd for a month or more, will there be any danger of abortion in the herd if suffered then to run together?

When abortion assumes an epidemic form, it requires that the affected animals be treated, disinfected and isolated. The pregnant cows need preventive treatment also. A cow that has aborted should not be allowed to run with pregnant cows under two months, and should be disinfected and washed off as far as tail can reach.

First Milking of Heifer.—At what age do you advise beginning to milk a heifer?

From twenty to twenty-four months. Get them into milk as soon as possible. Usually, when a heifer goes three years before coming into milk, she will take on the beef form and will not develop into as good a milch cow as when she comes in milk at two years. Begin developing her udder when she is a calf.

Blue Sweet Corn Ensilage.—Will this blue sweet corn make good ensilage for cows?

The very best, if properly grown and secured in the silo. It should be cut in the field when the ears are in "boiling stage," and put immediately into the silo, and put in whole, not cut, as it is very full of juice as sweet as syrup, which easily leaks out if the stalks are cut finely. This juice turns to acid very rapidly after the stalks have been cut. Put in whole; there is a much less loss from this source as there is less leakage. Remember, however, this corn must be secured in an air-tight silo. Cover with planks a foot wide, which are weighted and covered with hay or straw. When you want to open the silo, remove the straw and weights from one plank, turn it back, and with a broad axe, cut down the pit flush with the edge of next plank. The silage is then one foot in length, easily handled, and the cows will eat every morsel of it before touching anything else offered them. You will cut and feed enough each day, so fed from the silo, to prevent any loss from exposure.

Lumps in Udder.—Three weeks after cow dropped calf, bag became swollen and lumpy. What was the proper treatment?

Give one-half pound Epsom salts every three days. Mix in drink daily 1 ounce powdered nitrate potass.; get one pound of this. Do not feed corn in any form. Rub the udder twice a day with some of the following: Spirits camphor, two ounces; tincture aconite root, two ounces; tincture opium, two ounces; alcohol, eight ounces; mix.

Salting Cows Daily.—Why should cows have salt every day and what is its province?

Because in the process of digestion food tends to fermentation in the stomach, and this becomes a disease with them, producing gas and giving rise to various disorders, such as hollow-horn, hoof-ail, etc. The daily use of salt tends to prevent this fermentation. Fermentation in the stomach causes fermentation in the blood, and that is one reason why butter will not come. Experience with two churnings that had to be thrown away, showed a high state of putrefaction, because two cows strayed and drank from a pool covered with frog-spawn, decayed weeds, etc. The butter was not right for many days after.

Scouring in Cow.—A cow was taken with severe scouring two weeks after calving. Has been fed on cob meal, corn bran, wheat bran, clover hay and corn fodder in barnyard. Kept in warm stable with water constantly before her. How should she have been treated?

Give 4 drachms of chloral hydrate in one-half pint of water. Repeat in 24 hours. Give 3 tablespoonfuls of the powder in a gill of warm molasses two or three times a day. Bicarbonate of soda, 4 oz.; powdered charcoal, 4 oz.; nitrate potass., 6 oz.; mix. Her diet should be good oats, hay and bran.

Feeding Apples.—Can you give us any light upon feeding apples to milch cows?

There have been some experiments made which show that apples fed in moderation will increase the flow of milk and not injure the quality. If fed in large quantities it destroys the appetite, if in small quantities it stimulates it.

A Self-Sucking Cow.—Do you know anything to cure a cow of sucking herself?

A thick leather strap about five inches wide buckled around her jaws just above her nose and filled in front with very sharp-pointed nails, projecting three inches, with the two lower rows driven so as to point downward. This is supported by a narrow strap over the head, and it ought to do the business. Adjust the strap over the head so that the one around the jaws will not interfere with the cow's eating and yet hang low enough for the nails to prick the udder before the cow can reach the teats with her mouth. Two square frames of hard wood to fit around the neck of the cow and joined together with rods long enough to keep one frame close to her head and the other near her shoulders, will prevent the cow from reaching her udder, and sometimes this plan must be adopted. Also smear the teats with something disagreeable to the cow, say cayenne or snuff and lard, so that if she manages to get her tongue to them the bad taste will discourage her.

Breeding In-and-In.—Do you believe in breeding cattle in-and-in?

No more than to the second generation. The more we do it the more we intensify. Ordinarily, there is more profit found in native herds graded up to three-fourths or seven-eighths by good thoroughbred butter sires.

Sore Teats.—What is a good application for sore teats?

A mixture of tar and lard melted, in such proportion as not to be too sticky. Apply once or twice a day.

Scours in Ox.—A valuable ox has the scours; does not chew his cud; sweats but small amount on the nose; rather dainty; did eat oats (dry), but now refuses altogether, eats dry hay and corn fodder, and so keeps along, but scours remain.

Give 2 oz. of spirits of turpentine in one pint of raw linseed oil at one dose. Then give dose of the following powder in some water, turned down the animal three times a day: Powdered gentian, 1 lb.; bi-carbonate of potassium, 6 oz.; bi-carbonate of soda, 1½ lbs.; powdered zinziber, 4 oz.; powdered rhubarb, 3 oz.; mix. Make into 16 powders; give one powder as a dose. Such cases should be attended to before they become chronic.

Manurial Food Values.—Give the manurial value of different cattle foods?

The following table was prepared by Dr. E. H. Jenkins, director of the Connecticut Experiment Station:

	Nitro- gen.	Phos. Acid.	Potash.	Value Per Ton.
Timothy hay -	19.2	7.2	29.6	\$ 4.88
Clover hay - -	36.6	13.2	44.0	8.88
Maize - - -	33.8	14.2	8.0	6.94
Oats - - -	36.2	16.0	11.6	7.61
Wheat bran -	47.4	60.2	32.0	13.03
Pea meal - -	85.0	18.2	19.8	16.38
Linseed meal, (No.4)	105.4	43.5	30.9	21.85
Cotton seed meal	134.6	60.6	35.8	28.04
Skim milk - -	12.39	5.0	2.8	2.53
Apple pomace -	4.3	1.9	14.3	1.48

Blood Disease.—Some of my cows are constantly becoming lame in the forward legs. The ankle will swell, and then the skin will crack; there is a disagreeable smell; the disease slightly resembles scratches. The pastures are all dry, so that they do not have to go through mud.

Their blood is out of order. Give them a full dose of general cow drink, and three days later half a dose, and repeat in four or five days. Apply the following ointment to the cracks daily: Powdered sulphate of copper, 2 oz.; vaseline, 8 oz., mix.

Ox-Warble.—Is the life history of the ox-warble sufficiently well known to enable us to apply a sure remedy against its larvæ, which produce those disgusting grubs found along the backs of cattle, especially in the spring of the year?

We think not, says the Mirror and Farmer. The supposed life history of the warble or ox-bot fly has been found recently to be entirely erroneous. It is similar to, but not the same as, *hypoderma bovis*, so common in Europe, the life-history of which is not known. The species we have to deal with is now known as *hypoderma lineata*, and it would seem to be of American origin, as it is not known in Europe, nor does *hypoderma bovis* appear to be known here. *Hypoderma lineata* has been found in buffaloes, but only in a few cases. This may be its origin. But, to return to its life history. The eggs are not laid on the back of the animal, where they hatch and thus make their way through the skin, as has been supposed. Later investigations show that the eggs are laid on the legs—hence in Texas it is called the “heel fly”—on the flanks, at the roots of the tail and in such places as the animal can reach to lick. Thence they are licked off, lodge in the throat and œsophagus and slowly but painfully and surely make their way through the tissues to the back of the animal, where the larva makes a hole through the skin for air and becomes encysted to complete its development to the pupa state. Then it drops to the ground, becomes a fly and begins its disgusting work. No practical remedy is known.

Partial Soiling.—What is thought of partial soiling? Are peas good for the purpose?

Some farmers supplement pastures with oats and peas and clover. First, oats and peas, then the second cutting of clover. Also feed oats and peas in winter. Peas belong to clover family, and take nitrogen from the atmosphere; they, therefore, do not exhaust the soil. Sow about a bushel and a peck each to the acre.

Lice on Cattle.—How may cattle be rid of lice? Is carbolic good?

Mix two pounds lard and half pound sulphur. Apply to hair and skin especially along the back with a stiff brush. Wash or spray the stables with one part of carbolic acid in 50 parts warm water. Three parts kerosene to one part lard makes a good application for lice.

Silage as Milk Ration.—Would you recommend silage alone for milch cows?

No. Add cotton seed meal and wheat bran mixed, and a small ration of good hay at noon. Five or six pounds are enough of the hay. The cottonseed meal and bran should be fed separately from the silage, and fed for the purpose of balancing the ration.

Abortion Feared.—A large Jersey cow aborted last year. Is she more likely to again than though she never had? What treatment and rations would you advise?

Many cows abort but once, but it is considered that a cow that aborted at the last pregnancy is predisposed to abortion during the next one. The diet may be of the ordinary—avoiding any peculiar kind such as flaxseed, cottonseed, etc.

Lumpy Jaw.—Is there any remedy for lumpy jaw other than a surgical operation?

Until recently there was supposed to be no other remedy. But in March 1892, an important contribution to our knowledge of this subject was made by M. Nocard, of the Alfort Veterinary School, in communication to the French Central Society of Veterinary Medicine. He showed clearly that the actinomycosis of the tongue, a disease which appears to be quite common in Germany and is there known as "wooden-tongue," could be quickly and permanently cured by the administration of iodide of potassium. Experiments were made on cattle with lumpy jaw with excellent success. The size of the dose depends somewhat on the weight of the animal. M. Thomasson gives a drachm and a half of iodide of potassium daily in one dose dissolved in a pint of water until improvement is noticed, then he decreases it to one drachm. M. Godbille has given as much as four drachms (half an ounce) in one day to a steer, decreasing the dose half a drachm each day until the dose was one and one-fourth drachms, which was maintained until the twelfth day of treatment, when the steer appeared entirely cured. M. Nocard gave the first day one and one-half drachms in one dose to a cow; the second and succeeding days a dose of one drachm in the morning and evening, in each case before feeding. This treatment was continued for ten days, when the animal was cured. Dr. Norgaard gave two and one-half drachms dissolved in water once a day for three days. He

then omitted the medicine for a day or two, and continued it according to symptoms. These examples of the treatment as it has been successfully administered by others will serve as a sufficient indication for those who wish to test its qualities:

Tuberculosis.—About a year ago one of my cows commenced coughing and lost flesh steadily until she died. She was at first giving a good supply of milk, but went dry last summer. Can you tell what the trouble was?

The description given indicates that the cow died of tuberculosis, a disease that is frequently met with among cattle that have been closely inbred. It is regarded as incurable, and care should be taken to prevent its appearance, by not breeding from any animals showing a tendency in that direction, as it is hereditary. Medical authorities assert that the milk from cows affected with this disease is very unhealthy for children, and, it is also claimed that the use of milk, or meat, from such cattle is a cause of consumption in the human family.

Five Good Points in a Cow.—Name some good points of the dairy cow?

If you can find these five points in a cow, she will usually have the power of paying for her board and leaving a profit for her owner. We name them in the order of their value: 1. Long, large udder, broad and elastic. 2. Soft, mellow skin, covered with "mossy" silky hair. 3. A large barrel with broad ribs, wide apart, and very firm muscles in the abdomen. 4. Broad loins with long rumps and lean hips. 5. Long neck, clean cut face and large eyes.

Drying off Cows.—How can we stop a cow from giving milk, when we want to dry her off?

If we had a persistent milker I would not attempt to dry her off. There is danger in her losing a part of the udder. We lost two cows by attempting to dry them off. Starvation food may effect the result, but is a bad remedy. Stop milking her; do it abruptly. Do not endeavor to do it by partly milking, every day or two. After stopping the milking allow them to go a few days then milk them out. Once or twice repeated will bring the desired result. But the cow must be carefully watched. Mr. Powell says: There is no necessity for drying off a cow, if she is disposed to keep right on giving milk. If one dries off, it is because of her nature. Six weeks is a long enough time for a cow to go dry. By judicious feeding a cow may be stimulated into giving milk, unless she has an inherited tendency to dry off early, to within six weeks or two months of calving.

Hydrophobia in Cow.—Please give symptoms of hydrophobia in cow?

Loss of appetite, restlessness, excitability, muscular twitchings or tremblings, flow of saliva from the mouth, difficulty in swallowing, hallucinations. Later, excitement greater, paroxysms, eyes stare, pupils dilated, animal bellows, rushes at imaginary or real objects. The voice becomes changed, the animal works its jaws, foams at the mouth, eyes stare, countenance is haggard, the fore feet paw and throw earth over the shoulders. There are many other symptoms, and some animals omit certain ones given here.

A Hard Milker.—I have a cow that is a hard milker. Can you suggest any way by which this can be remedied?

The trouble is probably due to a thickening of the walls near the end of the teat, perhaps caused by the pressure of milk, which resulted in some inflammation at that point. This may be helped by gently dilating the orifice of the teat once a day, using a small probe for the purpose. This may be made of gutta percha, or silver, and should be oiled before it is used. Small, tapering wooden plugs may also be used for this purpose. The dilating should be done very carefully to prevent injury to the teat.

Cotton and Linseed Meal.—What is the feeding value of cotton and linseed meal?

Cottonseed meal is worth about \$24 per ton as a food and \$27 as a manure. Linseed meal is worth about \$19 per ton as a food and \$24 as a manure.

Farrow Cows Unprofitable.—Are farrow cows as profitable to make butter from as are new-milch? If not, why not?

No; the milk of farrow cows is much more viscous, and the butter fats will not come up as they will in new milk; nor is its churnability as great. Besides that loss, the farrow cow's milk does not produce as good butter as does that of the new-milch cows.

Poultice for Sprains.—How shall one make a poultice for sprains, bruises, etc?

Use bran or flaxseed meal. Put on boiling water, cover up closely, and allow slow steeping, which brings out more fully than any other method the medicinal qualities. But if the steam is allowed to escape, short steeping is better than long. Apply poultices as warm as the hand can be kept in them for a minute or more without pain.

CHAPTER II.

Feeding and Food Rations.

Bran Mash.—Give recipe for a good bran mash. What is the proper consistency?

A bran mash is made by turning boiling water over good, sweet bran, and covering it up so that it may retain its heat as long as possible, which, in a wooden pail with a wooden cover fitting closely, and then wrapped around with a woolen blanket, or buried in the hay to protect from outside air, it will do for several hours. It is better that the water should be actually at the boiling point when turned on than simply scalding hot, and it should be only stirred enough to thoroughly mix all the grain with the water. It makes the grain more easy to digest. Mashcs of other grains are used for various purposes, as well as bran mashcs, and they may be either soft or stiff mashcs, according to the amount of water added. If desired to loosen the bowels, they should be made soft. If simply to give necessary nutrition in a digestible form, not likely to irritate the stomach, there should be as little water as possible to thoroughly wet the grain. In other words, they may be all the way from a porridge to a thick pudding that will crumble between the fingers, and usually they should

be given while as warm as they can be comfortably eaten. If needed in haste, it must be allowed to cool more rapidly, but the longer the process the better the result. If it must be cooled rapidly for immediate use, stir constantly, so as to keep the heat alike in all parts.

Feed for Steers.—What shall we feed steers weighing about fourteen hundred, besides timothy hay, when we want them to eat all the hay they will?

Feed each steer a quart of linseed meal (old process) night and morning. This will not fill them up, but it will make digestion more active, and make the steers healthy. Water them three times a day.

Fattening Steers.—Will you give a good ration for fattening steers, the same to be composed of corn ensilage, clover hay, corn meal and cotton seed meal?

The proper combination of these foods would be: Ensilage 40 lbs., clover hay 5 lbs., finely-ground corn meal 10 lbs., cotton seed meal 3 lbs. This combination would give 2.74 albuminoids, 14.04 carbohydrates, 0.90 fat. Prepare the above ration for three feeds. Young steers will gain more rapidly than old ones. The gain should be three pounds per head per day for 100 days or more.

Feeding Straw.—What shall I feed with a large quantity of straw to cows coming in in March?

We must first take into account what the straw is. Straw is a carbonaceous food, and cows must eat a large amount of it. Other foods should be fed of a nitrogenous nature; those which go to build up the structure of the body and develop muscle, bone and blood. The straw's office is to make heat and fat if the animal can eat enough of it. She should be kept in a good condition, especially if she is producing. Wheat straw has one part of albuminoids to 40 of carbohydrates. A well balanced ration should be about 1 to 5; therefore to properly balance the straw, linseed meal, cotton seed meal, wheat bran and ground oats should be fed. The latter is in proportion of 1 to 6. Would recommend linseed meal, and, if the cows are producing milk, cotton seed meal, enough to properly balance the ration. Early cut clover hay should be fed.

Oil Meal for Calves.—Is there any profit in feeding oil meal to calves?

It depends upon the value of the calf. Oil meal and wheat bran mixed and fed properly—that is, dry—and the calf given sweet skim-milk and a little clover hay, will be found profitable. Give them "rowen" or young hay, well cured and cared for. Feed the skimmed milk before the grain, and feed it warm. Put the dry meal, or both mixed, in the calf's box, and allow him to have all the time he needs to eat it. Do not wet it; the saliva in the mouth will wet it sufficiently for that purpose.

Ration for Bull.—I want a ration that will keep a three-year-old bull in good condition for service. I have turnips, carrots, mangolds, peas, oats, etc.

This requires a ration light in fats and strong in albuminoids. Grind 10 bushels oats and 12 bushels peas finely together, and a small quantity of turnips, mangolds or carrots will be advantageous in keeping the digestive organs healthy. You may make the following combination: 12 lb. cut hay, 12 lb. pulped turnips, 10 lb. peas and oats ground together. You will have of albuminoids 2.21, carbohydrates 11.00, fat 0.39. Mix the ground grain thoroughly with the cut hay.

Rye as a Cattle Food.—Is rye a good grain for feeding to cows?

Clear rye grain is a poor food for cows. Even mixed there is some danger in feeding it to valuable cows, on account of the smut or ergot it may contain; and for butter it is not good food. Two pounds of cotton seed meal a day to a 700 lb. cow, together with from four to six pounds of shorts, makes almost a perfect food. Green rye is not profitable for forage, and there are only three or four days that a cow will eat it. Oats and peas, grown together are excellent for cows on going to grass.

Fattening Farrow Cows.—What is a good ration to fatten farrow cows while giving milk? Have plenty of corn fodder but would have to buy everything else.

Try the following: 14 lbs. cut corn fodder, 7 lbs. cob meal, 4 lbs. oat feed, 3 lbs. new process linseed meal. In this there will be 2.05 albuminoids, 11.40 carbohydrates, 0.67 fat. This should produce a rapid gain.

Carbonaceous and Nitrogenous Foods.—State which foods are carbonaceous and which nitrogenous.

Cattle foods are classed as carbonaceous and nitrogenous, the former of which corn is the principal one employed, produces chiefly heat and fat; there are scarcely no milk-producing forces in it, nor is its fertilizing energy of any great value. Living on heat its function is to produce heat in the animal structure; therefore, don't feed a milch cow any more corn than will serve to balance her ration properly. The nitrogenous foods are those rich in albuminoids, and which produce muscle, and, therefore, milk. They are oats, wheat bran, cotton seed meal, linseed meal and some others. These foods not only produce the most and best milk, but they are the best to promote growth in the young animal. Clover, if cut in season, and perfectly cured and saved, forms an almost perfect ration.

Clover for Milch Cows.—Which variety of clover is best for milch cows, and at what stage of maturity should it be cut?

Combine two kinds, the large red and the alsike; they produce best results; the cows respond to this feed better in the spring. Cut it just as the blossoms begin to appear. Wait till the dew is off, then cut and put it into the mow the same day, having the mow tight and keeping the barn doors shut.

Barley Meal.—What are the effects of feeding barley meal for butter production?

Barley meal is a carbonaceous food and should not be fed alone. Feed it in connection with wheat bran or middlings, half-and-half by weight.

Drying-off Ration.—I have a herd of Guernseys and grades that have been well fed and are due to calve in from ten to twelve weeks. I want a ration that will dry them off. Could buckwheat bran be used in the ration?

While wheat bran would ordinarily be recommended yet buckwheat bran with some ground oats might be used. Try this: Corn ensilage 30 lbs., cut hay or straw 6 lbs., ground oats 2 lbs., buckwheat bran 3 lbs. To the cows that now give most milk, give also 1 lb. cotton seed meal. Mix the grain ration evenly with the coarse fodder. Give above amount in three feeds.

Feeding Young Calf.—What is the best way to rear a calf after it is taken from its mother?

As soon as it is dropped, take it away and allow it to go 24 hours before feeding it. Then give it the mother's milk. When old enough to eat hay give a little oil meal and sometimes a little cotton seed meal; then turn out to grass. Cut oats when in the "milk" and cure them as hay, then give one feed a day of hay and two of oats. If there are not enough oats in the mess, supplement with oil meal.

When to Feed.—How often and in what quantities should food and water be given to maintain the animals in the best and most healthful condition?

If possible, water should be kept in reach of the cow, also salt. Feed as much food three times in 24 hours—at 6 a. m., 12 m., and 6 p. m.—as the cow will eat without waste and properly digest; effect, nutritious and wholesome milk will be produced if the cow is from good stock.

A Milk Ration.—Would like a ration for good milk, which I wholesale, to include malt sprouts and brewers' grains, with cornstalks and hay.

You will find the following a proper combination: 10 lbs. cut cornstalks, 6 lbs. cut hay, 35 lbs. brewers' grain, 4 lbs. malt sprouts, 6 lbs. beets. This is a well-balanced milk ration and besides producing a liberal yield of milk it should keep cows in good condition. Here is another combination with different foods which will produce a good milk yield: 15 lbs. corn tops, 5 lbs. clover hay, 2 lbs. corn meal, 3 lbs. bran, 3 lbs. cotton seed meal. From good cows this ought to produce a maximum milk yield. You could increase the clover hay to 8 lbs., reduce corn tops to 8 lbs., with 4 lbs. bran, 3 lbs. cotton seed meal and use no corn meal. The ration is for three feeds. Or use a ration of 50 lbs., corn ensilage, 8 lbs. cotton seed hulls, 5 lbs. wheat bran, 3 lbs. cotton seed meal. Proper mixing is important. Another ration to include brewers' grains and ensilage is this: Ensilage 40 lbs., mixed hay 6 lbs., brewers' grains 30 lbs., bran 3 lbs. This ration is better adapted to cows nearly dry or that are fresh in milk. A good day's ration for ordinary-sized Jerseys would be 10 lbs. mixed hay, 3 lbs. oat meal, 5 lbs. cob meal, 2 lbs. cotton seed meal.

When to Water Cows.—Which is best, to water cows before or after feeding grain?

After; never feed wet grain to a ruminating animal; the animal wets the grain with saliva; without saliva there can be no digestion. This is an important matter.

A Butter Ration.—I would like some good butter rations; please name two or three!

Here are two: (1) Ensilage 40 lbs., cut hay 6 lbs., corn meal 3 lbs., wheat bran 4 lbs., new process, linseed meal 4 lbs. (2) Grind an equal weight of corn and oats together and with them make up the following ration: 15 lbs. clover hay, 9 lbs. ground corn and oats, 2½ lbs. linseed meal. The butter produced will be rich in butter fat. Clover hay is a good basis. The fat in this ration comes mostly from the clover, corn and oats.

Sugar Beets.—Would you advise the feeding of sugar beets to milch cows?

They are a grand food for cows, but something else should be fed with them, as they contain too large per cent of water and sugar. Add nitrogenous foods.

Grain in Winter or Spring.—Which season is preferable in which to feed grain, late fall or spring?

If but one, in the fall. A cow started rightly in the fall is half wintered. Would feed in both fall and spring, both ends of the winter, if we could not feed every day during winter.

Cotton Seed Meal.—How much cotton seed meal is advisable to give on commencing to feed it?

Half a pound a day, in two feeds. Begin slowly and increase gradually. Would not feed more than three pounds; some feed only two; it is not suited to young animals. Feed oil meal or wheat middlings. Do not feed an animal under six months of age, corn meal; linseed meal is best. Ground oats make a splendid food for milk production.

Comparison of Food Values.—How do the scientific writers get at the values of different articles as food?

The basis of comparing food values commonly used, is to add the digestible fat to the digestible albuminoids and multiply the same by $4\frac{1}{2}$ cents per pound and then multiply the carbo-hydrates by .9 cents per pound, says the Country Gentleman. These products, added together, represent the values of a food.

DIGESTIBLE NUTRIENTS

KIND OF FOOD.	Albumi- noids.	Carbo- hydrates.	Fat.	Ash.	Value per 100 lbs.
Malt sprouts.....	18.82	52.95	0.88	5.67	1.33
Cottonseed meal.....	35.75	27.25	0.08	7.25	2.25
Wheat bran.....	11.72	44.66	2.58	5.68	1.02
Rye bran.....	12.00	48.98	1.43	3.68	1.02
Wheat middlings.....	11.60	48.87	2.68	3.18	1.00
Clover hay.....	7.82	40.25	1.49	6.10	0.77
Timothy hay.....	3.67	41.25	1.03	4.06	0.62

These comparative values mean that when each food is used in proper combination or proportion in a ration it has this comparative value. Carbohydrates are cheap, for many kinds of food are composed of carbohydrates, but albuminoids are in much smaller proportion in most foods than are required for a well-balanced ration. Therefore a food rich in albuminoids, like malt sprouts and cottonseed meal, has a higher value to balance carbohydrates in other foods. Yet these richer foods do not cost in market what they are supposed to be worth in comparison.

Millet for Fodder.—When should millet be sown, what soil is best, when should it be cut, etc?

Millet may be sown any time after the weather becomes warm, as cold checks the growth and turns the leaves yellow, and may destroy the young plants. Early in July is a

good time. It cannot be too hot for this tropical plant. It requires good soil, as it is a rich food. Half a bushel of seed per acre is as much as is required, but not too much, as thick sowing makes a better and finer hay. It matures for cutting in two months, and is best cut when the blossom is nearly over and before the seed forms, when the stems become hard and less nutritious for feeding. Good millet hay is worth fully as much as timothy or clover, and is eaten with avidity by all kinds of stock. As it is rich in the elements of flesh it is excellent fodder for working animals. Oxen do well on it, and it is a good milk-making food for cows. The hay cures quickly. When cut in the morning and spread soon after, it may be put up in cocks in the afternoon, and two days in this condition will cure it fit for the mow or stack. It is not apt to mold, and keeps well during the winter, heating but little and soon cooling down safely. The yield on good land may easily be three tons to the acre, and it will produce generally a half more than timothy under like circumstances.

Regular Salting of Cows.—Does the regular salting of cows make any difference in the product?

Experiments in that line show that if cows are not salted regularly they lose fourteen to fifteen per cent. in quantity of milk and in churning the cream from such milk it takes about one-third longer time to churn the milk of cows which have been deprived of salt than those which have had free access to it and thereby cause a great loss to dairymen.

Salt in Fattening.—Is it better to place rock salt in manger for fattening cattle, or to mix common salt with the feed? If the latter, how much per day to 1000 lb. cattle?

It is a good idea to place rock salt within reach of fattening cattle, as they are not likely to take more than they need; or it may be mixed with the food, in which case two or three ounces of salt is sufficient, and may be mixed in the ration for each animal per day. This is usually done where it is not convenient to place salt within reach. To begin with, it would be better to use, if mixed in the ration, the smaller quantity mentioned. Fattening cattle do not need so much salt as milch cows. It may be considered merely as an appetizer. The skilful feeder will always consult, to some extent, the taste of his animals. E. W. Stewart says he has often found a profit in giving a small amount of flavoring, in the form of cheap molasses. A gill of cheap molasses, dissolved in a quart of water mixed into the ration, will cause it to be eaten with a greater zest.

Succulence of Foods—Has corn siloed any greater nutritive value than when cured dry?

While chemical analysis may not show any more nutritive value in corn ensiloed over the same cured and fed dry, yet the effect of the succulence or moisture in the ensilage produces a much better result for the grain fed with it. The effect upon milk produced by succulent foods fed with those that are highly concentrated, is to develop to a higher degree those properties in the solids and fats that give high color and fine aromatic flavor to the butter made from them.

Hominy Meal.—Please state what are the elements of hominy meal and its comparative value for milk with other corn meal and other feeds?

The following is the average of eleven analyses of hominy meal: Water 11.14; ash 2.50; albuminoids, 9.85; fibre, 3.59; other carbohydrates, 64.49; fat, 8.43. Digestible nutrients: Albuminoids, 7.68 carbohydrates, 51.06; fat 5.31. The following are the digestible nutrients of corn meal: Albuminoids, 8.4; carbohydrates 64.8; fat, 4.8. It will be seen that corn meal has nearly 1 per cent. more albuminoids and 13 per cent. more carbohydrates and a little less fat.

Malt Sprouts as Feed.—Give opinion of malt sprouts as food for dairy stock?

Would not feed them; they produce an increased yield of milk, but butter made from them is of inferior quality. They are a good food for young or fattening animals, but unfit for butter production. Dairy men have experimented with them and found the result on the loss side of the account.

About Mangel Wurzels.—How should mangels be stored for winter use? Does freezing injure them?

Mangel wurzels are spoiled by freezing, and they should be gathered before the prevalence of a continued sharp frost, usually at the north early in November. In the absence of cellar room (which is best) they may be stored in heaps or shallow pits covered with eight or ten inches of compact straw and six inches of earth beaten smooth; and ventilation should be provided at the apex of the heap by crowbar holes filled with wisps of straw.

Utilizing Oat Straw.—How can straw be best utilized in the raising of live stock?

On this subject Prof. Sanborn says: "I have found after a long trial that clover and straw will make as much growth as timothy hay; 100 lbs. each of straw and clover hay contains more protein than 200 lbs. of timothy. While ordinarily I do not attach much importance to the so-called protein necessities of stock, as a good ration can scarcely be made up that does not contain enough of it, yet straw is so deficient in protein that the great excess of protein in clover over that of timothy hay gives to clover with straw an abnormal value. This protein need of straw can be supplied by bran, cottonseed meal, blood or by several other foods. I find that oat straw and two pounds of cottonseed meal and two more pounds of any good concentrated food will, when added to 18 to 20 pounds of straw—oat straw—make as much growth as 25 pounds of timothy. Straw or corn fodder I regard as of fully three-fourths the nutritive value of timothy hay. Its defect is the lack of palatableness, as it will not be eaten in sufficient quantity unless skillfully used."

Cottonseed Hulls.—What is the feeding value of cottonseed hulls? How many should be fed to milch cows?

Cotton seed hulls is composed simply of the shuck of the cottonseed; it has a little higher feeding value than oat straw. It is now in some cases ground fine, and is called cottonseed bran. In the South it is fed to some extent in place of course fodder, or it is fed with hay or corn fodder. It would be more valuable

if the hulls were ground fine, because more of it would be digested. The digestible nutrients of cottonseed hulls as near as can be determined, without a feeding experiment, is, albuminoids, 2.10; carbohydrates, 40.00; fat, 0.79. About 6 pounds of this might be fed to milch cows in place of so much hay. The hulling machines which separate the shuck from the cottonseed, do not usually break the seed, but if portions of the seed were mixed with hulls, that would increase the value.

Beans as Food.—What is the value of common white beans as milk food?

Mr. E. W. Stewart says that sound common white beans, when ground, are very valuable food for milch cows, because of their very nitrogenous character, being well adapted to balance strongly carbohydrate foods. Analysis gives beans the following digestible nutrients in each 100 pounds: Albuminoids 23 lbs., carbohydrates 50 lbs., fat 1.04; value per 100 \$1.50 in a properly balanced ration. The bean is too rich in albuminoids to be fed in large quantity, but it will make a most excellent balance for fodder corn, corn meal and straw. The following is one combination: 16 lbs., corn fodder, 5 lbs. bean meal, 6 lbs. corn meal, 4 lbs. wheat bran. The nutritive ration is one to six. This is a full ration for cows in full flow of milk, and very cheap, the grain costing only 12 cents per day. It will be seen how deficient the bean is in fat, but corn meal balances this. Here we have a fodder with poor albuminoids, and yet we are able to balance it with 5 lbs. of

beans. It will be found that the bean is an excellent food to keep up the condition of the cow. Prof. Horsfall, one of the most advanced dairymen England has ever produced, was accustomed to feed 2 lbs of bean meal per day regularly to each cow, as he said, to keep up her condition.

Green Corn for Soiling.—Have seen it stated that green corn for soiling cows does not increase flow of milk, and if fed on it alone will eventually dry up the milk. At what stage of growth is green corn the best for soiling milch cows?

Green corn for soiling cannot be used as a sole food for milk. It does not contain the nutritive elements in the proper proportion to produce milk. It should be used to keep up the flow of milk on a scant pasture. In this case the grass, although scant, furnishes the elements which the corn lacks, and the green corn furnishes the carbohydrates which enables the cows to keep up their flow when otherwise they would fall off in their milk. Green corn is an excellent aid in soiling, but it must always be fed with more nitrogenous food. Those who soil their animals endeavor to have good second crop clover to feed with it, or perhaps green oats and peas or green millet, or lacking any such crops, they feed green corn with a few pounds of bran. Green corn is most nutritious when in full tassel, and as a soiling crop this is the best stage to cut it. It is a good idea, if practicable, to take green corn, second crop clover or green oats and peas or millet and run through the cutter together, and this mixture of

green food fed with a little bran or middlings would keep up as good a flow of milk as the best pasture.

Feeding Pumpkins.—Is it a good plan to feed pumpkins to milch cows?

Pumpkins are composed largely of water, yet contain considerable sugar, both of which are calculated to increase the flow of milk. The greatest objection to feeding them, is that the cows are allowed to eat too many at one time, thus taking too much water and sugar, and overtaxing different organs. While pumpkins are very nutritious they should be fed with care. One good way is to feed with them some absorbent feed, such as wheat bran, or chop feed of almost any kind. Pumpkins should be cut into pieces small enough to be easily eaten by the cow. This may be done very readily with a heavy corn-cutter. After being cut up they should be mixed with the dry feed. The cows will thrive better and yield more butter, and there will be less water in the milk. When fed in small quantities or only occasionally it is not necessary to remove the seeds, but when fed in large quantities and continuously the seeds have a diuretic effect that might not prove beneficial.

Boiling Potatoes.—Would it pay to boil potatoes to feed to milch cows, instead of feeding them uncooked? What value have they for feeding raw or cooked?

It depends upon what quantity of potatoes are fed per day, whether it will pay to cook them for cows. And it may be further said that if cows are fed upon dry hay, 4 quarts of potatoes per day would be advan-

tageous, fed crushed but raw; because raw potatoes would act as a laxative, prevent any ill effects of dry fodder, and probably assist in the digestion of the hay. Another point may be made that if one is feeding bran to his cows, he might feed 4 quarts of crushed raw potatoes mixed with 2 or 3 quarts of bran, night and morning, or 1 peck of potatoes with 4 or 6 quarts of bran per day. In this case there would be a more complete digestion of both potatoes and bran, because of their mixture together. If he desired to feed more than this per day, they should be cooked, mashed and mixed with cut hay before feeding. To explain the value of cooked potatoes, we estimate the dry food in the cooked potato as equal in value, per weight, to corn meal, and as the dry food in 60 pounds of potatoes would be only 15 pounds (the potato being 75 per cent. water), if we estimate corn meal as being worth 1 cent per pound, then cooked potatoes would be worth 15 cents per bushel. Perhaps we might properly make a slight allowance in favor of the potatoes over corn meal, for its effect in helping the digestion of other food. This is the opinion of a writer in the "Country Gentleman."

CHAPTER III.

The Dairy: Milk and Butter.

Absorbing the Salt.—Will butter absorb more salt than necessary to preserve it through the summer?

If butter is worked so dry that it will not dissolve the salt and salt is mixed through it in this state it will contain too much salt. As salt is usually put into the butter or mixed with it while it has a large amount of water in it, the salt is formed into brine and so worked out. If the salt all dissolves while the butter is being worked, it will not impart an undue salty taste. Salt does not preserve butter, but it gives it a flavor most people like. When salted, an ounce to the pound, it does not retain this amount. We salt butter to season it. An increase will not preserve it, but it may make it, as explained, too salt for good taste or flavor. A small quantity is as good as a large amount, so far as preservation is concerned. The salt coats the butter granules or is distributed in little pockets of brine. It does not penetrate the butter, and is not absorbed.

Warming Milk.—Will it not take considerable lukewarm water to warm milk or cream?

Yes. Have the water at 110 degrees and then it will not take so much. Stir the milk and cream while the water is being poured in.

Best Churn.—What kind of churn is best?

Concussion or pounding churns butter; therefore any churn that produces concussion, whether it be a swing, box or barrel churn, is the proper one to use. There are over 4,000 patterns of churns in this country, but the man who hit upon the concussion plan did the business. The concussion churns are all good, but their work will be defective unless they are properly used. All the butter fat in the cream will not be recovered by *any* churn, if it is filled nearly full, nor will it recover the fat if the cream has been improperly ripened, mixed or otherwise treated.

Pan Filled or Half Filled.—Which will give the best results in cream, a pan filled or half filled, with milk?

The pan that is but half filled. Fill a pan half full of milk, then add another third of cold water. Set the milk at 98 degrees, or as near so as you can, and have the water as cold as you can get it. More and quicker creaming will result.

Churning Daily.—Would it be policy for a man with a small dairy to churn daily?

Yes, if he has cream enough. Holding cream after it is ready to churn will injure the product.

Aerating Milk.—Is it of any advantage to milk to aerate in the stable where the cows are?

No; on the contrary, it would injure it. If we are to aerate milk, we must do it in pure air. Exposing it in the stable would certainly add injury to it, by coming in contact with the foul air. When milk is warmer than the surrounding air, it is absorbing odors, if there are any to absorb; and milk warmed up to normal heat in the cheese factory will absorb foul odors from a whey vat, if it is near enough to contaminate it. Therefore, the necessity of enforcing the law of absolute cleanliness in the factory as well as in the stable. By aerating milk a better flavor and a better keeping quality are thereby imparted. It may not be so absolutely necessary as for making cheese, but it should be aerated if it is to be creamed by deep-setting.

Sugar and Saltpetre.—Does it injure butter to put sugar and saltpetre in it?

Sugar will change the flavor, and it will not keep so well unless pure. Some like the sugar flavor, some prefer the real butter taste. Saltpetre, a little, will not change the taste. It is antiseptic and no doubt preservative; but its use is not to be commended, as too much is injurious to the stomach. It must be used with care.

Nutritive Ratio.—What is meant by the terms nutritive ratio and a balanced ration?

There is a proper ratio between albuminoids and carbohydrates. One of the former to $4\frac{1}{2}$ or 5 of the latter is nearly right. Milk is a perfect food, that is, about one to four.

Private Dairy or Creamery.—Can as good butter be made in a private dairy as in a creamery?

No doubt there can be just as good butter made in the private dairy as in the creamery, and, I believe, better, says Geo. T. Powell. The only trouble with private butter is in its want of uniformity of color, grain and flavor. When private butter-makers learn to make a product of uniform requirements, they will receive just as good prices as do the creameries. Our best hotels, restaurants and private customers pay higher prices for creamery butter because it is always uniform. On the farm there is often a lack of facilities and first-class butter cannot be made. Too much of it is made in the kitchen, and the cream raised right where it can absorb the odors of boiled cabbage, onions or other vegetables. Give the skillful farmer and his wife the facilities of the creamery, and they can produce as fine butter as can be produced in the creamery.

Fibrine, how Formed.—How is fibrine formed in milk and how may its formation be avoided?

Fibrine in milk is formed by the decomposition in the blood of some substance unexposed to the air, and, though present in but a minute quantity, often causes much disturbance. Its development in milk is hastened by warmth, disturbance, transportation and like causes. To avoid it, cool the milk as soon as possible after it is drawn from the cow and as its formation is favored by agitation and exposure to the air, milk should be kept as still as possible and covered.

Butter Globules.—What are butter globules, their size, quantity, etc?

Butter globules are from one two-millionth of an inch to one three-millionth of an inch in diameter, shown through the microscope, magnified 750 diameters. There is an average of two millions of these globules in a quart of milk. The butter globules being lighter than water, rise to the surface slowly in the form of cream. Each little globule is encased in a coat of casein, which on agitation—as in churning—is broken, allowing the butter to cohere together. There should be at least 45 to 50 degrees between the temperature of milk and the atmosphere it is set in, to raise all the cream. In the summer time the milk as drawn from the cow is 98 degrees. If we set this in water at from 45 to 50 degrees, we will get all the cream in 12 hours. If set in open pans at 62 degrees, we should have all the cream in 36 hours.

Temperature for Churning.—We churn a half a day without getting butter. Temperature was 64°. What's the matter?

Try 68 degrees. Some churn in a cellar, in which case raise the temperature up to 70 degrees, or put it at 66 degrees and churn in a warmer place. The cold air of the cellar cools the churn and cream rapidly, and makes it too cold for the butter globules to adhere. When cream is churned at such a high temperature the buttermilk should be partially drawn off, and the butter cooled and washed with brine not above 60 degrees. When washed, the butter should be as cool as 59 degrees, and not above 60 degrees.

Warming and Cooling Cream.—Give the best method to warm and cool cream?

To warm cream, set the can containing it in a can of warm water and stir the cream during the process. Cool cream in the same way—set the can containing it into a can of cold water, but you may pour cold water into the cream. Do not put ice in cream; substitute ice water. You cannot tell how much ice to put in because you will have to wait till the ice melts before you can determine the result. Too much ice may reduce the temperature too low, when you would have to again warm the cream. Churn in 25 to 30 minutes. Milk containing large butter globules produces cream that will churn quicker than that containing small globules.

Cow for Butter or Cheese.—What is the difference between a good butter and a good cheese cow?

If she is a good butter cow she will be a good cheese cow. A cow that gives 4 per cent butter fat will usually give a proper proportion of casein, but a cow that gives 6 or more per cent fat does not put in casein enough to hold the fat. If a cow gives good milk she will be a good cheese cow. The trouble with our cheese is, there is a deficiency of fat in it.

Packing Butter.—Will butter keep better packed under brine than under salt?

Butter should be packed solid and the air excluded. This can be done well with salt and a cloth at the bottom and top. First salt, then a cloth, then a layer of salt paste on top of all. Some say that to submerge with brine is best.

Butter and Animal Fats.—What is the difference between butter and animal fat?

Prof. Van Slyke says: There are a number of fundamental fats. By fats we mean what we do when we speak of an oil, except that one is a fluid and the other is a solid. Tallows are hard fats—stearines and others, of which candles are made after the oleine has been removed. The difference is simply in the proportion in which these fundamental fats exist. The more oleine in a fat the easier the fat will melt. So, then, the difference is in the presence of these fundamental fats, just as between animal and vegetable fats. Olive oil contains no stearine or palmitine. Fat is composed of three elements, oxygen, hydrogen, carbon. Fats differ in proportion as these elements are present. It is not a simple thing to determine or describe. I will say it consists of glycerine and some acid. Stearine, oleine and palmitine are all found in butter, and are formed by the combination of glycerine with the acid of these substances. Butyric acid is composed of butyric acid and glycerine, and is the substance that gives to butter its peculiar flavor. It is a highly odoriferous substance and causes the disagreeable odor in rancid butter.

The Lactometer.—Is the lactometer of any practical worth to a dairyman whose cows give a high grade of milk?

No. Most scientists claim nearly an even balance of caseine and butter fat in milk. The instrument only indicates specific gravity of milk—the amount of solids in it, not the butter fat.

Butter in Skim-milk.—Why does so much butter pass off with the buttermilk and skim-milk at certain times?

There are several reasons. Cream not in the proper condition to churn, ripened too much or not enough; the mixing of fresh cream with ripened cream and immediately churning it; the mixing of cream from milk of different breeds, as Jersey and Holstein, the one containing large and the other small fat globules, or the cream from cows long in lactation or well advanced in gestation—all these causes produce the result.

Detecting Watered Milk.—Since there is much water in milk and milk varies in richness, how can you tell if water be added?

Only by a chemical test. The lactometer will not determine it. The solids of milk are usually nearly evenly balanced, so that a chemical test only will disclose the addition of water. There are chemists who claim they can detect such without making a chemical analysis, but there is no certain popular test to determine it.

Thinning Milk.—Will cream rise quicker at any time to thin the milk?

Yes; cream will always rise quicker by thinning the milk. The smaller the volume of milk the sooner it will rise. This fact teaches us not to have the milk too deep in the pails or cans.

Buttermilk in Cream.—Should sour buttermilk be put in sweet cream?

No. If you do, you will be likely to impart a buttermilk taste to your cream and injure flavor of butter.

Artificial vs. Genuine Butter.—How may artificial butter be distinguished from genuine and what are the differences?

The four acids, butyric, caproic, caprylic and capric are called "soluble" or "volatile" fatty acids, while oleic, palmitic and stearic are called "insoluble" fatty acids; since the former are more or less completely soluble in water and can be volatilised and distilled without change or decomposition; while the latter are insoluble in water and non-volatile. The fat of pure butter contains, on an average, 87 to 88 per cent of insoluble fatty acids, and 6 to 7 per cent of soluble fatty acids, the latter consisting mostly of butyric acid. Artificial butters contain over ninety per cent. of insoluble fatty acids, and usually less than one per cent. of soluble fatty acids.

Composition of Dairy Products.—Give a table showing average composition of dairy products.

Products	Fat	Casein	Sugar	Ash	Water
Milk	3.40	3.40	4.80	0.76	87.64
Cream	16.00	3.40	3.15	0.70	76.75
Skim Milk	0.70	3.50	4.90	0.80	90.10
Butter	83.59	0.60	0.40	0.15	15.26
Butter Milk	0.60	3.50	4.00	0.70	91.20
Skim Cheese	6.40	34.32	3.30	3.28	52.70
Cheese	23.00	27.56	1.90	3.65	33.89
Curd	6.03	36.64	0.90	4.07	52.36
Whey	0.15	1.02	4.96	0.61	93.26

Dash Churn.—Can butter churned in a dash churn be gathered in the granular form? If so, how?

Yes; but it is a more difficult job to do than when churned in a revolving churn. Stop the churn as soon separation occurs, then wash in cold water in the churn and dip the granules with a sieve. It is much more labor to do it and the butter should be cooled down to do it well.

A Milk Analysis.—What are the constituent elements of milk?

It contains carbon, hydrogen, oxygen and nitrogen, together with an insignificant amount of mineral matter. Following is what we call an ultimate or elementary analysis:

Carbon	53.7	per cent.
Nitrogen	15.7	" "
Hydrogen	7.2	" "
Oxygen	23.4	" "

This statement tells the proportions in which the chief elements are present.

Night vs. Morning's Milk.—Why is the night's milk richer than the morning's?

Because the longer the milk remains in the udder the poorer it is, as the elements are re-absorbed. The reason the last milk or stripings is richer is because it is just made, and contains all the elements put into it. This proves that milking three times a day is best for the dairyman, and more comfortable for the cow.

Weeds Make Bitter Butter.—Can a cow eat weeds that will make her butter bitter?

Certainly. Most noxious weeds will impart a bitter or other bad taste to butter; so will onions, cabbage and turnips, unless properly fed. In some weeds this constituent is volatile and is evaporated from the milk; in others it is not. All pastures and meadows should be freed from noxious weeds if the finest quality of butter is wanted.

Breeds, as to Milk Quality.—In what order do you place the different breeds of cows as to richness of their milk?

1st, Jerseys; 2d, Guernseys; 3d, Short Horn; 4th, Holsteins. The Holsteins give greater quantity, and equal results in amount of butter with Jerseys.

Mixed Cream.—Will the milk of Jersey cows, when mixed with that of other breeds, yield its full value when churned?

The cream from Jersey cows' milk will rise sooner than from any other milk, because the globules are larger and they come up quicker and freer. It will not be lost if kept sweet long enough for all the cream in it to rise. There will be no loss if all the cream is perfectly ripened and stirred or mingled together. There might, under certain conditions, be a little loss, but the proper way is to have the cream thoroughly mixed, so that the same degree of acidity shall permeate the whole, and it will be aerated and oxidized alike, and then it will churn alike. Col. Curtis used to say: "If I had a herd of Jerseys and took my milk to a creamery to put in with that of common cows, I should calculate I was being robbed every day. It would not be fair for one patron to feed his cows nothing but grass, while another fed bran, cottonseed meal, or other fat-producing food." There can be no adjudication of these interests except by a test of the solids which the milk of each patron contains. Milk may vary in its solids from one and one-half per cent. to eight and one-half per cent. There are many cows that give milk that has only one and one-half per cent. of butter-fat in it, and others whose milk will run four, five, six, seven and even eight per cent. but eight per cent. is an extreme.

No Value in Color.—Does the color of milk indicate or measure its value for milk?

No. A cow may give milk rich in color that is poor in butter fats.

A Simple Test.—What is the simplest form of a milk test you can prescribe?

The simplest method of testing milk is to take a pint of morning's milk and put it into an open quart bottle, and set it in a cool place for securing the best results in creaming. Do the same thing with a pint of night's milk, and then mature them alike and put them together and churn them, or agitate the mass till the butter separates. The milk and butter may be weighed, and the percentage of butter and milk be found. The first lot of milk should be kept at a temperature of 50 degrees or 55 degrees until the second one is ready to mature, and then be mixed and set in a warmer temperature. This is the proper way to handle cream, and then it will change together and be alike. Mixing a lot of sweet or green cream with a lot of sour does not change at once, chemically, the sweet cream, although the mass may taste sour. A slow and complete change in the whole churning is what is wanted.

Per Cent. of Water in Butter.—What per cent. of water should be left in butter?

Twelve per cent is enough. Salt will dissolve in five minutes, when it should be worked. It should then be immediately packed, to exclude the air. Do not work it but once. Butter will take on a higher color if left standing awhile exposed to the light, but it will lose in flavor. It is the custom in some creameries to work butter a second time after twenty-four hours from the first working, but the best creameries only work once, which is as soon as the butter is removed from the churn.

Effect of Grain Rations.—Are there any statistics or experiments showing actual gain from grain rations, on an average dairy herd?

At one of the New York State Dairy conferences the following statistics were given which answers the above question. There were represented in this report, 54 dairies, with 890 cows. Ten of these dairies, with 173 cows, gave a yield of \$22.60 per animal, on a grain ration that cost an average of \$3.11. Fourteen dairies, with 234 cows, gave an average yield of \$26.70, the grain costing \$3.47. Sixteen dairies, with 284 cows, yielded \$36.39 per cow, grain costing \$4.83. Eleven dairies, with 145 cows, yielded \$43.24 per cow, grain ration costing \$6.80. And three dairies with 54 cows yielded \$53, grain costing \$11.04. From this we see that an increase of 36 cents in the grain fed gave an increased yield of \$4.10 per cow. A further increase of \$1.36 in grain made an improvement of \$9.69 in the yield. A still further increase of \$1.77 in the grain resulted in a gain of \$6.83 in yield; while the last and highest increase of the grain ration of \$4.24, brought another improvement in the yield of \$9.78. These figures are conclusive, as the cows were a mixture of natives and grades, and they fairly represented the average farm dairy.

How Much Butter in Milk. How many pounds of butter in 100 pounds of milk that tests five per cent butter fat?

It is governed by two conditions: First, how much butter will the churn recover? Second, how much moisture shall be left in the butter? Such milk ought to give from 5.25 to 5.50 pounds from 100 lbs. of milk.

Weight of one Gallon.—Is there a standard weight per gallon of milk?

A gallon of milk varies in weight according to the quality. A gallon of pure water has a standard weight of 8.339 pounds avoirdupois; a gallon of milk of a standard gravity of 1,000 would weigh 8.589 pounds. It is usually taken to weigh 8½ pounds. The weight of milk depends on the cow more than on the food, for a cow giving rich milk will yield milk of lower specific gravity as the proportion of butter increases in it. But the difference is very slight. There will be a very slight difference between the gravity of milk made on summer pasture or good winter feeding, but the latter will produce somewhat heavier milk. The specific gravity of milk before calving is slightly greater than after calving, on account of the greater proportion of salts which it contains.

Causes of Tainted Milk.—How many and what causes are there for tainted milk?

There are several causes. One is the improper care of milk over night; keeping it in poor rusty cans, and not aerating it, and allowing it to stand where the atmosphere is impure, and shutting it up tight, and bringing it to the factory without getting out the animal odors; and another cause is impure water; another cause is harsh treatment of the cows. These are the important causes.

Butter Breeds.—Is there any difference in the butter from different breeds of cattle?

Yes. The cow giving the largest butter globules produces the hardest, firmest butter. Small globules produce soft, plastic butter.

The "Boyd Starter."—What is the "Boyd Starter" often spoken about?

The principles of ripening cream are much like those of raising bread with yeast. If it stands too long it loses. Ripen at 65 degrees in summer, if surroundings are favorable; in winter, at 75 degrees, and keep it where it will not go below 65 degrees. Ripen from twenty-two to twenty-four hours. Put in one gallon of the starter to twenty of cream. The starter is sour milk. Get the milk at the creamery as soon as possible after it is drawn as near normal—98 degrees—as possible. Reduce to 45 degrees—never below 40 degrees, and cream. Hold all cream at 45 degrees to 50 degrees, till there is enough for a churning; then mix, warm up, ripen and churn. Churn in warm weather at 66 degrees. In winter at 68 degrees to 70 degrees. Every dairyman must churn according to the condition of his dairy. No two dairies are alike; so that there can be no set rules.

Coloring Butter.—Has coloring material any bad effect on quality of butter?

Concerning the coloring of butter the Dairy World has this to say: If coloring butter in any wise changed its elements or rendered it an article entirely different from genuine butter, then fraud would be perpetrated in selling a customer something he had not asked for and did not want. Coloring matter does not change a particle of the butter or affect its wholesomeness, flavor or aroma in the slightest manner, and hence no necessity exists for ever invoking any legislation to protect consumers. No one is wronged in the transaction as we can see.

Souring of Milk.—Why does the morning's milk in summer sometimes sour before the milk of the previous night?

Evening's milk cools and the action of bacteria stops until the milk is again warmed. Next morning the morning's milk is put into cans warm; and bacteria commence work at once, before milk of previous evening has warmed up to temperature suitable for bacteria to grow. They effect milk in different ways. Some by souring and coagulating caseine; others produce no marked effect further than is indicated by peculiar odors; but it is probable that the souring of all milk is not the same kind of souring.

Cooling Cream with Ice.—Is it good policy to cool cream after it is ready to churn, by the introduction of ice in the churn?

It is not the proper way. Cool the cream to the proper temperature by placing the can containing the cream in ice water, after the cream has been properly ripened, then warm it to the proper degree when in the churn by the introduction of warm water. Experience will determine for you the right temperature.

The Aerator.—Will the aerator remove impurities in milk coming from impure water or improper food?

Not entirely, but, possibly some of them. Animal odors are the ones it is intended to remove. Cows should not be given an opportunity to drink impure water or to eat improper foods. At a butter factory, the patrons were compelled to aerate their milk last summer, and the effect was decidedly beneficial, showing that not cheese alone is affected by animal odors in milk.

The Washing of Butter.—When butter comes in granular form, how many times should it be washed, and how many times and how long at a time should it be worked? Is there danger of overworking?

The usual rule is three times, but in this matter circumstances alter cases very often. The first washing has much to do with the number of washings it will require to secure the proper freeing of the butter from the butter-milk. When the butter is in the granular stage, it can be almost separated from the milk at the first washing, if no attempt is made to draw off the buttermilk until after the water has been added. The water should be quite cold, so to harden the grains to a point that they do not readily adhere to each other, and thus facilitate the after operation. There should be as much water added to the churn as there was cream, and if a small amount of salt is added the separation will be all the more perfect. A very little agitation of the butter in this fluid will be sufficient, when it will come to the surface within an instant, and fairly crowd itself up out of the water. The water and buttermilk can then be drawn off without the aid of a strainer or sieve. The next washing of water should be a little warmer, and the salt will be an improvement, and assists in getting out the milk without so much hand labor, which is always in the direction of overworking. The third washing should be sufficient to take out all the buttermilk that it is possible to get, and it should be allowed to drain all it will in a reasonable time. The after-working needs but little more than the

mixing in of the salt, and pressing the mass together.

Winter or Summer Cream.—Will a gallon of cream make the same amount of butter in winter as in summer?

No; have seen it vary nearly a pound in a gallon of cream in both seasons. Our cream averages two pounds to the gallon; some days more, some days less; just as the cows vary in their butter fat from day to day, which they do.

Working Butter.—Would you work butter once or twice?

Once only, but work it properly and enough; about 12 per cent of moisture should be left in. When you have it worked put it into the packages and get it away from the air as soon as possible if you want it to keep. It is the *foreign* element—caseine, impure salt, etc., left in the butter that causes rancidity.

Richest Milk.—Is the milk of cows long in milk richer in fat than fresh in milk?

As a rule, yes. Cows will put more fat into their milk after being turned to pasture, and the churn will recover more fat from the cream. In other words, there will be a better or more nearly perfect separation of the butter from the milk after cows are turned on to good fresh pasture, in the spring.

White Specks.—What is the cause of white specks in butter?

If cream is set where it becomes dry, either by the wind blowing on it or from the heat of a stove, or in very hot weather when the milk stands until it wheys, the curd will become so hard that if you get it in the cream it will pass into the butter.

Old and New Process.—The terms old and new process (abbreviated sometimes to O. P. and N. P.) are applied to linseed meal. What is the difference?

Old process oil cake is made at present by pressing out the oil in very thin cakes, and now contains only about 6 per cent. of oil, whereas it formerly contained 11 per cent. Then these thin cakes are ground into O. P. linseed meal, and its digestible nutrients are: Albuminoids 26.00 per cent. carbohydrates 27.00, fat 6.00. New process linseed meal is never formed into cake because never put under pressure. The ground flaxseed is treated with certain solvents which dissolves out the oil more perfectly than any pressure can, and it is left when dry in a loose-textured meal, weighing only about one pound to the quart, whereas linseed cake meal weighs nearly 1½ pounds to the quart. The digestible nutrients of the new process linseed meal are: Albuminoids 28.00 per cent. carbohydrates 29.00, fat 2.9. It will thus be seen that the new process contains more albuminoids and carbohydrates and less fat, but the difference at present is not very great, the old process having about 3 per cent. more of oil. Both kinds of oil meal have a soothing effect on the digestive organs, and tend to keep animals in health when fed in moderate quantity.

Butter Fat.—How much butter fat is required for one pound of butter?

That depends on the amount of foreign matter—casein, salt and moisture—in it. Good butter should contain from 80 to 85 per cent. of pure butter fat.

Keeping Cream too Long.—Is it possible to make good butter from cream that has been kept a week?

No; not even if it has been kept at a low temperature. Three days is a long enough time. Churn twice a week, if not three times. A large percentage of the great mass of poor butter is made so by keeping the cream too long. It should be churned just as soon as it has become slightly acid, and has a smooth glossy satiny appearance. Every hour it is kept longer than that will be an injury to it.

Frost Injures Butter.—Will frost injure butter?

Certainly. Butter that has been frozen soon gets off flavor when exposed to a warmer temperature. Butter kept but a short time in cold storage soon spoils after exposing it in a warm temperature. Keep your milk, cream and butter away from severe cold and frost.

Retards Cream Raising.—Will it retard the raising of cream to strain milk into cans after the milk already in them has partly cooled?

Should say that it would. In straining into cold setting cans put all the milk into a can you intend to at once. As soon as milk has become still after being poured into a can the globules will begin to rise. If more milk is poured in the mass becomes agitated, and the rising process is stopped.

Value of Skim Milk.—What is the value of skim milk per 100 pounds, for feeding?

It varies, and depends upon the animal it is fed to. For calves, fed in connection with flax seed, boiled, it is worth 20 c., or more, per 100 lbs.

State Standards.—What is standard milk, and does it vary in different states?

The different states each have a standard of quality of their own for milk. Minnesota demands 13 per cent solids of which $3\frac{1}{2}$ shall be fats; Massachusetts, 13 per cent solids; Vermont, $12\frac{1}{2}$ per cent; Pennsylvania demands $12\frac{1}{2}$ per cent, of which 3 per cent shall be fats. Michigan, New York, Wisconsin and Iowa all have the Pennsylvania standard. The law in some states makes a discrimination of one per cent in the summer and one state makes the requirement that the milk shall be at 60 degrees, and have a specific gravity of not less than 1.028 at the testing. Several of the states have no standard, but have a penalty for adulterating milk, or skimming it for sale.

Difference in Cows.—Why will two cows on the same food—other things being equal—not give milk containing the same per cent of fat?

Simply because of a difference in their physical structure; one not having been bred in the line of butter production, puts the fat from food on her ribs; the other assimilates it, and the fat from it goes into the milk pail.

When to Market Butter.—Which will be preferable, to sell butter at current summer prices or hold it till late in the season?

It depends; as a rule it pays better to sell butter as fast as made. The demand for summer-made butter that has been kept is constantly growing less, and fresh-made butter more in demand. It will prove an experiment if it is held, and a good place must be provided to store it.

Streaked Butter.—What makes butter streaked?

There are different reasons for it. One reason is not having the salt evenly incorporated through the butter. Another reason is churning cream not sufficiently ripened. Spots in butter are caused sometimes by particles of cream that become dry, which will not soften up in the process of churning, and by little lumps of caseine. Sometimes by putting ice in a churn butter may be made streaked; where the ice lies against the butter it will sometimes draw out the yellow color and bleach it; cold water will sometimes do the same thing; and you will have, as a consequence, streaked butter.

Sweet and Sour Cream.—If cream is a little too sour can enough sweet cream be put in to make good butter?

You will lose all the sweet cream you put in. It will all go off in the butter milk. Never mix sweet and sour cream just before churning. Hold the first skimming at a low temperature until the second is added then ripen evenly. Do not put sour butter milk into sweet cream, either.

Cream vs. Butter.—How does cream differ from butter?

In cream, globules of fat are separate; in butter, they adhere to one another. Sweet cream butter differs from sour cream butter, mainly, in "ripeness." Pure butter fat has no so-called butter flavor. It is the "ripening" process that develops this flavor, and it is probable that none of the simple fats give or impart the yellow color in butter.

Leaking Milk.—A cow three years old leaks her milk when in pasture. What should be the treatment?

Possibly the change of being continually in the pasture is an exciting cause to the formation of a greater quantity of milk than would naturally come if treated otherwise. As the nervous system is at fault, some change must be made in her general treatment so that the cause may be removed and the nervous excitement controlled. The application of very cold water with some vinegar in it to the udder twice daily might act as a tonic to the weakened glands and the following to be given internally: Sulphate of iron 4 oz., powdered nuxvomica 2 oz., Epsom salts 16 oz. Give a tablespoonful 3 times daily.

Hand Separator.—Would a dairy of twelve or fifteen cows warrant buying a separator?

It would all depend on the cows. If a man has a dairy of that number that will give him 300 pounds of butter per year, it will pay him to buy one, but if they will only give him 125 pounds he does not want a separator or any other machine or creamer; he wants to sell the cows. With the separator the butter gets into the package twelve hours sooner than by any other method.

Causes of Bitter Cream.—Mention some of the causes of bitter cream?

(1) Weeds in pastures. The ragweed gives an intense bitter flavor to cream. (2) Mildew which gathers in spots on cream when milk is set in damp cellars. (3) Keeping milk too long before skimming, or cream too long before churning. (4) Sometimes an advanced state of pregnancy in cow thus affects cream.

Ropy Cream.—Have a cow that gives milk the cream of which is very ropy, but the milk is all right. How shall she be treated?

This must be due to some change in the general system, such as irritative fever caused by injuries, chills, colds, etc., or change in the food or too much exposure to the hot sun. This change has not gone so far as to immediately affect the milk, but lies latent in it and by the action of the air the chemical change takes place in the cream. Try the following: Tinct. aconite 2 drachms, bicarbonate of potass 4 oz., water 1 pint. Mix and give one ounce three or four times daily.

Butter at 12 Cents.—Can butter be made and sold at 12 cents a pound, at a profit?

Yes. If you have cows that will make from 300 to 400 pounds each, and you utilize their by-product, and they are fed in part from the silo. Cows of the 125-pound type, and kept in the old way, will run you in debt with butter at that price. Weed out the poor cows and give those that remain extra feed, which will bring you extra cash. Keep account with each cow as a banker keeps an account with depositors.

Ensilage and Prime Butter.—Can gilt-edged butter be made when ensilage is chief food?

We cannot make the finest grade of butter from any *one* feed; but there is no question about our being able to make good butter from ensilage, although not the best. If you will mix a ration of cottonseed meal, ground oats, wheat bran, wheat middlings, or linseed meal with the ensilage, you will be able to make as good butter in January and February as in June and July.

Curdley Milk.—Is there a remedy for curdley milk? If so, what is it?

This condition of the milk is due to some change in the blood and general system immediately affecting the lacteal secretions and may be brought about by change in the food, chills, colds or overfeeding or anything, in fact, that will or is liable to cause a change in the natural secretions, especially in very hot weather, for sometimes the weather has a great deal to do with it. To counteract the acidity of the blood the following may be of use: Salicylate of soda 4 oz., bicarbonate of potass. 2 oz., Epsom salts 16 oz. Mix and give a large tablespoonful of the prescription three times daily.

How Much Salt.—How much salt do you add to your butter?

For the New York market an ounce to the pound, but three-fourths and even but half an ounce is demanded by some customers. The market is drifting toward fresh butter, also toward sweet cream butter. For home market put in an ounce. For packing to hold, from one ounce and a quarter to one and a half.

How Dry to Work.—How dry shall we work butter?

Not below 12 per cent.; none but an expert should attempt to go below that figure, as there is a liability to make the butter "salvy" by injuring its grain. More butter is found with a greater than 12 per cent. than less of moisture in it. Properly worked butter when broken over with a paddle should have the appearance of broken steel.

Butter Packages.—What is the best package for putting up butter to keep?

A well-made ash or spruce tub with a cover made to fit air-tight. Tin packages are good until they become rusty. Parchment paper packages are good for temporary use, but would not do for packing butter to keep.

Volume of Cream.—Will two cows, giving cream of the same thickness in appearance, make about the same amount of butter?

They may differ very much. Volume of cream is no more proof of its butter value than is volume of milk of its value. Churnability also differs in cream, on account of the difference in the diameter of the fat globules.

Meaning of Viscosity.—What does the term "viscosity" signify?

It is the power of being adhesive. The caseine, sugar and fat cause it. It varies with breeds and with individual animals. It increases as the period of lactation advances and small fat globules are more affected by it than large ones. The more viscous the milk the longer will the cream be in rising.

Churning Sweet Cream.—What effect has it on the keeping qualities of butter, to churn the cream sweet, and do you get as much butter by this process?

Churn sweet cream at a much lower temperature than you would ripened cream; about 50 degrees is the proper one. If cream is pure there is no reason why sweet cream butter, if properly made, should not keep as well as that from ripened cream. It is the foreign matter, caseine and other substances, that causes butter to become rancid.

MISCELLANEOUS QUERIES.

Ques.—What system of creaming produces the richest cream? *Ans.*—Shallow open-pan setting.

Ques.—What causes a skin or pellicle to form on milk when it is heated? *Ans.*—Probably the coagulation of albumen.

Ques.—Does it injure the butter to put ice in the churn? *Ans.*—Yes; it injures the color or is liable to.

Ques.—How much water does average milk contain? *Ans.*—87 to 88 per cent. is the general rule.

Ques.—Does the addition of water to milk necessarily injure it? *Ans.*—No, for some purposes; yes, for others.

Ques.—What is the chief nitrogenous compound of milk? *Ans.*—Caseine.

Ques.—What elements does caseine contain? *Ans.*—Carbon, hydrogen, oxygen, nitrogen, and small amounts of phosphorus and calcium.

Ques.—What other important nitrogenous compound is found in milk? *Ans.*—Fibrin.

Ques.—What four conditions favor the formation of fibrin? *Ans.*—Warmth, exposure to air, agitation and contact with rough surfaces.

Ques.—What conditions retard or prevent the formation of fibrin in milk? *Ans.*—Immediate cooling, freedom from agitation, and placing in smooth, bright, clean vessels.

Ques.—How much sugar does average milk contain? *Ans.*—Four to five per cent. it is usually reckoned.

Ques.—What is the difference between fats and oils? *Ans.*—Fats are solids; oils are liquids at ordinary temperature.

Ques.—Do you add water to the milk in summer in deep setting?

Ans.—No; but no doubt the cream would rise more freely, and under unfavorable conditions it would be a good plan. In winter it is a necessity to get good results.

Ques.—How long should cream be kept in winter? *Ans.*—Not over three days at most.

Ques.—Is it practicable to set milk of farrow and new milch cows together? *Ans.*—It is all right if the conditions are favorable for the cream to rise and it is fully ripened.

Ques.—Will butter keep better in earthen jars than in wooden tubs? *Ans.*—If the jar is glazed it will keep well. Many prefer oaken tubs.

Ques.—Can the white specks be gotten out of butter in any other way except by washing? *Ans.*—No; a cream strainer will not remove them.

Ques.—Will cream spoil in a damp cellar before it will ripen? *Ans.*—Yes; it will rot or begin to, and make tainted butter.

Ques.—How cold is it necessary to have the water to raise all the cream by deep setting? *Ans.*—At 45 degrees the cream will all come up in ten hours—in twelve hours, sure.

Ques.—Should butter colored in winter be packed immediately? *Ans.*—Measure the cream and coloring, stir them well, and when churned, finish the butter at one working. Better color with breed and feed.

Ques.—Will more butter be obtained by churning the milk than the cream? *Ans.*—If the milk is well set, no.

Ques.—Why should milk that is to be set for cream be agitated no more than is necessary before setting? *Ans.*—Because agitation favors the formation of fibrine.

CHAPTER IV.

The Dairy: Cheese-Making.

Manufacture of Cheese.—Describe briefly the process of cheese-making.

After the milk is properly ripened heat it to 82 degrees in the summer and 84 degrees in the spring and fall during cool weather. After the proper heat is attained add the rennet in quantity to coagulate milk in from 50 to 60 minutes. Then cut the curd in cubes of about three-eighths of an inch each, then stir gently ten to fifteen minutes, then apply heat slowly at first and raise the heat to from 90 to 92 degrees when the heat can be raised rapidly to 98 degrees, when the whey can be drawn. Then stir the curd gently until it begins to pack. When sufficient acid is developed in the curd and cooled down to 85 degrees, grind, and salt about two and a half pounds of salt to 1000 pounds milk. Then the curd is put to press. Apply the pressure gradually until the whey is pressed out. The cheese should be in press about 24 hours. The curing room should be of a uniform temperature of about 70 degrees. After cheese is properly cured, if not marketed, it should be placed in a cool room so the curing process will be retarded. Curing rooms should be so constructed that

the temperature can be invariably kept at from 60 to 70 degrees.

To Prevent Rennet Tainting.—Sometimes when soaking rennet in warm weather it becomes tainted. How may this be prevented?

When soaking in weak brine in warm weather, the rennets will soon taint and spoil if kept soaking too long. To prevent this, soak in a small amount of weak brine one day, if very warm, or two days if not very warm, and rub or pound them often. Then turn the liquid into a separate vessel, and salt it to saturation for keeping. This will free the rennets from what would have the strongest tendency to cause tainting. If the rennets are now covered with a new, weak brine, they can be soaked and rubbed twice as long as before without danger of tainting; and by this time their strength will be pretty well exhausted, and they may be well drained and thrown away, or dried for steeping again in cold weather, if desired. Let the second steeping be now turned in with the first, and salted with a little more salt than it will dissolve, and it will be ready for use or for future keeping.

Getting full Strength of Rennet.—How can the full strength of the rennet be obtained?

The rennet's strength will be most readily and completely obtained by soaking them in a weak brine. A strong brine is generally employed, but it is objectionable, for the reason that it contracts the tissues in the membranes of the stomach, and thus prevents the ready escape of strength. A brine containing about five per cent. of salt—or, say, a pint of salt to a pailful of water—will soak out the strength quicker and more completely than either a strong brine or pure water. Brine, however strong, does no injury to the active agency in rennet. It may be salted to saturation and in excess of saturation, without impairing its power in the least. The only objection to making the brine too strong is, that it hinders the separation of the rennet's strength; therefore, soak in a weak brine first—a pint of salt to about twelve quarts of water—and, after the strength is out, throw away the rennet skins and put into the liquid all the salt it will dissolve, and a little in excess, in order to secure its proper keeping.

Cheese Elements.—Of what does a perfect cheese consist, and what are its elements?

Thirty-three per cent. fat, the same of caseine, 30 per cent. moisture and three per cent. mineral matter, or what chemists term "ash."

Time for Ripening.—How much time should be given milk for ripening for cheese?

If it is kept over night at from 65 to 70 degrees and then mixed with new milk not over three hours old, it will be in its best condition.

Loss in Butter Fats.—Is there not a greater per cent. of loss in butter fats where cheese is made from very rich milk?

There is a greater loss in the aggregate. The whey from rich milk will have more fat in it, and there is also a greater percentage of loss. That is, you take milk of three and three-fourths per cent. fat, which we call very normal milk for cheese milk in the summer season, and you will lose about twenty per cent. of that, as a rule, in the whey. In very rich milk you are required to use more rennet, so as to coagulate thoroughly, to get a firm structure if possible, and then when you cut the curd you leave a ruptured surface and on that surface are little globules of fat. If you take a cubic inch of curd you will have over a thousand millions of these globules of fat, and when you cut the surface of the curd you expose a great many of these, and a great many, therefore, are rubbed off and if the milk is very rich there will be more rubbed off; the structure of the curd is not so strong and you lose more.

Temperature for Curing Room.—What is the proper temperature for a curing room?

No matter how well made, if the curing-room is not so constructed that the temperature can be kept steadily at 65 to 70 degrees Fahrenheit, the cheese may be spoiled in the curing, and turn out to be very indifferent if not valueless stuff. No dependence can be placed on a room, the temperature of which is constantly rising and falling with the temperature outside; but the greatest injury, perhaps, comes from excess of heat and the constant change of temperature.

Cheese Ration.—What is the best ration for a cow whose milk goes into cheese?

The ration that will be best for production of butter. The special cheese cow that some seem to have an idea is to be found in some particular breed, is a myth. The man who makes the milk from so-called "cheese cows" will have hard luck unless he finds solids in it; and, as these solids are usually very nearly balanced, the richer the milk, the better for both butter and cheese. There will be found but slight variation between the per cent of fat and caseine except in phenomenal cows, when an excess of fat is not balanced with caseine; and as the average dairy cow will not show four per cent. of fat, with good appliances and a knowledge of how to do it on part of the maker, the fat may be incorporated in the caseine.

Canadian Cheese Best.—Why do Canadian cheeses bring more than American?

Because the Canada cheese-makers make only strictly fine cheese and then sell it on its merits. When we learn to let that abominable skimmer alone, and make what is known as full-cream cheese, and the people realize that they can get it, we will have no trouble in obtaining as good prices as our Canadian neighbors do.

Washing Curd.—At what temperature would you have the water for washing curd?

In using water it is best to heat to 130 degrees, and allow the water to filter through a strainer; it thereby gives the best condition for making the curd moist, and hot at the same time. Water at 95 or 98 degrees is apt to leave a slippery curd.

What are Bacteria?—Describe bacteria and what effect they have on milk.

Bacteria are very minute living organisms and are known as microbes, yeasts, molds, etc. The largest of bacteria are about one-three-thousandth of an inch in diameter. These organisms produce fermentation in cider, souring in milk and decay and putrefaction in animal matter. They flourish best between temperatures of 70 and 100 degrees. They can be destroyed in milk by boiling it for half an hour and in cream by heating to temperature of boiling water. A single quart of milk is estimated to contain from 300,000,000 to 6,000,000,000 of these minute bacteria.

Price of Milk for Cheese.—Can farmers afford to draw their milk to a cheese factory for 65c per 100 pounds?

We should not want to sell milk at that price. We would, if we were compelled to do so, keep cows that gave 6,000 lbs. of milk per year instead of 3,000 lbs., which is the average yield of the 1,500,000 cows in New York state. No man can make a cent from such cows even if he gets \$1 per 100 lbs. for milk. The system needs reforming—in short, it must be reformed, and the present great waste of solids at the cheese factories stopped. There are enough solids lost in these factories annually to pay the farmers' taxes.

Cheese and Soil Fertility.—Why does cheese take more fertility from the soil than does butter, both coming from the same cow?

Because cheese contains nitrogen, phosphoric acid and potash, the three principal and important elements of plant food, while butter contains but a small per cent. of nitrogen; about 46 cents worth in a ton of pure butter.

Too Low Temperature.—What is the effect of too low a temperature in curing room?

If the temperature is too low, the cheese not only does not cure—that is, rennet action is not only checked—but a slow fermentation sets in that converts the cheese into hog feed instead of human food. With a constantly rising and falling temperature, all sorts of flavors may be developed, except the one desired, and decomposition rather than curing is thereby hastened. But with a mild, even temperature of 65 or 70 degrees, the rennet action and oxidation of the curd proceed evenly and as rapidly as can be and not liberate the gases to a deleterious degree. With this slow, even curing, the gases pass out through the pores of the rind without making holes in the cheese or causing huffing. The flavor is not only kept mild and natural, but the added cheese flavor is developed in its mildest and most palatable form. A curd that could hardly be kept on the shelves of a hot curing-room, will cure down and make a fine, firm and buttery cheese in a temperature of 65 degrees.

Preparing Rennet.—When should rennet be prepared?

The best time for preparing rennet is in cold weather, when the soaking in weak brine can be carried on as long as desired without danger of spoiling. Only one soaking will then be required. Cold does no injury to them, but, on the contrary, freezing helps very much in liberating their strength. The oftener they are frozen and thawed, the more strength can be got out of them. After the steeping is done,

set the liquid in a cool place, and salt to saturation, and stir occasionally, and it will keep almost indefinitely. Rennet enough for a whole season's use may thus be prepared in advance, and save much trouble and waste in preparing them in hot weather. The use of tainted rennets should be carefully guarded against. The practice, quite common, of soaking rennets in whey, either sweet or sour, should be avoided, as the whey invariably tends to the injury of the cheese. Water is the best known agent for preparing rennets, and to it nothing but salt should ever be added.

A Cheese Herd.—What are the requirements for a good cheese herd?

In selecting a cheese herd, the first consideration is a large flow of fairly rich milk—rich in both fat and caseine—but difficult to be deprived of its cream. The aim should not be simply a large flow, because if the milk is made into cheese at home, a large flow of poor milk only calls for extra labor in handling without producing an extra yield of cheese. It is the amount of solids that a cow gives that determines her value as a cheesemaker. If they are small, no matter how large the flow of milk, the cow is a poor cheese producer. If they are large, she is a good cheese producer, and this makes her milk all the more valuable for the consumer, if her milk is marketed—and, surely, every conscientious man will desire to give his customer full value for his money, and it is certainly much more satisfactory to have the reputation for peddling

rich milk than for peddling poor milk. A good herd for the production of milk for cheese is also a good herd for the production of milk for market, and *vice versa*.

Aeration Necessary.—State what is the necessity of aerating milk for cheese?

The necessity for thorough aeration of milk lies in the fact that milk, when drawn from the cow, contains animal odors and impurities, which must be eliminated before that milk can make fine flavored cheese. The time to get those odors out is at once, before the milk is cooled. The way to remove them is by means of an aerator, which allows the milk to trickle slowly through it while the air circulates through the milk and removes the impurities. But if the aerator is lacking, then take a gallon dipper and thoroughly bale the milk for 10 minutes. Then set the can in water if you wish, and a half hour later bale again; after which you may rest secure in the belief that your milk at least is properly cared for.

Salting Ground Curd.—Would you salt cheese from ground curd any more than you would any other?

Where you add over two and one-half pounds of salt you will make a dry, hard cheese and one that will have to stand a long time before it will break down and cut in the shape you want it. Two and one-half pounds of salt is sufficient surely where the curd is ground, but perhaps not enough where not ground.

Rennet's Effect on Flavor.—What will be the effect of the excessive use of rennet on the flavor of cheese and in digesting cheese beyond the coagulation of the curd?

The use of a large quantity of rennet will increase the amount of moisture in cheese, and thereby provide favorable conditions for rapid curing. The common impression prevailing, that cheese will cure more rapidly when a large amount of rennet is used, is correct, because it will increase the moisture and thereby the curing fermentation is facilitated. The first action of the rennet is merely to coagulate the caseine to make it solid, with a substantial texture as distinguished from its previous state of solution. It expresses the moisture by contraction of the curd, the same as if you were to squeeze a sponge. Beyond that it will not expel so much moisture as if less rennet was used, but it will hold more moisture and in the subsequent curing fermentation the extra moisture provides the suitable conditions for the rapid curing. The fermentation renders the coagulated caseine again soluble.

Rennet in Tainted Milk.—Would you add more rennet or less if you had tainted milk?

In handling tainted milk add less rennet and give it plenty of hand-stirring and keep it stirred for an hour, or an hour and a half, or more if necessary, and keep temperature up all the while. Keep it covered and let it pack until the gas cells flatten out and the gas is expelled.

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