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The Farm Dairy

H. B. GURLER

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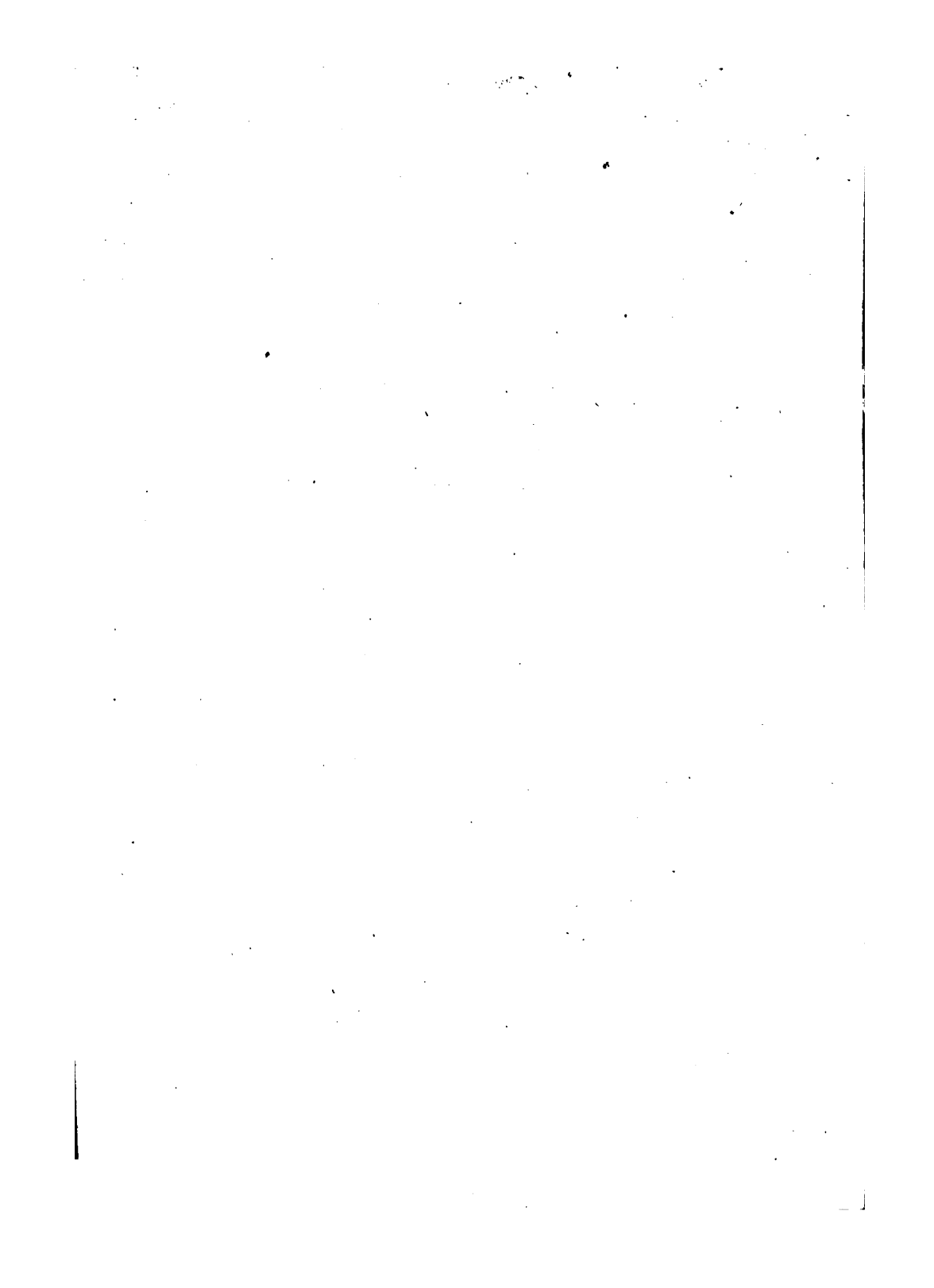
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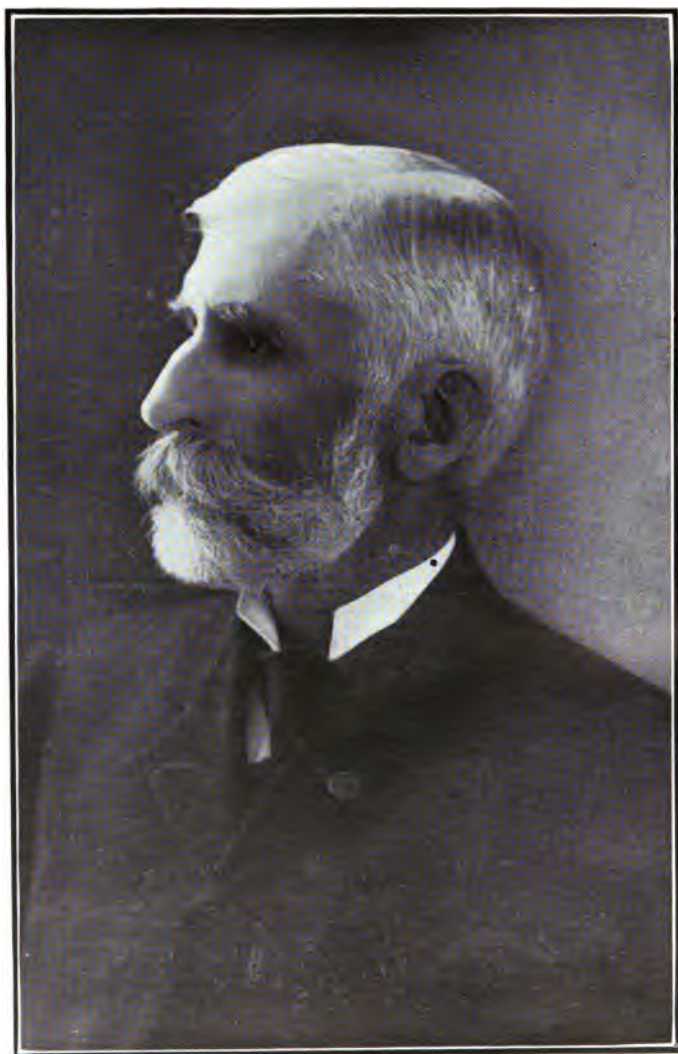
The surplus annual balance "shall be expended for books for the library."

— *Letter of Waldo Higginson,*
Jan. 10, 1893.

Received 23 Feb 1909







H. B. GURLER

The Farm Dairy

By

H. B. GURLER

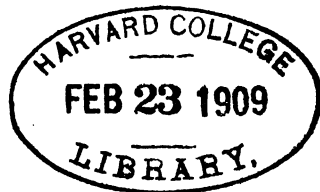
DeKalb, Ill.

President National Dairy Show Association

The Breeder's Gazette

Chicago, 1908

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PREFACE.

The author dedicates this little book to the boys, hoping that it will help them to see the opportunities in the field of agriculture, and especially in dairying, the most profitable branch of agriculture when its possibilities are developed.

The young man who fits himself by education and training to master the details of farm work is sure to succeed. I fully believe there is no field open to the young man that offers as great opportunities for the development of character, and for the acquisition of good health and a competency as does agriculture.

We have just commenced to open our eyes to the opportunities. Keep in touch with the agricultural colleges and experiment stations where experts are working out problems in their special lines, and remember that the educated-practical farmer is in the future to be looked up to by all classes. He is to be the only lord in this country.

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CHAPTER I.

THE DAIRYMAN.

The successful dairyman must be a gentleman (gentle man). If he is rough and brutal with his cows he cannot secure the best results from them, as they will not do their best for the man who is unkind to them. In case a man cannot control his temper when milking, cannot resist the temptation to pound the cows with the milking stool, he should have a milking stool made so long and heavy that it cannot be used as a club. When I lived on my farm I used a stool with a low part for the pail to rest upon and another part of sufficient height for the seat. This kept the pail off the floor and clean on the bottom, and is easier and better than holding the pail between the knees or allowing it to sit on the floor.

It would, I am sure, be appreciated by the cows if we should secure women milkers, as they are always kind to the cows. I never saw a woman abuse a cow, but I have seen men abuse them shamefully.

Ill Effect of Abuse.—I suppose abuse affects the cow the same as it does the human being.

There are very few of us who turn the other cheek when one is smitten. It seems to be a natural law or instinct to pay back, to get even; and the cow does it right then and there at that milking. No animal can more forcibly demonstrate to its owner the poor policy of abuse than can the dairy cow. It pays to be familiar with every cow in the herd and every calf that is being raised to become a cow. When I go to my farm and into the pasture or yard the cows immediately gather about me and seem to wish to be petted; and when I go into the calf pasture the calves gather about me and I have to be on my guard to prevent being butted by them. This proves to me that they have been kindly treated by those who care for them. It is a sure indication that they have been treated as they should be treated.

Dairying Everyday Work.—The dairyman must be a persistent worker. A spasmodical worker will not make a successful dairyman, as dairying is every day work and twice a day, and the work must be done at a uniform time in the day to secure the best results. The cow knows when milking time comes and she does her best at that time. She also knows just as well when she should have feed and water and any neglect along these lines may easily turn the balance sheet against the owner at the end of the year.

Study Is Necessary.—The observing dairyman will notice any shortage of milk at milking time and if he is built to succeed he will immediately commence an investigation to learn the cause of the shortage. The businesslike dairyman will not guess at the cause or fail to try to remove it. If he is an intelligent man he will study at all times the conditions he has to meet. He will wish to know the most economical ration to feed his cows. He will be figuring out the feeding value of his home-grown foods to know whether it is economy to feed what he has grown or sell a part of it and buy some food that when added to his home-grown will give him a better balanced ration, such as will help him to produce milk at the lowest cost. He will study to learn whether to have his cows freshen in the spring or in the fall to make him the best profit. He will try to inform himself as to the most profitable breed for his purpose. He will consider his location and markets and will wish to visit his brother dairyman to exchange ideas and experiences. He knows that life is too short to learn very much from one's own experience. He will subscribe for several of the best dairy and stock papers, knowing that he can learn many times the cost of subscription every year from them. This kind of a dairyman will learn to respect his business and himself and will feel there is an opening for him all along the whole line of agriculture.

Increasing Fertility.—He will not only be studying how to feed his cows, calves and pigs, but he will be studying how to feed his land. He will cease to be a soil robber, as he will realize that the farmer who reduces the fertility of his land is a robber without reason, as he is robbing himself. He will, if he has not already done so, get himself out of the rut which was made by the pioneers and has been worn deeper every succeeding generation. No one will hear him saying that his farm does not need fertilizing. He will learn that by continuous cropping and selling corn in the cornbelt of Illinois the yield is decreasing annually one bushel per acre. He will know when nothing but butter-fat or butter is removed from the farm there is practically no fertility removed and that his farm with a sensible system of rotations and growing legumes will increase in fertility from year to year. He will make a persistent and continued effort to grow alfalfa, having learned that it is the most profitable forage crop we have when we take into account its feeding value for stock and its marvelous work as a soil renewer.

Improved Milk Supply.—The dairyman of the future is sure to find that the consumers of milk will require a constant improvement in the milk supply from a sanitary standpoint. The

public is awake to the fact that it has not been securing milk as clean as other foods and it will demand that it gets it, and the dairyman who is ready to meet this demand will reap his reward. When before did the president of the United States interest himself in the milk supply of his city, as President Roosevelt has recently done? This is right and proper. Milk and its products are sure to advance in price to a point where dairying will pay better than any other line of farming. This must be so or the farmers will not confine themselves to this business.

Observant Farmers.—The farmers who will read this little book have been watching the development of our agricultural colleges and of the work they are doing to interest the boys in farming, by showing them the opportunities to use trained minds and hands in agricultural work, showing them that there are plenty of opportunities to discipline the mind in studying agricultural problems and as many opportunities to make a profit in farming as in other pursuits.

Keep Only Paying Cows.—A dairyman will not spend his time with cows which do not make a profit. He will know the capacity of each cow and keep none which is not profitable. He will realize there is a wonderful opportunity to improve and increase the profits in this way. When

we keep a cow per acre (which is a possibility) and she makes 400 lbs. of butter worth \$100, and \$20 worth of skim-milk at a feed cost of \$50 and a labor cost of \$20, we have a net income of \$50 which is five per cent interest on \$1,000. It requires a great effort to reach this mark but when one is year by year approaching this standard, he is successful and happy, and should be making every one about him happy.

Future Profits Certain.—The dairyman will see that there are greater opportunities for his boy on the farm than elsewhere and will educate the son to fill the opening that is here already for him. Many are not appreciating the chances for farmers' boys on the farm. Many city boys are seeing these opportunities before the farmers' boys or the farmers themselves see them.

The dairyman will learn that the cow produces human food at less cost than any other of the domestic animals and she will be doing business when our lands reach a price that will force the owners to quit producing beef, mutton and pork.

CHAPTER II.

THE DAIRY FARM.

For fifty years we have heard talk of the dairy belt of the United States. This supposed belt has been increasing from year to year until dairying is successfully conducted in a greater part of this country. It has at least been demonstrated that dairying can be profitably conducted in most states of the Union and in most states where it does not flourish it is for the reason that the farmers can get a good living without being confined to dairying. This does not prove that dairying intelligently conducted would not be more profitable than any other line of stock farming. In parts of Europe the cow is holding possession of the land when the price has reached such a point that the steer, the sheep and the pig have been driven from the farm. The cow is the cheapest producer of human food of our domestic animals. The other animals following in this order: the pig, the sheep and then the steer. We do not expect to see the steer crowded off the earth, but we do expect to see the dairy cow more fully recog-

nized as the years pass. The rapid advance in price of lands all over the United States; the unprecedented number of immigrants; the awakening of the public to the value of milk as a human food are among the causes that are at work to bring more farmers to think about dairying.

Dairying Most Profitable.—The dairy farm may be located in the Northeast, it may be located in the cotton section, it may be on the Pacific Coast, it may be in the British possessions or it may be in the cornbelt, but wherever it is when properly managed it is paying better than any other line of farming for a term of years. The dairy farmer is not a soil robber as is the farmer who sells his soil fertility by the load in his corn, oats, wheat, hay and other bulky products. The majority of farmers are the most senseless lot of robbers on the face of the earth; they are robbing themselves of their soil fertility which is of as much importance as their bank account. They realize that they cannot continue checking out of their bank without making deposits, but they act as though they expected to continue checking against their soil fertility for all time without returning a fair equivalent.

Losing Fertility.—Some Illinois lands have grown corn for forty or fifty years in succession and some lands in the cotton belt have



NORTHERN ILLINOIS DAIRY FARM EQUIPMENT—PHOTO FROM J. C. BAUER

grown cotton for seventy consecutive years and have never been fertilized. If the cotton grower would return the cotton seed or its value in some fertilizer, he would not be a bad soil robber, as the lint cotton would take but little from the soil fertility. Statistics show that the wonderful corn lands in the cornbelt of Illinois are showing a decreased yield from year to year of one bushel per acre.

Restoring Fertility With Manure and Alfalfa.—The dairy farmer who sells only butter or cream is taking next to nothing from his farm in the way of fertility, if he saves the manure and applies it to his land and practices a sensible system of rotation, growing such leguminous crops as will grow successfully on his farm. Alfalfa leads the list in the legumes where it will thrive and it will succeed in many sections where it is feared that it will not. Every farmer should make an effort to grow it; he should make many efforts, if it is necessary to succeed. It is doubtless our greatest forage plant on soils that are adapted to its growth. It is our greatest soil renewer. We can grow greater crops after it than after any other forage plant. We have abundant proof of this statement.

The author has clearly demonstrated the fact that a wornout grain farm can be brought up to a state of fertility and of profit by dairy-

ing, having bought forty years ago a prairie farm in Illinois that had been robbed for years by growing wheat until it would not produce a profitable crop of anything. The dairy cow has brought the productive capacity of this farm from a yield of corn of 30 to 35 bushels per acre to where we now secure from 60 to 100 bushels. When we compare the profits then and now the difference is greater than the comparison of yields, as there was no profit when we produced 30 bushels of corn. I discovered that I might as well go to work for my neighbor by the month as to farm on lands that would not produce more than 30 bushels per acre. I was forced to do some thinking and I discovered that the most prosperous sections of the United States were the dairy sections. This fact decided me to take up dairying and now after forty years I am sure I made a wise decision, that I could not have made a better one. If I could have had alfalfa to aid in the building up of the farm I could have accomplished the work in one-third of the time.

Water and Drainage.—It is nice to have a supply of spring water on a dairy farm, but it is not necessary, as water can be secured from bored wells at a reasonable depth in most localities and with windmill or the gasoline engine we can have water whenever we want it. Stagnant pools or muddy streams are objection-



WISCONSIN DAIRY FARM EQUIPMENT—PHOTO FROM J. W. MARTIN

able as a supply of water for a dairy. The cows should be fenced away from such water.

The farm should have good drainage, either natural or artificial. A flat or wet farm may be tiled, taking the water line down in the soil so as to make an excellent dairy farm, and the low tiled lands are very productive and are the lands that are selling for the top prices. I also think it best to have shade which the cows can utilize when they wish.

The Breed Should Fit the Farm.—I think the character of the farm should be taken into account when selecting the breed of cows to place upon it. To illustrate, I would not put a large breed of cows on a hilly farm where much traveling about is necessary to enable the animals to secure the necessary food, but would select for such a farm one of the smaller and more active breeds.

CHAPTER III.

THE DAIRY HERD.

According to the census of 1900 the total number of cows in the United States, kept for milk production, was 18,112,707, and the total number of gallons of milk produced was 7,728,583,350. This reduced to pounds makes the average per cow of 3,672 lbs. of milk per year. To get at the work these cows are doing as butter producers, we will suppose this milk to average four per cent fat (which is doubtless a little high), and we have each cow producing 146 lbs. of butter-fat, to which we will add fifteen per cent to estimate the butter, and we get 168 lbs. of butter as the average annual production per cow in the United States.

Comparing these figures with the census report of 1890, we find an improvement, as at that time the cows were estimated as producing 130 lbs. of butter per annum. It is encouraging to feel that we are progressing in our business, yet where can we get any satisfaction out of the present condition, when we are thirty-two



TYPICAL HOLSTEIN-FRIESIAN BULL

pounds of butter per cow short of what is necessary to make the business as a whole profitable? There is no doubt that the average cost of keeping and caring for the cows of the country will require an average production of 200 lbs. of butter to pay for feed, labor and interest on the investment.

Cost of Keeping a Cow.—I believe that the average annual cost of feeding a cow in the United States for a term of years is not less than \$35, and where the milk is taken to a creamery the patron will not receive an average above twenty-two cents per pound for the butter, and when the cow produces 168 lbs. we have \$36.96 to her credit, or \$1.96 above cost of feeding her, which with the skim-milk is our pay for labor, interest, taxes and insurance. It is apparent that there is something wrong with the dairymen when they are content to be doing this quality of work.

If it costs on an average for a term of years \$35 per annum to feed a cow and to this we add \$12.50 for labor and \$2.50 for interest, we have \$50 charged up against each cow annually. Now what shall we put on the other side of the account? We will allow \$10 per cow for the feeding value of the skim-milk, which would be 28½ cents per 100 lbs. for the skim-milk of the average cow, and we still have \$40 against the cow, which must be met by the butter pro-

duced. We have ascertained that this averages 168 lbs., and it must sell for twenty-four cents per pound to bring the cow and her owner out even. Few of us can secure this average price for our butter.

Some may think that I have charged the cow too much for labor, but I think not. If the dairyman has boys, girls or a wife who milks it is his good fortune, but that is no reason why the labor account should not be charged against the cow. Other dairymen would be glad to pay for such work if you do not have to pay for yours.

Profitable Butter Production.—A cow that makes less than 200 lbs. of butter per year should not be kept in the herd, and the 200-lb. cow should only be retained such a time as is necessary to secure a better one. No one will become rich milking 200-lb. cows. Where is the business sense in keeping such cows in the herd?

We would not keep a horse year after year that could only do sufficient work to pay for its keeping, neither would we keep permanently a hired man who was not profitable, yet at the same time many farmers keep cows that get in debt to them every year.

Way of Valuing a Cow.—The following statement shows the comparative value of cows that produce 200 lbs. of butter per year and those making 250 lbs., 300 lbs., 350 lbs., and 400



TYPICAL HOLSTEIN-FRIESIAN COW

lbs. The cow that will make only 200 lbs. annually is worth what she will sell for in the market, which is about \$30.

The 250-lb. cow gives us 50 lbs. for profit, which we will say is worth 20 cents per lb. or \$10, which will pay 10% interest on \$100. Therefore if the 200-lb. cow is worth \$30, the 250-lb. cow is worth \$130. In other words you can as well afford to pay \$130 for a cow that will make 250 lbs. of butter yearly as to pay \$30 for a cow that will only produce butter-fat to make 200 lbs. of butter. No one would think of paying \$130 for the 250-lb. cow, but she is just as good an investment as the 200-lb. cow is when both are to be kept for a term of years on the farm. If any improvement is made on the 200-lb. cow by raising her calves, the credit must be given the dairy sire to which she is bred. By the use of a proper sire the heifer calves from the 250-lb. cow may also be improved over their dam.

On the above basis the 300-lb. cow would give 100 lbs. of butter for profit which would be worth \$20, or 10% interest on \$200. Therefore the 300-lb. cow is as good an investment at \$230 as the 200-lb. cow is at \$30. And when we have a 350-lb. cow, as we frequently do, we have another \$10 of profit which means that the cow is worth another \$100, and the 400-lb. cow gives us still another \$10 of profit to figure as

interest on another \$100, which makes her worth \$430, and each additional fifty pounds of butter that a cow will produce annually makes her worth another \$100, as an investment.

This rule would not hold good if a dairyman buys his cows for one milking period and then sells them for beef; but I believe it is fair and true when a dairyman selects a bull from some dairy herd and raises the heifer calves from his cows to keep up his dairy.

Investment Good in Big Producing Cows.—I believe it is unfair to the cow to require her to pay 10% interest, as she will, if bred intelligently, reproduce herself in her heifer calf so as to perpetuate the family. In fact, she will as a rule leave you more than one offspring that will be her equal as a butter producer, which makes you practically safe in calculating on keeping your investment good that you have in the 300-lb., 350-lb. and 400-lb. cows.

Dairies Running Owners in Debt.—What I have said in regard to individual cows will apply with equal force to dairies, as there are thousands of dairies in the United States which are, when considered on a business basis, putting their owners in debt every year. I cannot understand why dairymen will persist in working with unprofitable cows when it is entirely practical for them to have dairies that



TYPICAL JERSEY BULL

will make them \$30 or \$40 per cow annually after paying for all their feed at market price and \$12 to \$15 for the labor of caring for them.

Improving the Herd.—I do not advise all dairymen to secure registered herds of any breed. This is all right when one can see his way clear to do so. What every dairyman can do to improve his herd is to test his individual cows and dispose of those that do not come up to a profitable standard. This standard will vary in different localities, depending upon the cost of feed, labor and the value of the products.

I shall not undertake to tell you what breed to select for dairy purposes, but I would advise selecting some one of the dairy breeds. Study the subject thoroughly and then select the breed that you think is best suited to your wants.

In case you have no cows and are intending to buy, get the privilege of testing them before buying. See them milked, weigh the milk, take a sample and test it or have it tested, and you can figure out what the cow is doing in the line of producing butter-fat, to which you may add fifteen per cent to learn how much butter she will produce. This work will require a little time, but will pay in the end. If you have a dairy, test every cow to know what she is doing. Do not go guessing along with this work.

Raise all the heifer calves from the cows that test well enough to be retained in the herd and

have been bred to the right bull. These heifers will do more profitable work for you their first season when only two years old than will the average cows that you will be able to buy. This is my experience. I have a demonstration of the truth every year and I now have seventy-five such heifers on my farm, some of which will drop their calves soon and some of them are not yet weaned. It is becoming more difficult every year to buy good cows. When we grow our heifer calves for a few generations, we have a longer line of heredity to aid us in selecting the calves which we will raise and will learn to look back along the line to the butter and milk record of their ancestors.

Study the Cows.—We should know the good and bad qualities of our individual cows just as well as we know those of the men we employ. It is of just as much importance and is much easier to control, as we can do as we please with our cows, but I find there are times when I cannot do as I would like to do with some of the men in my employ. We do not keep a man permanently when we know where we can secure a better one, and yet we go sliding along with a large percentage of our herds unprofitable. Why do we do this? Why can we not appreciate our business and apply business sense to our work? Why not get ourselves up to the business standards of our merchants and manufac-



TYPICAL JERSEY COW

turers? They are studying all the time how to lessen the cost of doing business and they are succeeding. There is as much room to apply intelligent thought to dairying as to any business in our country. In one sense we are doing a higher grade of work than any mechanical manufacturer, for we are dealing with machines that have life like ourselves—machines that appreciate kind treatment and respond to it always with an increased profit to the owner. I wish I could make the dairyman see the subject as I see it—see the opportunities that might and should be improved.

Begin Study at Home.—We need to commence at home to study the cause of such a condition. Do not go to the farther end of the line and kick everyone except yourself because you are not making a profit in your business of dairying, but commence with yourself. The probabilities are that you are the weakest link in the chain. Comparatively few of us have the moral courage to admit that we are in the wrong when we know it to be true. It is necessary that we should reach this condition before we shall develop as we should. There are in most communities dairy herds that produce per cow from 300 to 400 lbs. of butter annually. These herds should be object lessons, as what one dairyman has done another can do. We should not take figures of another when

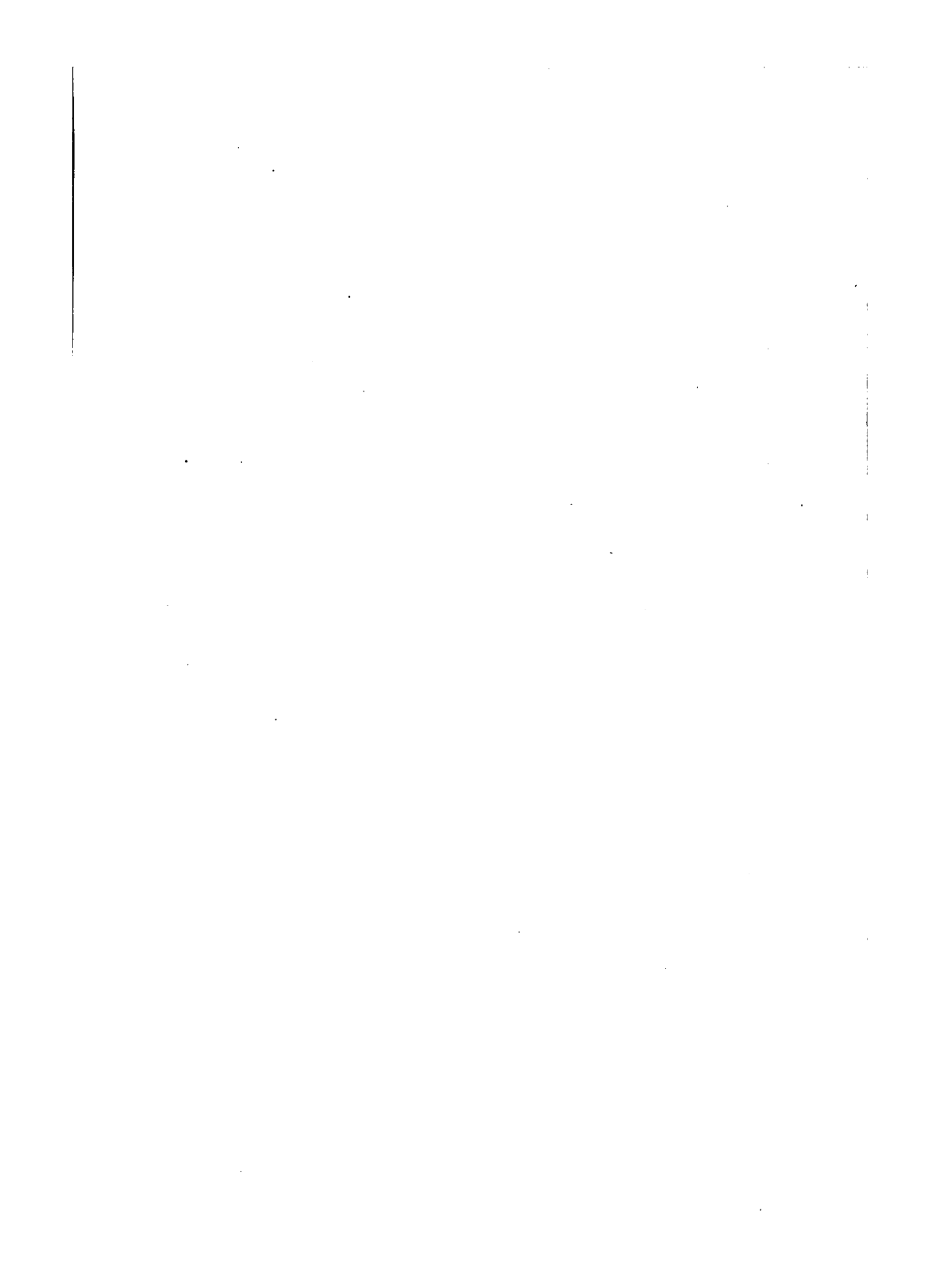
estimating the cost of feeding our cows, but should learn from our own work what it costs. This is not a difficult matter; the most difficult part is to bring ourselves to realize that it will pay us to do it.

Trying to Do too Much.—The most of us are trying to do too much, just a little more than is profitable, more than we can do as it should be done. I do not know when we acquire this habit, but we have it and knowing the fact we should try to break ourselves of it, as it is as unprofitable as to grow weeds in our cornfields. It is worse, as the weeds in the cornfields may not damage more than one year while the faults in the management of our farms will remain for all time if we do not eradicate them. Success depends upon their being eradicated and it is as necessary as to remove the weeds from our cornfields, if we are to produce 100 bushels of corn to the acre. That yield of corn to the acre is to be much more common in the future than it has been in the past. The breeders of corn are sure to put the breeders of cows to shame in the near future if they do not get wide-awake soon.

Test the Cows.—Many dairymen have so much to look after that they do not (or think they do not) have time to look after the testing of their cows. In such cases get the boys, the girls or the wife to look after it, and I will guarantee that after it is followed a year you



TYPICAL GUERNSEY BULL.



will become interested in it, as you will see that it pays better than any other work that has been done on the farm. The whole family will become interested in it and it will help them to see the business side of farm work. This work will cause you to think better of your business and will cause the boys to think better of the farm and some of them will begin to see the matter as an attorney did who visited my farm in the summer of 1901. This gentleman had a son whom he had educated for the bar, but the young man did not like that profession and was determined to go on a farm which his father owned. He took a course in an agricultural college to fit him for farming. His father came to my farm to obtain ideas on barn building and the last remark he made as he drove out of my yard was that there were greater opportunities on the farm than in any other profession. Think of this, boys, and remember that it was a professional man who was talking.

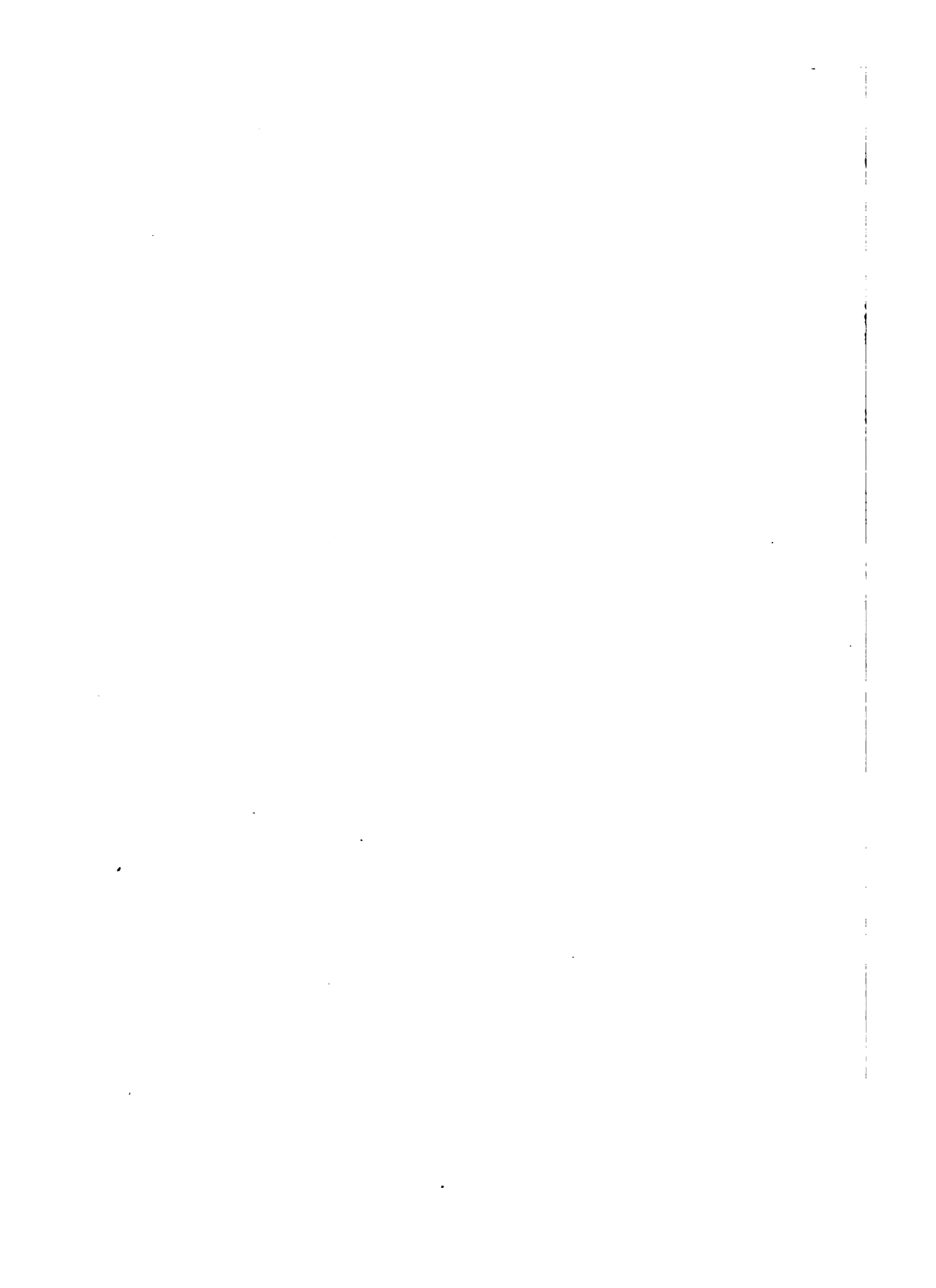
Importance of a Good Bull.—The old saying that the bull is half the herd does not express half the truth when he is selected and handled intelligently. The heifer calves are most likely to be like their sires and the bull calves like their dams. The record of a cow's grandam on the sire's side has the same interest to me as her own dam's record. This is especially true when we have a herd of grade cows. Do not

allow a few dollars to get in the way of your securing a bull that has the individuality you want and also has the right heredity. Do not put the bull in service before he is one and a half years old and let the service be light until he is well matured, as it is necessary to maintain his sexual vigor. This is more necessary when breeding for a dairy herd than when breeding for beef.

Use a Masculine Bull.—The bull must have plenty of exercise if he is to continue in condition to do his best work and he must be properly fed. Do not feed him carbonaceous food, but feed protein foods such as oats, wheat bran, the gluten foods, alfalfa, clover and pasture grass. It is established now beyond dispute that an animal can be fed to produce strong bone and good muscle and that is what we wish to do with the bull. We want him to be vigorous, not pretty. Let him have masculine beauty. A feminine bull should be driven out of the herd by the cows if the owner has not sense enough to take him out. A strong vigorous masculine bull will get a larger percentage of heifer calves than will a feminine bull and they are more likely to inherit the dairy qualities of the bull's dam. This may be called theory, but it is based upon thirty years of study and experience. When we have learned the ability of each cow in the herd and have intelligently



TYPICAL GUERNSEY COW



selected a bull, we are in position to raise some heifer calves that will do us good.

Raising the Heifer.—I practice breeding my heifers so as to have them drop the first calf at two years of age. I am confident that they make better cows to come in milk at two years of age than at a later period. They should be handled from the time they are calves so they will have no fear of the person who handles them. There is need of great care at this period and much patience is also needed to overcome their fear and teach them that they are not to be harmed and to cause them to be quiet while being milked. Care must be exercised during the first milking period to establish and fix the habit of milking as long as it is desirable to have them milked. If they are allowed to go dry too early in their first period of milking, they are more likely to do the same the succeeding year, and the habit is soon established. They should be milked to within two months of the time of dropping the second calf. This is the kind of work that has made it possible to secure the large yields of butter that we now so frequently obtain.

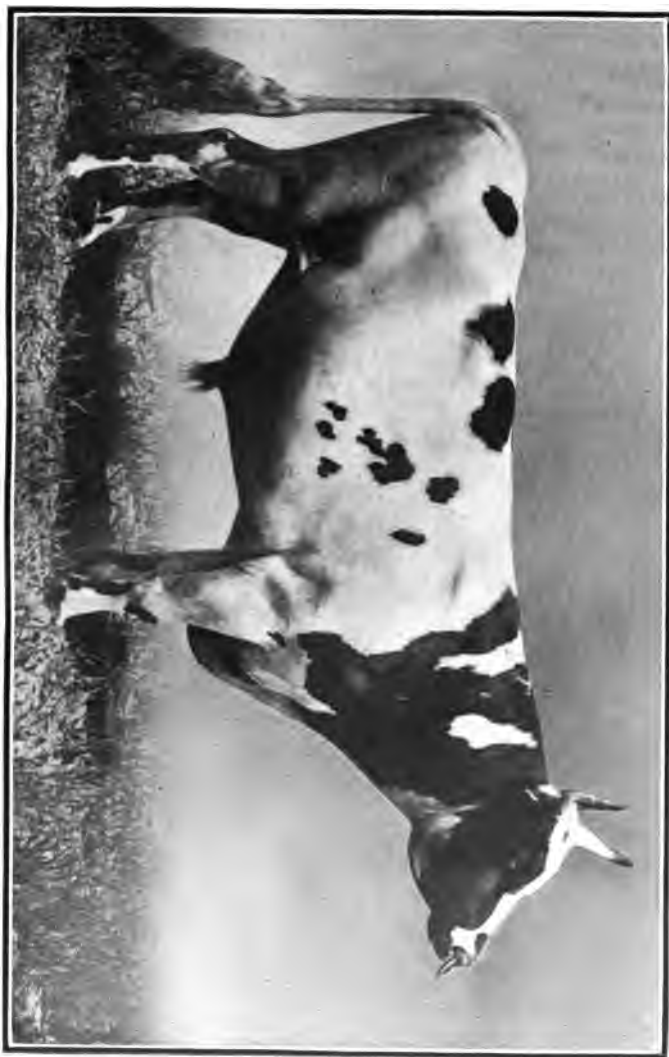
Drying Off the Cows.—Do not force a cow dry. If she persists in milking the whole time let her have her way about it, as there is danger of doing damage to the udder of a persistent milking cow in drying her off. I have had many damaged udders from this cause.

The best way to dispose of cows that are below standard is to feed heavy and to milk at the same time. After three or four months most cows will improve in condition and may be fattened while being milked and sold for beef soon after becoming dry. Fattening dry cows is unprofitable work and I have never been able to do it without a loss. I advise to fatten while milking always and sell as soon as possible after the cow is dry, as a dry cow cannot be fed at a profit.

Best Season for Fresh Cows.—There are reasons why it is best to have cows fresh in the fall. The first of these reasons is that more milk will be produced during the year or the milking period. When cows are fresh in the fall they produce the greatest flow of milk when it is worth the most. This is one point in favor of winter dairying. Another reason is that it helps to equalize the work of the farm, giving more work in the winter and less in the summer when the farm work is crowding. I have often found it a great relief not to have the cows to milk in time of harvesting and threshing.

Some dairymen will get home from town earlier when there is milking to do and it may be best that they do. If the pleasures of home will not bring them it is well for them to have business that will.

The third point in favor of winter dairying is



TYPICAL AYSHIRE BULL

that a fall calf is superior to a spring calf. It can be kept growing through the winter, and when the grass comes in the spring it can be weaned, if there is not milk to feed it longer. There usually is unless the skim-milk is wanted for young pigs. The winter calf will as a rule get better care than a spring calf; it will not have the flies to contend with until it is several months old and strong enough to withstand the annoyance better than the youngster can. As a rule the fall calf will be the larger and worth more money when it is a year old than a spring calf.

With a warm, light, well ventilated stable and plenty of the right food, the cow will keep up a good flow of milk until she is put to pasture and then she will increase in her flow of milk to nearly the amount she gave when fresh. There is an old saying that a cow fresh in the fall is fresh twice in the season, and it is so nearly true that I am reminded of it every year. Under these conditions the cow will milk as near to the time of parturition as she ought and in many cases the persistent milkers cannot be dried off without great care to prevent their udders being damaged so much that when they calve we find one quarter or more that will not furnish milk.

Withdrawing Grain on Grass.—As soon as the cows get full pasture I cease to give them

any ground feed for about six weeks. The object is to renovate them, to get the grain food all out of their system. This method does not add to the profit of that season, but it prolongs the usefulness of the cow and brings a larger profit for a term of years than the plan of feeding grain the whole milking period.

Dehorning Calves.—I practice dehorning my calves when they are quite young by blistering the little buttons before they adhere to the skull. This is very simple and not painful. First clip the hair about the horns and wet the little loose button and apply caustic potash in stick form by rubbing it on the damp horn. Remember this must be done before the horn or button adheres to the skull.



TYPICAL AYRSHIRE COW

CHAPTER IV.

ABORTION.

This is an old trouble that dairymen have had to contend with. Nearly forty years ago the New York Legislature appropriated \$10,000 to be spent in trying to discover the cause of this trouble. A commission was appointed and after the members had completed their investigation they said they did not know as much about the cause of abortion as they thought they did when they commenced the investigation. We were many years in the dark as to the cause of abortion, and I remember well my surprise when informed that there was a contagious form of the disease.

Contagious Abortion.—I have had some experience with contagious abortion and it was very expensive indeed. The first season that it appeared in my dairy I had sixty cows and thirty-five of them aborted. This was many years ago and as I did not know there was such a disease I did not know what to do, and could not find any one who did know, and consequently I did nothing. This trouble followed

my herd three seasons and caused me to dispose of nearly all my cows that had aborted, as they failed to breed, became fat and dried up on their milk.

Combating an Outbreak.—Several years later it broke out again when I had learned something about the disease, and I isolated every cow as soon as possible after she had aborted and treated her to vaginal injection of bichloride of mercury, one part to four thousand of water, using one gallon as a treatment three times per week, using the same lotion to wash the vulva, tail and any parts necessary. A 2% solution of carbolic acid may be used for this purpose. A fountain syringe may be improvised for this work, using a common tin pail and a nipple to which a piece of hose can be attached and the pail suspended at a height sufficient to cause the liquid to flow freely. The foetus and afterbirth must be buried or cremated as soon as possible to prevent the spread of the contagion.

In cases of contagious abortion there are usually the signs of normal parturition, enlargement of the udder and vulva, but in some cases we do not discover these symptoms.

Now we do not wait to investigate as to whether we have the contagious or some other form when a cow aborts, but isolate her immediately and commence to treat her, keeping her



TYPICAL BROWN SWISS BULL

isolated for three weeks or longer if it is necessary, certainly until she is thoroughly cleansed of the disease. I have for many years prevented any serious loss in this way.

This trouble must be grappled with vigor or it will spread through the dairy. Do not try to make yourself believe it is not the contagious form but treat it as though you knew it was, as this is the only safe method.

Abortion from Ergot.—Ergot will cause abortion. I once had several cases caused by ergot of rye that was cut with clover hay from a field that had rye the previous year and the clover had some of the volunteer crop of rye, which I found on examination to be quite badly ergotized. I have had it caused by ergotized pasture grass on land that had been overflowed during the summer.

Prevention and Treatment.—The following is copied from The Monthly Bulletin, Vol. III, No. 12, of the Missouri State Board of Agriculture:

“Take every precaution to prevent the introduction of the disease into the herd. It is prudent not to introduce a recently purchased pregnant female into the herd until her calf is dropped normally, unless you know that the herd from which the purchase is made is free from the disease. Separate quarters should be provided for these animals. Non-pregnant cows purchased at public sales, unless they are heifers that have never been bred, are probably a greater

source of danger. It is not of infrequent occurrence that a cow that proved to be a non-breeder passes through a sale. Such an animal may in fact be an aborter without the least intent on the part of the seller to deceive. The non-breeder is of course returnable to the original owner, by the rules of the sale; but the return may occur only after the cow has been repeatedly served by your best herd bull, and the infection transferred to a number of other cows. Look with suspicion on the non-breeder. Care should also be exercised in the purchase of bulls that have been in service. Before permitting service in your herd, a thorough irrigation of the sheath with a mild antiseptic solution is recommended.

“If an abortion occurs, the foetus and afterbirth should be carried away and burned or buried. The aborting animal should be removed from the herd. If occurring in the barn, the bedding should be removed and burned. The floor, walls and stall partitions should be thoroughly disinfected with a five per cent solution of carbolic acid or creolin. This may be followed by a coat of whitewash.

“The uterus of the animal that has aborted should be washed out with two gallons or more of a non-irritant antiseptic solution. Nocard recommends a two per cent creolin solution. A somewhat weaker solution made by adding two ounces of creolin to each gallon of water will answer the purpose. The solution should be lukewarm when injected. It may be siphoned into the uterus by means of a rubber tube three feet or more in length. The tube should be passed through the mouth of the womb, not



TYPICAL BROWN SWISS COW

merely into the vagina. Repeat the washing in a day or two and thereafter once or twice a week until the discharges disappear. Before irrigating the womb, wash the tail, vulva and soiled parts of the legs with a solution of twice the strength given above.

"The discharge of the portions of retained after-birth is said to be hastened by the introduction into the womb of a few handfuls of brown sugar. This probably forms a syrupy coating which is helpful in allaying irritation. In the use of sugar for this purpose it is my practice to mix with it about one-eighth the quantity of powdered boracic acid. This makes a mildly antiseptic mixture which is retained for some time. Give time for the expulsion of the antiseptic solution that was injected before introducing the sugar and boracic acid powder. The floor and bedding where the animal is kept should be properly disinfected daily.

"In addition to the treatment given above, the affected animal should receive hypodermic injections of a two per cent solution of carbolic acid in doses of 25 to 50 cubic centimeters as often as every two weeks. In 1888 Brauer reported in a German publication excellent results from this treatment, and I am glad to say that in the hands of some of our Missouri breeders it has given satisfaction. The ordinary syringe used in vaccinating against blackleg will answer the purpose, although a syringe holding 25 cubic centimeters would be more convenient. The blackleg syringe holds only five cubic centimeters and requires to be filled several times. The needle may be left in the skin until the proper amount is

injected, the syringe being refilled apart from the needle. Brauer recommends that the injections be made under the skin on the flank, ten cubic centimeters on each side. It is my practice to inject in front of the shoulder, just as is done in blackleg vaccination, injecting half the quantity on each side. The larger dose mentioned does not appear to produce any bad effects. In some cases a hardened nodule may form at the point of inoculation and remain for a few weeks, but no disturbance to the general health of the animal is observed.

"The animal should not be bred short of ninety days and not then if any discharge is present.

"It is well to continue the hypodermic injections until assured that the animal is pregnant. They may then be omitted until about eight weeks before the period at which the last abortion occurred. The hypodermic injections should then be given every two weeks until near the full term.

"In cows that show well marked symptoms of abortion, as swelling of udder and vulva before the proper time, prompt treatment by the hypodermic method with the larger doses, and the repetition of the injection within a week cause a disappearance of the symptoms. The udder and vulva return to their normal condition and the use of smaller doses from time to time will enable the female to carry the young to a safe delivery at full term.

"I am permitted to quote a few interesting lines from the letter of a Missouri breeder. He says: 'I have had the best of success with the carbolic acid treatment when used hypodermically. My results



TYPICAL DUAL-PURPOSE SHORT-HORN COW

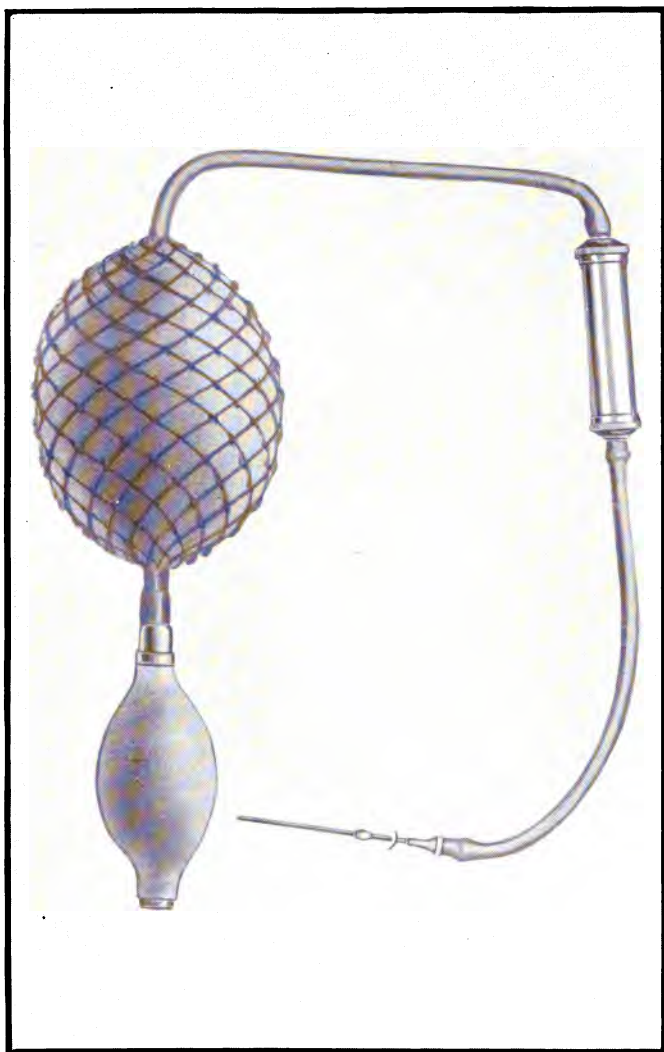
were not flattering when I followed the old method of feeding it. I have not had a cow to lose a calf this year. I have had some to show signs, but have stopped it with the hypodermic injections. I will mention one case. This was a cow that had previously aborted, and when she was six months gone her bag swelled up and teats strutted out as if she would calve in a short time. I gave her a hypodermic injection of 50 cubic centimeters of the two per cent carbolic solution and repeated the dose in a week. Her bag reduced to a proper size and she dropped a healthy calf at the regular time.' "

CHAPTER V.

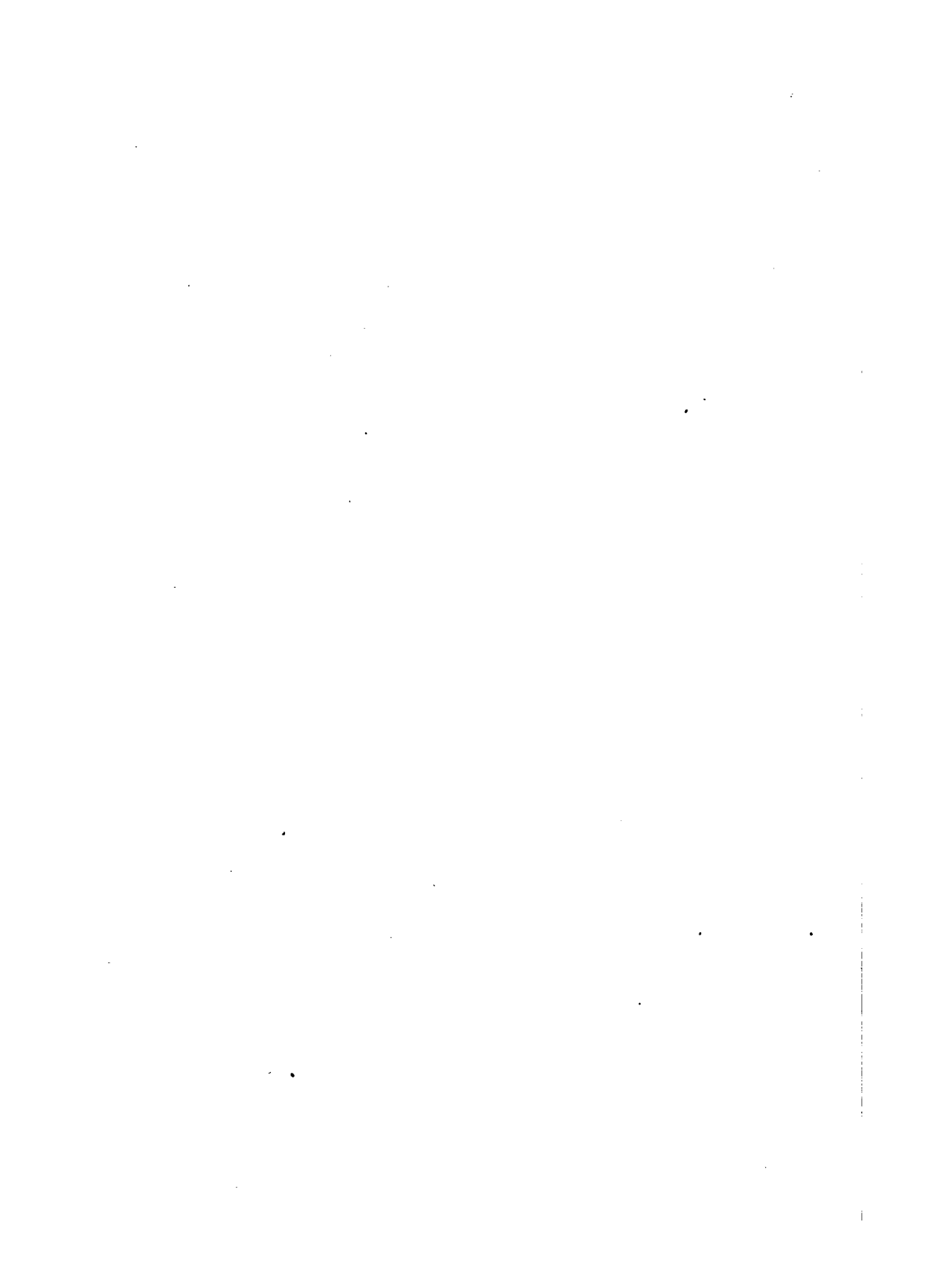
MILK FEVER.

This disease usually sets in 24 to 48 hours after the birth of the calf. In some cases as long a period as three days passes before the disease develops. The most common symptoms first noticed are a weakness in the legs, especially the hind legs. The cow staggers when it walks and soon falls and fails to rise, lying with its head on the side of the breast. Constipation is one of the symptoms of the disease. Many times the cow appears like a person stricken with apoplexy. She stops eating, and ceases to secrete milk.

Little Trouble in Winter Dairying.—Milk fever has been one of the most fatal diseases to which the cow was subject. The dread of it possessed me for thirty years or more, but I had no losses from this cause so long as my dairy was operated as a winter dairy, the cows all freshening in the autumn and passing their dry period on pasture supplemented with green succulent feed when the pastures were short and being fed no grain food during their dry period,



APPARATUS FOR AIR-INJECTION CURE FOR MILK FEVER



which was usually six to eight weeks. But when I embarked in the certified milk business I was compelled to have a uniform quantity of milk which necessitated having cows freshening at all times of the year. Then my experience with milk fever commenced and continued to make me losses until it was discovered that oxygen injected into the udder through the teats was a sure cure. Since then I have had no losses with milk fever.

Air Injection Cure.—Later it was learned that pure air accomplished the same results as did the oxygen and it is much less expensive as well as always “on tap.” All dairymen should have ready for use an apparatus for forcing air into the udder, but in case it is not at hand the bicycle pump may be used, taking care to have it cleansed as thoroughly as possible before using. The accompanying illustration shows the apparatus for injecting air. Remember it must be kept clean and sterile; otherwise the udder may become infected from it.

CHAPTER VI.

TUBERCULOSIS.

The rapid awakening of the public to the danger from using the milk of tuberculous cows, with the senseless and in some cases frenzied antagonism of dairymen to the tuberculin test, causes me to give my experience covering twelve years with the tuberculin test for detecting tuberculosis in cows.

Experience with Tuberculosis.—My experience commenced in 1895 when I embarked in the certified milk business. Mine was the first large dairy in the state to have the tuberculin test applied to it. I had little information to help me to judge how large a percentage of tuberculous cows I should find and it required considerable nerve to undertake the work, knowing that all tuberculous animals would be a total loss to me. I was so fortunate as to find that only three per cent of the 133 cows tested reacted. One of the reacting cows was the cow from which the family was using milk. This cow was in good beef condition, but we found a tuberculous ulcer in one lung as large as a pint cup.

I once bought three cows from a dairy after examining them carefully and when the tuberculin test was applied two of the three reacted and at the postmortem examination were found tuberculous. I do not remember one case where a cow had reacted to the tuberculin test that she was not found diseased at the postmortem. I have never detected any bad effects from the use of the tuberculin test.

Contagion of the Disease.—It is now known that hogs and calves contract tuberculosis by being fed infected skim-milk from creameries. It is also known that hogs contract tuberculosis from the droppings of tuberculous cows. It is easy to see the danger of milk being infected by the dust from the dried droppings of the tuberculous cows getting into the milk at milking time.

Dean H. L. Russell, of the Wisconsin Agricultural College, recently made the following statement:

“The great danger of transmitting tuberculosis from the bovine to the human is through the child. In the case of a baby, an infant that lives upon cow’s milk that is infectious, there is not any question but that tuberculosis is sometimes imparted to the child in that way.”

Tuberculin Reliable.—The tuberculin test I believe to be very reliable when intelligently applied. Care should be taken to have the cows

in a normal condition when the test is commenced. If they have been shipped by rail or driven a distance to a new home, allow sufficient time for them to reach a normal condition before commencing the test. Cows close to the calving have been known to react to the test when they are not diseased. Common sense is useful here as in most lines of work. There have been mistakes made which have thrown discredit on the work.

Danger in Antagonizing Test.—Dairymen who are antagonizing the tuberculin test are making a serious mistake. The consumers of milk are aroused on this subject. They know the danger of using milk from tuberculous cows and will not continue using it. I advise dairymen to cease their antagonism to the tuberculin test and join the procession of people who are awakening to the seriousness of the situation. The longer you antagonize this move the worse you will be hurt in the end.

Self interest is sufficient cause for a dairyman to apply the tuberculin test. If you have infected cows in your herd the disease is almost sure to extend to other animals and may in time infect the whole herd. There have been instances where the whole dairy were found tuberculous. As a strict business matter a dairyman cannot afford to take the chances of neglecting to have his herd tested with tuberculin.

State Should Bear Part of Loss.—New York State now has a law under which the state pays a part of the value of tuberculous cows up to \$75, so the loss does not come entirely on the owner. I believe this is right, as every one is interested in having milk free from contamination by disease germs and should help pay the losses. It is not right that the owner of the cows should stand all the loss. The owner is innocent in 99 cases out of 100. No man who has had experience in this field will undertake to select tuberculous cows from a herd. He can detect those in the advanced stages, but he cannot detect one out of five, scarcely one out of twenty, except by the use of the tuberculin test.

CHAPTER VII.

THE COW STABLE.

Consumers of milk are now beginning to realize that there is often something wrong in the way dairy cows are stabled. The milk too frequently reminds them of this fact, being in such condition that a person with a delicate stomach cannot accept it as a food, for the simple reason that the stomach rebels against it.

A Place Where Food is Prepared.—From thinking of the stable as a place where cows are kept, we must come to think of it as a place where human food is prepared. When we have brought ourselves to this way of thinking, we are prepared to build an up-to-date sanitary cow stable. Let us think a little more about this subject before we commence to construct this modern cow stable.

I once made the statement before a farmer's convention that we consume more filth in our milk than in any other article of food. At the close of the session the dean of an agricultural college said to me that I might safely have said more than in all other articles of food.



**GAS PIPE STALLS, STEEL MANGERS AND CONCRETE FLOOR IN DAIRY BARN KENTUCKY AGRICULTURAL
EXPERIMENT STATION**

What an arraignment this is for us as a class! If we cannot improve on our methods of building cow stables and caring for our cows, we shall find ourselves indicted by the consumers of milk in the near future. All that is needed to bring this indictment is for them to secure a little more evidence; and they are securing it very rapidly, much more rapidly than pleases many of the dairymen. There is no use in longer trying to cover our faults; the only way to do is to eradicate them root and branch. We have covered them too long already. When we have brought ourselves to a realizing sense of the conditions that exist and those that we need to secure, we are ready to begin the construction of this sanitary cow stable.

The Cow Stable as a Dining Room.—I will suggest that a good way to get ourselves to thinking in a new way about this matter would be to have the cook some evening move her work of preparing supper to the cow stable where her father, husband, brother, or perhaps her lover is milking the cows. Do I hear objections to this? If so, why? Is not the cow stable in condition to receive ladies? Are you ashamed to have your mother, wife, sister, or sweetheart call on you there? If so would it not be best to postpone the milking a few minutes and renovate the stable, put it in shape to receive company, in such shape that you can eat the supper

that the cook is preparing there for you? The probabilities are that the food that she is preparing at the stable is no more contaminated than is the milk that you obtain from the cows, if as much. The milk is as much an article of food as anything the cook is preparing for you.

Personal Cleanliness Necessary.—I suggest that you allow the cook the same privileges that you take. If you go from your farm work to milking without washing your hands, allow the cook to go from other housework to preparing the supper without washing her hands. It will shock her to do it, but probably she may be induced to do it once to give you a lesson. If you do your milking with the clothes on that you have been doing other work in, let the cook have the same privilege. What matters it if she waits on the table with the clothes she had on when she scrubbed the floor? That is not as bad as your milking with the clothes you had on when currying the horses or cleaning the hog pen.

You need to have this matter driven home to you, and with some it requires hard blows to do this. Remember that there is no food that the cook is preparing that will be so readily contaminated as is milk from impure unclean surroundings. It is as necessary to cleanse the cow's udder before milking as it is to cleanse vegetables before cooking; yes, more necessary.

The vegetables simply have dirt attached to them which is clean in comparison with the filth that is at times on the cows' udders. Moreover this filth is there for the simple reason that the cow is maintained in such a way that she cannot keep clean.

Location of the Stable.—The sanitary cow stable may be located wherever most convenient, providing it is not so near the house as to be objectionable on account of unpleasant odors. Locate it so that the surface drainage will not run towards the house, for when the ground is frozen the surface water from the cow yard cannot enter the sewers and must flow away on the surface. A stock yard of any kind becomes so packed that it will hold water like a tub and the water must be trapped into the sewer or run off on the surface.

A Two-Story Stable Best.—The cow stable may be the first story of the barn or it may be a one-story building. I prefer to have a story above the cows for hay or straw as it makes a warmer ceiling, and gives opportunity for a longer or higher ventilating flue for taking off the impure air. A great objection to a one-story ceiling is that it becomes cold and condenses moisture, which freezes in cold weather but melts the first mild day and drips onto the cows, later causing the ceiling to mould and become unsanitary.

The stone basement partially underground I have no use for, not even as a place to keep hogs or store manure. A basement story in a framed barn is all right; it gives opportunity for plenty of windows and it is entirely practical to bridge to the second story if one desires to do so, and I believe it is a good plan. Insist upon having windows on all sides of the barn. There is no danger of having too much light.

Provide Ample Foundation.—The foundation of the building must be made to carry the load that is put upon it and much depends whether it is to be one or two stories. If one story and a wooden floor supported by joists and sills, the outside walls need to be somewhat heavier, and piers will be required when a stone or partition wall is not built. Many barns have been nearly ruined by not having sufficient foundation to prevent their settling out of shape.

The writer built a barn in 1876 that was 50x60 feet with 28 feet posts, the first eight feet being for stock. Under this barn were over forty piers, those under the posts being three feet square at the bottom. Into the second story of this barn, when it was twenty-five years old, I put a cement floor and it is carrying it perfectly. This was done to utilize the room formerly given to storing hay but was no longer needed for this purpose with the coming of the silo.

Be sure to provide for ventilation under the

stable floor when it is up from the ground or there will be trouble from dry rot. This matter must not be neglected.

When putting in a foundation for a barn or stable, place a four-inch tile outside and a little below the foundation wall to catch and carry off all the surface water that would otherwise get under the wall. This costs but little and secures a dry foundation that prevents the settling of the walls and gives an outlet for the waste water from the roof through the down spouts.

The Cow Stable Floor.—The stable floor may be made of wood or cement. The latter is preferable and at the price of Portland cement it will cost no more to put in cement than a two-inch wood floor. The writer has cement floors that have been used for eight years and they are not perceptibly worn yet. A cement stable floor should be as well laid as a cement sidewalk. Work that will stand in a sidewalk will stand in a cow stable floor.

Do not smooth the cement surface of the stalls and the platform on which the cow walks, as this makes the floor too slippery for the cows. Leave the surface in the same condition as left by the wooden float, then it is not so smooth as to cause the cows to slip. Make the cement mangers as smooth as possible as they are more easily cleaned.

The cows should not be allowed to lie on the

bare cement floor but should have plenty of bedding to keep them from the cement. In case the dairyman cannot for any reason do this, it will be best for him to put a board or plank floor on top of the cement.

A Stable Without Stalls.—The plan of having the cows run loose in a stable without stalls or ties except stalls in which to put the cows, a few at a time, to be milked, appears to be gaining friends. I know some who are using this method and are very much pleased with it. The cows are fed their roughage in mangers in the open stable and also get their water there. They are fed their ground feed in the milking stalls at milking time.

There are some strong points in favor of this method. The cows are more comfortable than when confined in a stall or stanchion. The manure does not need to be moved until it is drawn to the land and there is no waste, as it is under cover. This method requires that sufficient bedding be used to absorb all the liquid manure, otherwise the cows could not be kept clean, and this is what every dairyman should do to save all the manure. The cows pack the manure in this way so there is practically no loss from fermentation. I am so much pleased with this method that in case I fit up more cow stables I shall adopt it.

Cement Mangers.—When cement mangers are used, the cows may be watered in the barn if it is so desired, as the mangers can easily have all food removed from them and then they become an ideal place to water the cows. The cement mangers should have connection with the sewer so that they can be readily cleansed and can be easily emptied after the cows are watered.

Individual Watering Troughs.—I once came near ordering some individual watering troughs or buckets, but was deterred by the fear of their being impracticable or at least requiring too much labor to keep them properly cleansed. I find that it requires constant care to keep in proper condition the large watering tank from which the cows drink out-of-doors. Standing water in the cow stable will purify the atmosphere, but is it well for the cows to drink it after it has served this purpose? I think not. We ourselves object to drinking water which has stood in an open vessel in the house for a short time. If we remember that eighty-seven per cent of the milk is water we can realize the necessity of the water being pure. There is another objection to the individual watering bucket—the danger of food being dropped into it by the cows, as they will drink when they have food in their mouths. This food will very soon produce objectionable conditions in the

bucket. A professor in an agricultural college, who had traveled in several states looking for ideas to incorporate in a barn to be built for the college, told me that he had not in a single instance found the individual water devices in good condition.

Cows Drinking from Streams.—I am sometimes amused and at other times disgusted with pictures of herds of cows standing in streams or pools of water. The pictures are often pretty to look at, but only stop to think what it means. It means that the cow drinks from the source that she has contaminated by her sewerage.

The Cow Stalls.—The platform of the stalls should be from $4\frac{1}{2}$ to $5\frac{1}{4}$ feet long from the gutter to the manger. When there is to be more than one row of cows, the platforms should be made of different width or make them wider at one end than at the other end of the stall so as to give each cow a platform that fits her length. The cows that can stand on a platform $4\frac{1}{2}$ feet long will need no more than three feet in width, but a cow that needs a platform five or more feet long will need $3\frac{1}{2}$ feet in width on the platform. These widths of stalls will be right for individual stalls of the Drown or Bidwell pattern as well as for stanchions.

The model stall used by the senior editor of "Hoard's Dairyman" is a most excellent one and should be investigated by anyone building

THE JAMES SANITARY STEEL STALLS AND MANGER



a stable for cows. The Drown stall is a good one and is used in many first-class stables. I use a stall that has some of the ideas from the Drown stall, some features of the Bidwell and some of my own ideas, one of which is the continuous cement manger. This stall has an adjustable front that holds the cow lined on the gutter, which is necessary if she is to be kept clean. The cow should be lined on the gutter instead of on the manger.

The gutters should be at least 16 inches wide, 18 inches is better. Let them be 6 inches deep at one end and 8 inches at the other which will give 2 inches fall to drain.

Cow Stanchion.—I am not a believer in the stanchion, although I have seventy of them that I use for heifers and dry cows. I do not use them, however, in the milking stables because of the danger of having a cow's udder stepped on by the cow standing next to her; this is sufficient to condemn the stanchion. I have lost the use of more teats and portions of a cow's udder from this cause than any other. A cow would step on the udder of her neighbor, causing a bruise followed by inflammation that would often end in the loss of that quarter of the udder. A bruised teat or sore udder is very painful to the cow and a great annoyance to the milker, sufficient to spoil the temper of some milkers, and it is therefore good policy to avoid

all such accidents we can as a prevention against ugly cows and ugly milkers.

Feeding Space.—It is not necessary that the feed alleys be more than four feet wide, although it is more convenient to have them wider. The alleys through which the cows pass in going in and out of a barn need not be more than five feet wide unless one wishes to drive through the barn with a wagon in taking the manure out, and in this case it is not really a necessity, as the cows may be turned out of the stable and the manure wagon may then be driven on the platform. Whether or not to build the stable for two or more rows of cows is a matter of choice in the main. When putting in two rows have their rumps together so that a wagon may be driven through to get the manure, and when four rows are put in, it is best to have the pairs of rows with rumps together which will require a center feed alley and one on each side. This will make more labor in feeding but is preferable to having three manure alleys. More light can be secured in a stable with only two rows of cows, but all the light necessary can be secured when there are four rows and arranged so that light can be admitted from three sides.

Many times the stable is built as a lean-to on one side or two sides of the barn, in which case it is good practice to have the manger toward

the side of the barn as a convenience in feeding. I prefer to have the stable built as an "L" to the barn. A cow stable should have as much light as a dwelling house and more than many of the old style dwellings. Put in full sized windows, using 9x14 six-light sash. Put the ceiling ten feet from the floor; eight feet will answer if you cannot do better. Ceil all the side walls and overhead with matched lumber to protect from the frost in winter and to give a better surface to keep clean.

Ventilation.—The plan of having a certain number of cubic feet for air without any system of ventilation is not up-to-date, and is not economical in any way. We should have a system of ventilation that will give a constant change of air. I use the King system and know of nothing better.

Disposal of Manure.—We doubtless get the most out of our manure when it is removed from the stable and spread over a field. There is considerable food value in manure for hogs when the cows are being well fed on grain, even when all the grain is ground, and it doubtless pays in dollars to utilize this. I have known dairymen to allow their hogs to enter the stable and glean the manure before the cows were put out and then load the manure onto the spreader or a wagon and take it to the field. This method is entirely practical, as is also the practice of put-

ting it into the yard for the hogs to work over and then take it to the field. Keep the manure away from the barns. I do not allow it nearer than thirty feet from the stable, and there only when it cannot be taken to the field without damage to the land when wet.

CHAPTER VIII.

THE CONCRETE COW YARD.

The cow yard had always been an unsolved problem with me until the autumn of 1904, when, after making estimates as to the comparative cost of paving with brick and concrete, I decided to pave a part of two cow yards with concrete. My experience with gravel in the cow yard had been quite unsatisfactory, and plank, I had learned, would last only about five years. I was able to purchase Portland cement delivered at DeKalb for \$1.35 per barrel and the gravel cost me 40c per cubic yard one mile from my farm. I employed one skilled man in cement work, assisted by the farm help. A part of this work we made the same as a sidewalk, using one part of cement to seven of gravel in the foundation and finished it the same as a sidewalk is finished, and with another part of the work we used one part of cement to five of gravel and did not put on the finishing coat. We found very little difference in the amount of material used by the two methods, but there was a saving of labor by putting it down at one

time, and as it is a simpler matter to put it all down with one operation, it does not require so much skilled labor.

Comparison of Results.—In regard to the success of this yard, at the end of three years there is not a flaw in the cement work where we put on the finishing coat as in sidewalk building, but I do find a break in the work where we did not put on the finishing coat. This convinces me that it is best to build it as a sidewalk is built.

In the preparation of the yard for the concrete, I found a great difference of opinion, almost every one thinking it necessary to put in a gravel or cinder foundation. My belief is that it is simply necessary to keep the earth dry under the concrete so it will not expand when frozen and we accomplished this with tile. I can truthfully state that I have never spent money at my farm that has given me more satisfaction than the money which I invested in the concreted cow yards. We did not cover the entire yard, but enclosed the concreted portion so that we can confine the cows on it when the outer yard is muddy. In dry weather we allow the cows to go into the outside yard.

Concrete Hog Feeding Floor.—While I was paving my yard the owner of a farm near DeKalb told me the man who was renting her place was asking for a platform on which to feed



CONCRETE COW YARD AT CLOVER FARM

hogs and I suggested a concrete platform, as I believed it would cost no more than a two-inch plank platform. The outcome was that a concrete platform was made, the renter drawing the material and working with the expert. When through, the cost was found to be no more than it would have been to put down a two-inch plank platform instead of the four-inch concrete feeding floor. A trench was dug eighteen inches deep around the sides and a two by six laid in the bottom of the trench and cement put on top. This was done to prevent the hogs getting at the edge of the wall. This platform is sound after three years' service. I sold this neighbor cement at cost, which was 40c per barrel below the retail price, which of course helped to keep the cost down to the cost of lumber.

CHAPTER IX.

THE PALATABILITY OF FEED.

The profitable feeding of dairy cows is a very important matter, and a careful consideration of this subject by the dairyman will be time well spent. The chemical composition and the digestibility of feeds are of great importance and deserve a certain amount of attention, but the first question to be asked in regard to a food is, Will the cow eat it with a relish? Is it palatable?

Unpalatable Feed Unprofitable.—The experience of many of the most successful dairy farmers has led them to believe that the most perfectly balanced food may lack palatability to such a degree that the cow will not consume sufficient to make a profit. Experience has taught them that a palatable unbalanced food is superior to an unpalatable balanced food. It matters not how much nutriment analysis may show a food to contain; if the cow will not eat it what profit are we to secure from feeding it? Do not understand me as ignoring the desirability of securing a balanced ration for our cows,

as I am really very insistent on that point. We must not ignore the question of digestibility, but experience has taught me that a palatable food is a digestible food; in fact, I believe the palatability of food is a correct basis on which to judge its digestibility. How to secure palatability is a live question and one that is not half appreciated by dairymen.

Time of Cutting Hay.—Experience has taught me that clovers (medium and alsike) make excellent hay for cows when cut at the proper time. Clover hay should be cut as soon as in full blossom; in fact, it is best to commence before it reaches that stage, if we have a large quantity to cut, as some of it will have passed that stage before we can secure all of it unless we commence earlier. The great majority of farmers do not cut their hay as early as they should. A pressure of other farm work is the most common excuse for this neglect, but it is not a sufficient one by any means. I have heard farmers say their hay “spent better” when cut late, which is probably true in their way of looking at the matter, but the proper, the business way, to view the question is to find what profit there is connected with the work of feeding it to the cows, which are the machines that are converting this food into milk.

The Cow a Manufacturer.—Some writers object to a cow being called a machine, but I think

it makes little difference whether we call her a machine, a converter, a condenser or some other name; but it makes a great difference how we feed and care for her. Whatever we call her, she manufactures our coarse fodder and grain into milk and we should do our part well to aid her in performing this work to our profit. She requires a certain amount to keep herself in working order and our share comes after she has taken care of herself, and whether or not our share is sufficient to make us a profit depends many times on the way we have cared for and fed her. There are thousands of unprofitable cows in the country that might be made profitable by intelligent care and feeding. Let us commence at home in this work and study to see if there is not some way in which we can help the cow to do better work for us. The cow is never so happy as when she is cared for in a way that she can do her very best. It is with the bovine family as it is with the human family, where the true source of happiness is in making others happy, and with the bovine family when we make them happy, they yield us a profit that makes us happy.

We should learn to know as soon as we look over a cow's surroundings what, if anything, is the trouble, what should be done that has not been done to make her comfortable and contented. There are many things which I cannot

describe here that the educated, experienced dairyman understands. He knows intuitively when he goes into the cow stable whether things are right or not.

Value of Coarse Feed.—We should study to make all the possible use we can of the coarse food, as it is the most economical as far as we can utilize it, for the cow is better off than when fed an excess of ground feed. We should remember that the coarse foods are the most economical so far as we can use them and keep the cow up to her capacity of production. There is no doubt that we pay dearly when we fail to secure our coarse foods, such as hay, corn-fodder and silage, in the best possible condition. We can simply accept our failure as an experience for which we have paid well and attempt to derive benefits from it in the future.

Selecting Grain Feed.—In securing ground feed for our cows we need to look for those that are rich in protein. When buying I take into account the cost per ton and the percentage of protein a feed contains. If the analysis of a feed is not known, we all have the privilege of writing to our state experiment stations for information which will undoubtedly be freely given and which can be relied upon. We cannot always accept the statements of agents of the commercial foods.

Calculating Feed Values.—When buying feed I figure about as follows: When corn is worth 50 cents per bushel, it costs \$18 per ton, which contains 125 lbs. of protein and makes the protein cost 14 cents per pound.

When wheat bran costs \$16 per ton and contains 250 lbs. of digestible protein, the cost per pound of protein is 6.4 cents.

When oats are worth 32 cents per bushel it is equal to \$20 per ton which contains 182 lbs. of digestible protein and makes the protein cost 11 cents per pound.

With the Chicago cream gluten meal costing \$26 per ton and containing 644 lbs. of protein (or 32.2 per cent) the protein costs 4.5 cents per pound.

Grano Gluten feed at \$17.20 and containing 26 $\frac{7}{10}$ per cent protein, or 534 lbs. in a ton, makes the protein cost 3.25 cents per pound.

Ground oats are an excellent food for cows, but many times they are bringing such a price in the market that it makes it economical to sell them and buy some of the feeds that are rich in protein. To illustrate: a ton of oats, or 62½ bushels, may sell at 28 cents per bushel and the \$17 received if invested in gluten meal at \$28 per ton will buy 1,250 pounds of this feed, which contains 32 per cent or more of protein. This exchange of oats for gluten feed gives 400 pounds of protein in place of the 182 pounds

that the ton of oats contained. The 1,250 pounds of gluten meal fed with corn meal will bring better returns in milk than the ton of oats. I find that I cannot dispense with gluten meal as a part of my cows' rations.

The kiln-dried by-products of the glucose factories and whiskey distilleries are valuable and economical cow feed when bought intelligently. Insist upon reliable information as to the analysis of them. Many of the states have laws that are respected, and these feeds are pretty sure to contain more protein than is guaranteed, but it may not be so always in states which have no laws requiring any guarantee from the manufacturers.

Keep the Mangers Clean.—It may be said in this connection that whatever the food, all that is rejected by the cows should be removed and fed to the dry cows, the young cattle or the horses. Do not leave it in the cows' mangers. Remember always that your profit comes from what food you can induce the cow to consume above what she must have to sustain herself.

CHAPTER X.

TYPICAL RATIONS FOR DAIRY COWS.

While quite a number of dairymen have figured out balanced rations for their cows, according to the feeding standard of the scientists which are now used as a basis, most farmers prefer to have this work done for them. They would rather adopt a ration suggested in plain pounds by some authority on food stuffs or one known to have given profitable results in actual use. For the benefit of dairy farmers I have collected rations from widely separated parts of agricultural America, embracing nearly all the feeds that are used in milk making in this country. The dairy departments of state agricultural colleges have furnished this matter at my request and in several instances the professors have submitted also helpful comments. I recommend these various rations to the study of farmers as coming from eminent authorities on dairy cattle feeding both from the scientific and the practical point of view.

University of Illinois.—The Department of Dairy Husbandry of the University of Illinois

at Urbana offers the appended general comments on the subject of feeding dairy cows:

We send you a few rations, with the attempt to suit them to farmers who have neither silos nor alfalfa, but pointing out the great economy of these two feeds when fed together. We find them the most economical producers of milk. It is true that there are great evils resulting when one attempts to use either alone.

The subject of feed for the dairy cow is one about which we have much to learn. One should use all the home-grown feeds possible, yet such feeds are often expensive because one can sell them and buy mill feeds at a profit. It seldom, or never, pays to feed a pound of oats. On the other hand, one acre of alfalfa produces more protein food than three acres of corn or six acres of oats, or two acres of clover. The corn plant produces more starch and sugar than any other plant. These two should form the bulk of the ration for dairy cows. What to add depends upon conditions. If one is compelled to buy, he will do far better to secure a mixture than to decide on the best feed and depend upon that alone.

Some of these fundamental facts in the feeding of dairy cows may be thus summarized:

1. Alfalfa land furnishes the cheapest protein food for cows known.
2. Corn, especially when labor is cheaper than at present so the silo can be used more generally, is the best fat producing feed for dairy cows.
3. Use these two as home-grown feeds.
4. A single feed, like corn meal, produces small yields, and has evil effects upon the cow.
5. The same is true of any single feed, such as oil meal, gluten feed or silage.

6. To make milk cheaply, the cow will always succeed better with a variety rather than with a single feed, even though the latter be the most perfect single feed known.

7. When feeding a heavy ground grain ration, it is best to mix some coarse bulky feed, such as bran or chopped hay. Bran, however, is very expensive at present.

8. If bran, oats and chopped hay are too expensive, try the plan of feeding a mixture of three or more grains.

9. Silage is one of the best foods known to stimulate milk flow, providing sufficient protein feed is given in connection with it.

10. Silage cannot produce milk alone, since it has little protein in it. Many farmers have tried feeding corn meal, timothy hay and silage, and soon found that cows shrank in milk, which is to be expected. Silage is a fattening food, and if no protein is fed with it, a cow must soon shrink in milk flow. If clover or alfalfa is fed, then the succulent silage is a stimulant to production.

11. Do not condemn silage because you found it wanting. Part of its value is as a stimulant and an aid to digestion, but there must be other feeds with it.

Ration No. 1.

	Lbs.	Protein.	Carbo- hydrates.	Fat.
Clover hay	15	1.02	5.37	.25
Corn & cob meal. . . .	11	.48	6.60	.32
Oil meal	1	.25	.40	.03
Gluten meal	2	.52	.86	.22
	29	2.27	13.23	.82

Ration No. 2.

Note in the ration below how the same nutrients are secured with a saving of both hay and grain.

	Lbs.	Protein.	Carbo- hydrates.	Fat.
Clover hay	12	.82	4.30	.20
Silage	40	.36	4.52	.28
Corn meal	4	.32	2.66	.18
Gluten meal	2	.52	.86	.22
Linseed meal	1	.28	.40	.03
	59	2.30	12.74	.91

Ration No. 3.

Note in the ration below the high protein contents of alfalfa hay, thus saving grain as well.

	Lbs.	Protein.	Carbo- hydrates.	Fat.
Alfalfa hay	15	1.65	6.00	.18
Sorghum fodder..	10	.12	5.00	.02
Corn meal	4	.32	2.66	.18
	29	2.09	13.66	.38

Ration No. 4.

Three pounds of alfalfa hay may be saved per day, but at the expense of several pounds of mill feeds.

	Lbs.	Protein.	Carbo- hydrates.	Fat.
Alfalfa hay	12	1.32	4.80	.14
Sorghum fodder..	10	.12	5.00	.02
Corn meal	4	.32	2.66	.18
Gluten feed	1	.20	.48	.09
Oil meal	1	.29	.40	.03
	28	2.25	13.34	.46

Ration No. 5.

In the ration below note how alfalfa and silage produce the same nutrients as the above rations, with much less mill feed.

	Lbs.	Protein.	Carbo- hydrates.	Fat.
Alfalfa hay	12	1.32	4.80	.14
Silage	40	.36	4.52	.28
Corn meal	6	.47	4.00	.25
	58	2.15	13.32	.67

Iowa State College.—H. G. Van Pelt, Assistant Professor and Superintendent Dairy Farm, Ames, contributes the subjoined:

Many different kinds of rations are fed in this state. In the season of grass very little is fed except grass. There is very little soiling done and silos are scarce. In the winter time a large number of the cows in this state subsist on corn and cob meal with oats mixed in. Some farmers use bran, but not to a very great extent. The ration most commonly used is probably clover and timothy hay mixed, 20 lbs., corn stover 20 lbs., corn 6 lbs., oats 3 lbs. At the college we have fed during the last year corn silage, clover hay, corn meal, ground barley, gluten feed, cottonseed meal, and some ground oats. Our cows are given all the corn silage and hay they will clean up. The grain is given them in amounts varying with their production, varying from 2 to 15 pounds daily. The average ration is in the neighborhood of 6 to 8 pounds.

University of Wisconsin.—D. H. Otis, Associate in Animal Nutrition, College of Agriculture, Madison, offers the following:

Probably the best dairy ration for Wisconsin conditions would be corn silage 30 lbs.; clover hay 12 lbs.; corn meal 4 lbs.; oats (or wheat bran) 2 lbs. The roughage should be regulated so as to give the cow all she will eat up clean. The amount of grain should be regulated according to the production of the cow. One pound of grain daily for each pound of butter-fat produced weekly is a fair guide, although it may be a little too much where clover or alfalfa form the roughage.

University of Minnesota.—T. L. Haecker, Dairying and Animal Nutrition, Agricultural Experiment Station, St. Anthony Park, presents some rations which have been in use in the station dairy herd:

Three of these practical rations are from our winter's record. On account of weighing feed stuff to each animal during the past twelve years, we have used only upland prairie hay. We do this because cows eat it up clean, and because it is of uniform composition. I use prairie hay, silage and grain; fodder corn, hay and grain; clover and grain, and clover and timothy and grain.

The proportions of the different kinds of grain are largely governed by the market prices. In one ration I have corn 4 lbs., barley 1 lb. This is because barley is so expensive. I do not want to feed five pounds of corn and no barley, because more variety

in the mixture is desirable. In a general way corn and barley are interchangeable; the same is true with oats and bran. If oats is cheaper than bran I feed it, otherwise bran is used. We always use oil meal instead of gluten feed because it is manufactured up here. On general principles I do not believe in going farther away from home for our feed stuffs than is absolutely necessary.

A cow weighing 608 lbs., yielding a daily average for the winter of 22 lbs. of milk testing 5.4 per cent butter-fat, had corn 4 lbs., barley 1 lb., bran 3 lbs., oil meal 2 lbs., prairie hay 9 lbs., silage 16 lbs.

A cow weighing 821 lbs., yielding a daily average for the winter of 23.8 lbs. of milk (1.15 lbs. fat per day), had corn 4 lbs., barley 1 lb., bran 3 lbs., oil meal 2 lbs., prairie hay 10 lbs., silage (drilled corn) 25 lbs.

A cow weighing 1,095 lbs., yielding a daily average for the winter of 33 lbs. milk testing 3.5 per cent butter-fat, had corn 4 lbs., barley 2 lbs., bran 4 lbs., oil meal 2 lbs., prairie hay 10 lbs., silage 30 lbs.

For a cow weighing 1,000 lbs. and yielding daily 20 lbs. of milk testing 4.5 per cent butter-fat, this ration is good: corn 4 lbs., barley 3 lbs., clover hay 20 lbs.

For a cow weighing 1,200 lbs. and yielding daily 30 lbs. of milk testing 3 per cent butter-fat, the following ration is good: Corn 4 lbs., barley 2 lbs., bran 4 lbs., clover and timothy hay 20 lbs.

University of Nebraska.—A. L. Haecker, Dairy Husbandry, Agricultural Experiment Station, Lincoln, makes these suggestions:

Three rations for dairy cows suit Nebraska conditions very well. Ration No. 2 is perhaps the cheapest and quite as good as the others, but for variety I submit three. These rations are for a 1,000-lb. cow producing 20 lbs. of 4 per cent milk per day.

Ration No. 1: corn, 2 lbs.; bran, 2 lbs.; oil meal, 1 lb.; alfalfa, 6 lbs.; corn stover, 20 lbs.

Ration No. 2: Corn, 4 lbs.; bran, 2 lbs.; alfalfa, 8 lbs.; corn silage, 35 lbs.

Ration No. 3: Corn, 3 lbs.; bran, 2 lbs.; oil meal, $\frac{1}{2}$ lb.; alfalfa, 6 lbs.; corn silage, 30 lbs.; sorghum, 8 lbs.

University of Missouri.—C. H. Eckles, Professor of Dairy Husbandry, College of Agriculture, Columbia, furnishes the subjoined:

The following are about typical dairy cow rations for Missouri conditions. The rations are designed for animals producing possibly 25 lbs. of milk per day.

Ration No. 1: Clover hay, 20 lbs.; corn (ground or crushed corn and cob), 5 to 6 lbs.; bran or oats, 3 to 5 lbs.

Ration No. 2: Alfalfa or cow pea hay, 10 lbs.; corn fodder (field cured and fed whole), 10 lbs.; corn (ground or crushed corn and cob), 7 to 9 lbs.; bran, 3 lbs.

Ration No. 3: Corn silage, 40 lbs.; clover hay, 12 lbs.; corn (ground or crushed corn and cob), 5 lbs.; bran, 4 lbs.

Ration No. 4: Alfalfa or cow pea hay, 15 to 20 lbs.; corn (ground or crushed corn and cob), 8 to 12 lbs.

Ration No. 5: Corn silage, 20 lbs.; alfalfa or cow pea hay, 15 lbs.; corn (ground or crushed corn and cob), 8 to 10 lbs.

Cornell University.—H. H. Wing, Professor of Animal Husbandry, New York State College of Agriculture, Ithaca, supplies this information:

A typical ration for milch cows in this state would be: Corn silage, 40 to 45 lbs.; mixed clover and timothy hay, 8 to 10 lbs.; concentrates, 8 to 12 lbs. A typical mixture of concentrates would be by weight: 50 parts gluten, 25 parts wheat bran or middlings, 25 parts of corn or corn and oats.

Dried distillers' grains are extensively used in place of the gluten as a protein food, and buckwheat middlings and cotton seed meal are both used to a greater or less extent for the same purpose.

University of Vermont.—Charles L. Beach, Professor of Dairy Husbandry, State Agricultural College, Burlington, writes:

I do not think I can give you a typical Vermont ration. There are all kinds and classes of dairymen in this state and the feeding practice is as variable as the skill and intelligence of the dairymen themselves. From some knowledge of the markets I would suggest the following as an economical ration: Corn silage, 30 lbs.; mixed hay, 12 lbs.; cotton seed meal, 2 lbs.; gluten feed, 1 lb.; wheat bran, 2 lbs.; dried brewers' grain, 2 lbs.

Kentucky State University.—Prof. M. A. Scovell, Director State Experiment Station,

Lexington, mentions the following as the best rations for that section, and not as those generally used:

In many parts of our state, especially the bluegrass region, we have an abundance of grass and therefore feed very little concentrates in the summer time. A good daily winter ration for a cow in full flow of milk, giving from 32 to 40 lbs. of milk per day, is as follows:

Ration No. 1: Bran, 8 lbs.; corn meal, 2 lbs.; cotton seed meal, 2 lbs.; linseed meal, 1 lb.; clover or alfalfa hay as much as will be eaten.

Ration No. 2: Bran, 6 lbs.; crushed oats, 2 lbs.; cotton seed meal, 2 lbs.; silage, 30 lbs.; and clover hay as much as will be eaten.

Dry cows and young stock can be fed corn fodder or stover, clover hay and probably a little corn. Gluten feed is not much used in this state, although it could be substituted for the cotton seed meal in proportion to the protein it contains, or substituted for some of the bran, using one pound of gluten feed instead of two pounds of bran. Any ration should be changed according to the capacity of the individual cows.

Georgia State College.—Prof. C. L. Willoughby, Dairyman, Agricultural Experiment Station, Experiment, responds thus with an outline of the feeding of dairy cattle as practiced in the South:

The rations submitted are among a number which have been recommended by the Georgia Experiment

Station to the dairy farmers of this state as especially suitable to southern conditions for cows of 1,000 lbs. weight.

Ration No. 1: Corn silage, 40 lbs.; cottonseed meal, 8 lbs.

Ration No. 2: Corn silage, 40 lbs.; cotton seed meal, 5 lbs.; bran, 3 lbs.

Ration No. 3: Hay (mixed grasses), 20 lbs.; corn meal, 4 lbs.; cotton seed meal, 3 lbs.

Ration No. 4: Cotton seed hulls, 20 lbs.; cottonseed meal, 4 lbs.; bran, 5 lbs.

Ration No. 5: Cotton seed hulls, 25 lbs.; cotton seed meal, 5 lbs.

Ration No. 6: Cow pea hay, 15 lbs.; shredded corn stalks, 10 lbs.; cotton seed meal, 2 lbs.; corn meal, 2 lbs.

Mississippi Agricultural College.—J. S. Moore, Professor of Dairy Husbandry, Agricultural College, thus sets forth the combinations of food stuffs in favor in that state and recommended by the college:

The rations are designed to furnish materials in about the proper proportions for the production of milk by cows weighing from 800 to 1,000 lbs. and yielding from 20 lbs. to 24 lbs. of milk a day. For cows giving a larger amount the ration should be increased and for cows falling under that yield it should be reduced.

Ration No. 1: Johnson grass hay, 13 lbs.; cotton seed hulls, 15 lbs.; cotton seed meal, 3 lbs.; wheat bran, 4 lbs.

Ration No. 2: Cow pea hay, 15 lbs.; corn silage, 40 lbs.; wheat bran, 5 lbs.

Ration No. 3: Cotton seed hulls, 20 lbs.; cotton seed meal, 4 lbs.; wheat bran, 5 lbs.

Ration No. 4: Cow pea hay, 10 lbs.; cotton seed hulls, 15 lbs.; cotton seed meal, 3 lbs.

Ration No. 5: Cow pea hay, 10 lbs.; Bermuda grass hay, 10 lbs.; wheat bran, 3 lbs.; cotton seed, 6 pounds.

Ration No. 6: Bermuda grass hay, 18 lbs.; cotton seed meal, 2 lbs.; wheat bran, 3 lbs.; corn and cob meal, 3 lbs.

Ration No. 7: Cow pea hay, 15 lbs.; cotton seed, 8 lbs.; corn meal, 6 lbs.

Ration No. 8: Sorghum hay, 20 lbs.; cow pea hay, 10 lbs.; cotton seed meal, 3 lbs.

Ration No. 9: Alfalfa, 15 lbs.; cotton seed hulls, 12 lbs.; cotton seed meal, 3 lbs.

Ration No. 10: Crab grass hay, 15 lbs.; cowpea hay, 12 lbs.; cotton seed, 6 lbs.

North Carolina College of Agriculture.—John Michels, Professor of Animal Husbandry and Dairying, West Raleigh, takes a position in regard to the feeding of cottonseed hulls which will interest all southern dairymen:

The dairy rations submitted would meet North Carolina conditions. These rations are calculated for cows yielding from 28 lbs. to 32 lbs. of milk of good quality. You may be surprised that I have not included cotton seed hulls, a common feed with us. I wish to say that the cost alone of this material absolutely precludes its feeding, and if the cost were rea-

sonable, it would not be desirable to feed any of this material to cows for any length of time, as it has been my experience that the continuous feeding of cotton seed hulls will soon make a poor producer out of a good one.

Ration No. 1: Corn silage, 30 lbs.; corn stover, 8 lbs.; cotton seed meal, 4 lbs.; corn meal, 3 lbs.; dried brewers' grains, 4 lbs.

Ration No. 2: Pea vine hay, 8 lbs.; corn stover, 8 lbs.; cotton seed meal, 3 lbs.; wheat bran, 4 lbs.

Ration No. 3: Corn stover, 15 lbs.; cotton seed meal, 3 lbs.; dried brewers' grains, 4 lbs.; corn meal, 4 lbs.

Ration No. 4: Corn silage, 30 lbs.; corn stover, 8 lbs.; cotton seed meal, 5 lbs.; dried brewers' grains, 2 lbs.; corn meal, 4 lbs.

CHAPTER XI.

WATERING COWS IN WINTER.

I always warm the water for my cows as soon as cool weather comes in the fall, believing that the cow should have her choice in the matter and having learned from her that she prefers to have it warm. I have a steam boiler at my farm and a reservoir for water on the floor above from which the water runs through pipes underground to the watering tanks in the yards. The steam pipe is connected with the water pipes so when we wish to warm the water we open the steam valve and inject enough steam into the water to give it the desired temperature. I warm the water to a temperature of 75 to 80 degrees. The cows give more milk when they have warm water. They also look better and are less liable to sickness.

Danger in Cold Water.—It is safe to allow a cow to drink all the warm water she wants at any time, but it is not safe to allow her to drink cold water at all times. This I paid well to know. I remember well one Sunday morning many years ago, when there was a fresh cow to

care for and the hired man, who had been told never to let a fresh cow have cold water to drink, was in a hurry to go to church. He gave her cold water to save time and killed the cow. He took the chances and I paid for it by losing an excellent cow. I do not allow cold water to go into the troughs in cold weather, but warm it as described, and when the cows are through drinking the tanks are emptied into the sewer so there is no ice in them when we water next time. I have heard men argue that warm water is not palatable to stock, but I am sure that does not apply to cows or young stock, as I once saw my youngsters get into a tank to get the warm water that was running out of the pipe on the opposite side of the tank where they could not reach it without getting into the tank.

Cows Choose Warm Water.—I have also watched my cows in the pasture in summer and fall where I have an eight-inch tile opening into a ditch about forty rods from a stream into which the ditch empties. In warm weather the cows would drink from this open ditch near where it emptied into the stream; but when it became cool in the fall they would drink at the mouth of the tile. In each case they were after the warmest water and to secure it they allowed it to run in the open ditch to become warmed by the sun and the hot weather, but in cool weather they took it as it came out of the tile

before it was cooled by running in the open ditch. The cow can talk to the thinking dairyman in many ways, and it pays to listen to her, and follow all her wishes, taking heed to what she tells you in her cow language. I am sure I could learn cow language in less time than I could learn French, and it would pay me better.

In her choice of water it will not answer to judge the milch cow by the laboring animal such as the horse and the ox as the latter wish to reduce the temperature of the body. The cold water is more palatable to them and they will have it if they can get it.

We water the cows once a day in tanks in the yard and once in the cement mangers in the barn.

CHAPTER XII.

THE FEEDING VALUE OF SKIM-MILK.

The feeding value of skim-milk has been investigated by many of our agricultural experiment stations and by some other reliable authorities. The conclusions reached are all so favorable that it is not necessary to give much space to a discussion of the subject here.

Some Feeding Tests with Pigs.—Many years ago Ex-Gov. W. D. Hoard of Wisconsin made an experiment feeding sweet skim-milk to pigs weighing 100 pounds each and costing $4\frac{1}{2}$ cents per pound. They were fed 56 days on clear skim-milk and then sold. The growth of the pigs during this time, figured at $4\frac{1}{2}$ cents per pound, paid $22\frac{1}{2}$ cents per 100 pounds for the skim-milk fed to them.

C. P. Goodrich, Ft. Atkinson, Wis., at one time fed a bunch of six months old pigs weighing 125 pounds each. They were divided into three lots as nearly equal as possible. Lot I was fed on skim-milk and made 5 pounds' growth from 100 pounds of skim-milk. Lot II was fed entirely upon corn and made 10 pounds'

growth from one bushel of 70 pounds of ear corn. Lot III was fed skim-milk and corn in proportion of one bushel of corn to 100 pounds of skim-milk. This combination produced 18 pounds of growth.

This illustrates very nicely the economy of feeding a combination of corn and skim-milk. When the bushel of corn and 100 pounds of skim-milk were fed separately, they made 15 pounds of growth; when fed together they made 18 pounds' growth, an increase of 20 per cent.

Personal Experience with Skim-milk.—In my early experience in dairying I wished to have some reliable basis upon which to estimate the value of skim-milk, and there were so few experiments available at that time that I felt it advisable to do a little experimenting myself. I found that there is no food so good as skim-milk to make muscle, bone and growth in pigs when fed intelligently. Many farmers have a belief that they need to feed a large quantity of skim-milk because it contains no cream; this is a mistake and in many cases a fatal mistake, as too much of it causes scours, which if not checked soon will ruin the pigs.

My first experiments were made in the early seventies by feeding skim-milk without other food and the results showed that with pigs weighing 50 to 75 pounds each, I secured one pound of growth from 16 pounds of skim-milk

which at 4 cents per pound would make the skim-milk worth 25 cents per 100 pounds.

In 1878 I made some experiments to show at what age pigs made the most growth from their feed. I began with pigs 12 days old, and of course included the mother they were nursing, the sow being fed corn-meal and wheat bran with the skim-milk. The corn-meal and wheat bran were charged up at cost and the increased weight of sow and pigs credited at 4 cents per pound. On this basis I received for each 100 pounds of skim-milk $23 \frac{4}{5}$ cents. When these pigs had reached the weight of 40 pounds they gave me for each 100 pounds of skim-milk $56 \frac{1}{2}$ cents. Still later when they had reached the weight of 125 pounds each and the work figured upon the same basis as in the two experiments just stated, charging the corn-meal and wheat bran at \$14 per ton, and giving the skim-milk credit for the balance, I received $53 \frac{1}{4}$ cents per 100 pounds for the skim-milk.

As I had made many experiments with pigs after they had reached the weight which these had, I carried the lot no farther.

I have used the work of Hoard, Goodrich and myself to show that it is practical for an intelligent farmer to do some work in experimental lines. When this work was done I lived on my farm and milked the cows, made the butter and fed the calves and pigs myself.

Experiment Station Work.—The Wisconsin report of 1888, page 92, gives record of experimental work that, figured on the basis of my work, shows equally good results. I summarize it: Corn-meal at \$16 per ton and pork at 4 cents per pound live weight; the growth after paying for corn-meal paid 58 cents per 100 pounds for skim-milk. Prof. Henry said after closing some experiments showing the actual quantities of corn-meal and skim-milk it is most profitable to feed, that to produce pork rapidly a large proportion of corn-meal to skim-milk may be fed, but that such feeding is not the most economical when the cost of production is considered, and that from one pound to one and a half pounds of skim-milk to one of corn-meal is as much as can be profitably fed when skim-milk is valued at 20 per cent to 25 per cent per 100 pounds and corn-meal at 75 cents per 100 pounds.

To show the comparative profit of feeding growing hogs with those that have reached a heavy weight, I quote from the Wisconsin report of 1889, where hogs weighing 400 pounds each gave a return for skim-milk of 11 cents per 100 pounds; and hogs weighing 125 pounds gave a return of 25 cents per 100 pounds of skim-milk when fed with corn-meal in proportions of 5 to 6 pounds of skim-milk to one of corn-meal. These figures illustrate the fact that has been demonstrated hundreds of times in the last 25 years,

that to do the most profitable work we must feed young growing animals.

The Cornell University Agricultural Experiment Station Bulletin 199, in the summary of several years' work on separator skim-milk as food for pigs, says that in 1897 one pound increase in live weight was made from 1.7 pounds of corn-meal and 4.8 pounds of skim-milk. In 1898 the most economical gain was made with corn-meal and skim-milk when the proportion by weight of corn-meal and skim-milk was one to three. The most economic gains were made in 1899 when corn-meal and skim-milk were fed in the proportion of one pound of corn-meal to 6.7 of skim-milk.

Skim-Milk for Calves.—We have a right to suppose that the dairyman is to feed his skim-milk to heifer calves sired from his best cows by a well selected bull of some dairy breed, as he cannot afford to feed it to "dairy steers." If he wishes to feed it to steers let it be to some beef breed steers.

If the dairyman will feed his skim-milk to heifer calves thus bred, remembering that the bull is more than half the herd for the reason that the heifer calves are more likely to "take after" the sire than the dam, he will secure better returns than in feeding it to pigs to sell for pork. With the heifer calf he is growing an animal from which he will probably get many

years' profitable work. An animal that will make him from 300 to 450 pounds of butter annually and show a profit of \$25 to \$60 per year after paying for feed and labor is worth having. Do not say this cannot be done for it is being done.

Calves Better to Feed than Pigs.—The calf probably will not make as much growth from the same food as the pig, but when one must choose between a pig to sell or a heifer calf to raise for the dairy, feed the skim-milk to the calf by all means.

Methods of Feeding Calves.—The calf should be allowed to take the first milk from its dam as nature requires this and if her rules are violated there will surely be trouble. After the calf has once nursed, it should be removed from its mother but fed its mother's milk for a few days, depending on the vigor of the calf. Commence to add skim-milk after a week or ten days, adding a small amount at first and increasing it daily until the calf is on an entire skim-milk diet.

There are a few simple rules to follow in growing calves on skim-milk. The milk must be sweet; it must be as warm as the mother's milk and care must be exercised not to feed too much of it. There are many more calves injured by being fed too much skim-milk than there are by not having enough of it. Four quarts at a feed

twice per day is sufficient for the average-sized calf for the first month. Add a spoonful of ground flax seed to each feed and teach the calf to eat a little corn-meal as soon as possible. Corn is the most economical food to balance a ration containing so much skim-milk. Feed shelled corn as soon as the young calf will digest it well.

Never feed a young calf cold milk; better take an ax and knock it on the head. Calves must be watched and when they show a tendency to looseness of the bowels, feed less milk and if this does not remedy the trouble, heat some skim-milk to boiling and when it is cooled to a proper temperature, feed this to the calf. If taken in time this will check the scours caused by over-feeding.

Calves must have a warm dry nest and it requires much bedding to keep them dry. This causes the calf to thrive and it saves the liquid manure. I prefer fall calves to raise as they can be taken care of the first winter and when they go to grass in the spring they will be able to take care of themselves, if they have good pasture.

Experimental Work in Calf Feeding.—The Indiana Experiment Station in Bulletin No. 47 gives a record of work to show the relative cost of calves grown on skim-milk and on whole milk. The skim-milk calves cost less than 4 cents per pound and the whole milk calves cost

10 cents per pound and the calves fed skim-milk make as good growth as the ones fed whole milk.

Feeding in Stanchions.—At Clover Farm we put the calves in stanchions when they are to be fed milk. By so doing we can feed each calf from a pail just as much milk as we wish it to have and after it has had its milk, feed it some grain food or hay to cause it to forget its desire to suck, after which it may be loosened from its stanchion.

CHAPTER XIII.

BUILDING THE SILO.

For many years before I built a silo I had studied the subject and was impressed with the value of silage as a feed for dairy cows, but at that time the only ones I could learn of were built of concrete or some form of masonry, which made the cost so great that I did not feel like undertaking the work. However after a few years I reached the conclusion that I could not afford to get along without one, and as at that time many were being built of wood in different parts of the country, I decided to build one of this kind.

Rectangular Wooden Silo.—It was built rectangular in form and twenty-two feet deep, of ten inch studding, sheeted inside with a high grade of white pine flooring thoroughly seasoned, and sided outside like a house. A few years later I built a larger one in three compartments, which I first sheeted inside with common surfaced lumber on which I put tarred paper and on this six-inch white pine flooring. With this double sheeting I had the same

trouble that many others have had, from the moisture getting between the two sheetings, saturating the paper and thus holding the moisture to such an extent that it started decay and resulted in the walls becoming useless in a few years. I used paper on the walls three years as we filled the silos. This was done for the purpose of helping to make the walls air tight; but at the end of ten years I was compelled to tear out the partitions and put in circular cemented silos in place of the square wooden ones.

If I were to build more wooden silos I would not make any double wooden walls on the inside next to the silage, for the moisture will get through the joints and fail to dry out, and will surely cause decay in a few years. If one thinks he must use lumber in some form on the inside let it be of a good sound quality (sound knots are no objection) thoroughly dried and not wider than four inches. Three inches in width is better, as in case of shrinkage there is less danger of the joints opening and letting the air come through the walls.

The Cemented Silo.—My first experience with the cemented silo was ten years ago, when I built three. These proved so satisfactory that I shall build no other kind hereafter, at least until it is demonstrated that there is something better than the wooden cemented silo. When I devised this style of silo I did not know that any

had been built on this plan, but learned through the Wisconsin agricultural college that such silos had been in use in that state for several years and had proved a success. This relieved my mind very much as it removed the experimental feature of the work to a great extent.

Of course no one will build anything but circular silos any more, let the material be what it may, as a circular form gives the greatest contents for the material used and the greatest resistance for the amount of lumber used. There are now on my farm six cemented round silos that will contain 1,750 tons, and after ten years' experience with them I would not build any other kind in my locality. There are places where it may be economy to build all concrete walls. I cannot say as to that point, as the local conditions have much to do with the economy of it.

My first cement lined silos were built twenty feet in diameter and thirty-eight feet deep. A year after I built one thirty-eight feet in diameter and twenty-four feet deep. This I found too large, as I had to feed about 200 head of cattle from it to keep ahead of decay. It is also more labor to distribute the contents when filling and more labor to remove the feed when taking it out to feed the cows.

Relation between Size and Cost.—The greater the diameter of the silo the less the cost per



SILO OF SOLID CONCRETE WALLS

ton of contents of the silo to build it. To illustrate: a silo ten feet in diameter is about $31\frac{1}{2}$ feet in circumference and has an area of 75 square feet, while one twenty feet in diameter is nearly sixty-three feet in circumference and has an area of 300 square feet. It will cost half as much in material and labor to build one ten feet in diameter as one twenty feet in diameter and one twenty feet in diameter will contain four times as much as one ten feet in diameter. Twenty feet in diameter is a desirable size to build, and I would not build larger than twenty-five feet in diameter. As to depth I have not learned that there is any danger of getting them too deep. I certainly have found no objection to a depth of thirty-eight feet.

Amount of Exposed Surface per Cow.—One point about the matter of diameter that must not be forgotten is that it must not be too large for the number of cattle to be fed from it. Eight surface feet per cow to be fed is the danger limit, and six feet is safer. To explain: a silo that is twenty feet in diameter has 300 surface feet of area and when we apply the rule of six surface feet per cow we find that we can feed safely fifty cows from it and keep ahead of decay. When we apply the rule of eight surface feet we can feed as few as forty cows from a twenty foot silo. This may be done safely when care is exercised in keeping the surface feed

down level, taking off a layer of such thickness that we can go over the surface once in two days. Do not allow any holes to be dug in the surface unless it be to get down to a door to throw out the feed. Remember that you are handling canned feed, and the same care must be taken as the women use in handling canned fruit. In both cases too long an exposure to the air is harmful.

Repairing Cracks in Cement.—I have had very little trouble with the cement cracking, and when it does we put on a wash of cement, making it as thick as will spread well with a brush the same as would be used on a cracked cistern and it makes the walls perfect again. This costs but little, and it is a good idea to do it every season, though I have not done so in the past, as I did not find it necessary. This wash can be put on best as the silo is being filled, using the silage as a platform to stand on.

Drain for Silo.—Wherever you build, do not go into the ground below where you can secure drainage to carry off the water, as it must not be allowed to collect in the silo. There should be a tile outside and a little lower than the foundation to catch and carry away all water that would get into the silo.

Details of Silo.—The foundation for the silo may be of stone, brick or concrete, and should extend above the ground to a sufficient height to

protect the lumber from the moisture of the ground. There is no necessity of a sill, as the studding may be set on the foundation and held in position by the inside sheeting being nailed to it to hold the bottom of the studs in place. I put the studding twelve inches apart, which I believe is nearer than necessary, as all the studding does is to hold the lumber together, the sheeting bearing all the lateral pressure before the silo can possibly give away. Any lumber that you can spring to the circle may be used for the inside sheeting, though it needs to be surfaced to bring it to a uniform thickness, as we put on this surface a lath that is made beveled. This is done for the purpose of securing a dove-tailed joint to hold the cement. For this inside sheeting and also for the lath I used six inch fencing, having it resawed making it about $\frac{3}{8}$ inch thick. I had the lath sawed out of this same lumber at the mill where the lumber was resawed. A carpenter that has a supply of gumption can help one out with many ideas in the building of a round silo.

The outside sheeting may be of the same material as is used for the inside sheeting, or wooden hoops may be put on the studding and the outside sheeting may be put on perpendicular, and nailed to these hoops. Sheeting sprung to the outside of a circle is prone not to stay in place, as in its effort to straighten it may get

away, but on the inside this tendency to straighten helps to hold it in place. My experience teaches me that the most satisfactory way to sheet the outside is to put on the hoops and put the sheeting up and down, nailing it to the hoops which should be of one inch hard wood.

Kind and Amount of Cement.—For the cement work use none but the best Portland cement that you can buy. Use one part cement and two parts of clean sand. Be sure there is no loam or clay in the sand, as it will certainly cause trouble. The cement should have a thickness of $\frac{1}{2}$ to $\frac{5}{8}$ of an inch.

Silo Roof.—It matters little whether there is a roof on the silo or not. It is much in the way when we are filling, and I have failed to learn of any good it has done except to prevent having to throw off the snow after a storm when we were feeding from it. The water does no harm: in fact it is often an advantage to have the water when we are done filling to give weight to cause the silage to settle and pack properly. I have one without a roof, and think that I should not put on a roof if I were to build more.

Cost of Silo.—The silo that I put no roof on cost me $12\frac{1}{2}$ cents per square foot of surface. To illustrate: a silo twenty feet in diameter is sixty-three feet in circumference and if thirty-eight feet deep it has 2,400 surface feet, which at $12\frac{1}{2}$ cents per square foot would cost \$300

and it would contain 250 tons of silage. Some would estimate it to hold 300 tons. My silos all have clay floors, and the silage keeps as well on these as it does on cement. If you need to keep out the rats cement the bottom.

I have in one place three silos in a row which are all inclosed under one roof or building put up the same as a barn frame. These are all filled at one setting of the machine, having a horizontal carrier onto which the elevator drops the feed and it is carried and dropped into either one of the three silos. In building these three silos, which were not sheeted outside, I was not certain that I had sufficient resistance to the lateral pressure in the inside sheeting, the lath, and the cement. I had some figuring done to learn how I would secure additional resistance on the outside for the least cost, and was surprised to find resistance to lateral pressure to be cheaper in the form of wood hoops than any form of iron.

Silo Doors.—The openings for taking out the silage may be put as pleases one, but should not occupy more than one third of the perpendicular space of the silo. The doors should be made of two thicknesses of matched lumber, the inside thickness being one inch larger all round than the outside thickness and the door frames made to correspond, and thus give a better exclusion of the air. The best way to seal the doors

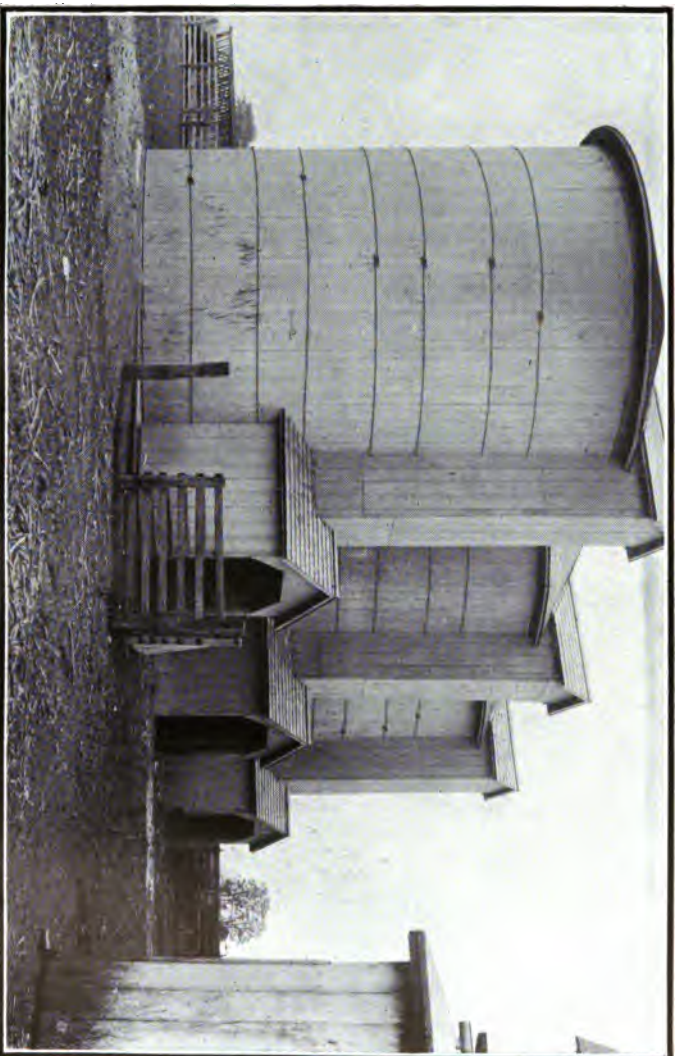
is to use cement, filling all cracks around them.

Advantages of Round Silo.—With my old square silos I found it practically impossible to prevent loss in the corners from mouldy and decayed silage, and when the silo had reached a few years of age there would be considerable loss next to the walls all around the silo, which was caused by the air coming through the imperfect walls. With my round cemented silos I have no loss anywhere when we do our work well, as the silage is sound where it comes in contact with the cement walls.

Some of the writers who are recommending the cheapest silo they can plan because it will preserve the silage when the silo is new, will know more about the business after they have had one of the cheap ones lose them sufficient silage to pay for a good one.

I have now emptied some of my cemented silos for the tenth time and there is very little indication of any corrosion of the cement by the acid of the silage. With ten years' experience I am convinced that the round wooden cemented silo is the most economical to build, taking into consideration the best preservation of the silage and the durability of the silo. The cement not only keeps the air from the silage but it also keeps the moisture of the silage from the wood and prevents its decay.

Location of Silo.—The location of the silo is



DETACHED STAVE SILOS WITH COVERED DOORS AND VESTIBULES

largely a matter of convenience. It should not open directly into the cow stable, as the odor of the silage must not be in the stable at milking time to be absorbed by the milk; remember the odor of silage does not go through the cow into the milk, but is absorbed by the milk direct. The silo may be built near the barn where it will be convenient to the feed alley, leaving a space between it and the barn that may be inclosed and used to hold the silage for one day's feeding until you are ready to feed. Such a room is almost a necessity as it takes too much time to go into the silo at feeding time to throw out the silage for that feed.

Solid Wall Concrete Silo.—Taking a 1908 view of silo building one is led to believe that the high price of lumber and the lower price of Portland cement are going to induce us to build more and more the all-concrete silos.

CHAPTER XIV.

FILLING THE SILO.

The most satisfactory variety of corn for silage depends somewhat on the locality and on the views of the farmer. One rule applies to all varieties and conditions—that is, plant a variety that will reach the stage when the ears are between denting and glazing at the time of filling the silo.

The Field Crop Variety Safest.—In localities where the large southern varieties reach this stage of maturity they may be grown, but in the northern border of the cornbelt the southern varieties will not reach this stage and should not be grown. Many prefer the varieties grown in their vicinity for field crops. This is a safe thing to do. The flint variety of corn should be grown in latitudes where the dents will not reach the desired stage of maturity. The most palatable silage I have ever had was made from the flint variety of corn planted July 1, in the latitude of Chicago. This silage gave the best results in milk of any I have ever fed, it having been put in silo in the stage from roasting ears to glazing.



LOW PLATFORM WAGON FOR HAULING CORN TO THE SILAGE CUTTER

Amount of Seed to Plant.—In my early experience I planted twenty to thirty quarts of corn per acre for silage. From this quantity I changed gradually to ten quarts per acre and then back to fifteen quarts per acre, on one half bushel. I believe this will give as much grain of the corn in the silage as the cows require, and it is best to buy some protein food to feed with it. If a farmer wishes to carry all the stock possible on his farm let him plant the corn thick, using as much as twenty-four to thirty quarts of seed per acre and buy the ground feed. I plant in rows forty inches apart with a double row corn planter, always using the drill attachment.

When to Cut the Silage.—A few years' experience convinced me that I gained the best results from the cows when feeding silage made from corn put in the silo at the denting to glazing stage of maturity, my guide in this being the cows in their work of digesting the food. I do not believe it is best to have the corn so far matured that the cows do not digest all the kernel, as I believe this is not only a loss of feed, but it is putting an unnecessary burden on the digestive organs of the cows. I do not believe one can afford to let the cows that are making us 300 to 400 pounds of butter annually wear out their digestive organs in trying to do what they cannot do. The steer that we expect to

feed one to two years is different in several ways. He can stand this kind of work for his short life, and he is not expected to perpetuate himself, no matter how good an individual he may be. But the choice cows we wish to keep to produce butter and to perpetuate themselves or an improvement on themselves. For that reason the cow is deserving of more consideration than is the steer, and the man who does not realize this will not be able to secure the best results from his cows, either from the present or the future.

In early work with the silo many cut their corn before it was sufficiently matured to give the best results when fed to cows or other stock. Later the opposite extreme was reached by some, and the corn was allowed to become too matured before being put into the silo. Some of us tried to induce the cows to adjust themselves to the conditions of the corn in which the chemists found the most nutrition, but did not quite succeed and have learned to stand by our observation of the cow.

Cut with a Corn Harvester.—When filling my silo I cut the corn in the field with a corn harvester, binding it as though it was to be shocked. Enough is saved in labor by having it bound more than to pay for the twine used for binding. There is a great difference in the labor of handling bound and loose corn at the feed cut-



FILLING AN UNCOMPLETED CEMENT LINED SILO

ter. In the early part of the season's work there is often so much moisture in the corn that it is advisable to have it lie in the sun for a few hours before being drawn for cutting, but this is not a vital point, and when we are having or are liable to have rainy weather I keep the harvester just ahead of the work.

Wetting the Silage.—As the corn becomes more matured it is not advisable to allow it to dry in the field after being cut, but keep this work close up to the harvester. Later still, when there are large quantities to be put in, it may become so dry that it is advisable to wet it before it is put into the silo. I have done this many times with good results and never with any bad results. Do not hesitate to do this as no harm will come from it. But harm may come from the lack of water to give it more weight and to pack it more closely. It must be packed so as to exclude the air or it will decay, and it should have weight in itself to accomplish this. When the time comes that you are in doubt as to whether you should use water, use it. I have never seen harm from its use. When the corn is frosted before putting it in the silo use water unless the corn is quite green and the frost is light.

Continuous Filling Best.—In filling the silos I have so much to put in that we are compelled to work rapidly, but my experience has not taught

me that it is necessary to fill rapidly to secure good silage. However it is necessary that there should not be periods of more than two or three days' time when feed is not put into the silo. This is necessary to prevent some of the silage spoiling, as it becomes very warm on top, and decay will commence in a surprisingly short time. I have been caught in this way, so I am talking from experience.

The Silage Cutter and Blower.—I use a cutter that picks the large pieces fine after they are cut. I have been terribly annoyed with the double chain elevators and now use a single chain elevator and have no trouble. I would not put up a double chain elevator if one were given to me, as I have never been able to prevent one side getting ahead of the other and causing a break which is very expensive with a lot of help about. Of late blowers have been used for elevating the silage in place of the elevators, and they have been very successful.

Method of Wetting Silage.—When the corn becomes so dry that it needs to be moistened conduct water to the feed cutter through a hose or pipe and have it sprinkled on the feed as it drops from the cutter on the elevator. This can be done by having a perforated pipe made fast across the lower part of the elevator to which the water hose is to be attached. This plan requires no labor and but little care, and it does uniform work.



A POPULAR TYPE OF SILAGE CUTTER

Packing the Silage.—As this corn is going in it must be spread evenly and packed by tramping. Especially is this necessary against the outside as there is the friction against the walls to overcome. Do not neglect this part of the work. In a silo twenty feet in diameter where seventy-five to one hundred tons are being put in daily there should be three men constantly at work spreading and packing. I have used a movable chute for an aid in distributing, and also a cone suspended so as to distribute the corn in a circle around the centre. These are an aid when they are properly managed.

Weighting the Top.—In weighting the top of the silos use the most worthless material you have in the shape of hay, chaff, straw, weeds or anything that you can cut fine and thoroughly saturate with water before or after it is elevated, as we need weight and water is the least expensive weight which we can secure. There is no danger of getting too much water on the top. This covering on the top of the silo should be eight to twelve inches thick which will prevent any loss of silage. Decay takes place on top of the silo as deep as the air penetrates or to the depth at which the weight has not forced the air out of the silage.

CHAPTER XV.

USING THE SILAGE.

Care must be exercised in removing the silage for feeding. This must be done systematically, as it is a moist feed and decay commences in a very few days after it is exposed to the air. For this reason the feed must be taken off systematically from the top, taking a layer off such depth as can be removed in two days at most, and it is better to take such a depth as can be removed daily to feed the stock. Do not allow any digging into the surface and leave some parts longer exposed than others. There is nothing to be gained by it, and there may be much lost if such a shiftless course is allowed.

Keeping Silage Two Years.—I have many times been asked how long silage may be kept. My answer is to give my experience. Two years only have I carried silage over to the following year. In that case at the time we were ready to fill on top of this one-year-old silage we removed all the decayed silage and put the freshly cut corn on top of it. The following winter when we reached this point in feeding I was very



CUTTING CORN INTO THE SILO

much interested to see if the cows would notice the difference between the silage that was six months old and that which was eighteen months old. I was at the farm when the first of the old silage was fed to study the question of palatability and was convinced that the cows did not discover that there was any change in their diet. The next point I watched was the weight of milk as it was being weighed daily. Here also I was unable to discover any change. These results were no great surprise to me, but were interesting and instructive, as they convinced me that with a perfect silo one can carry the contents as long as it may be desirable just as safely as the housewife can carry her canned fruit from year to year until it is consumed.

To carry silage from one year to the next requires a perfect silo. A silo that will permit a slight loss on the sides during the winter will make a much greater loss during the summer months, and the only safety is in perfection, or an air-tight wall and this I am sure is best secured by a cement wall.

Value of Silage as a Feed.—After about twenty-five years' experience in feeding silage my faith in it is greater than ever before. I believe that it is more superior to shocked corn than canned fruit is to dried fruit. Silage is canned feed, and if we had called it by that name from the start I believe it would have

helped many to understand the principle involved in the work. Our mothers, wives, and sisters understand canning fruit, and they know better than to use an imperfect fruit can. But we foolish men many times think anything is good enough in which to can feed for the cows. We do not always feel good natured when our canned fruit is spoiled; we do not relish it because it is not palatable. The cow rebels against injured, unpalatable food by eating less, but she gets even with us because she cannot help it. When her food is unpalatable, causing her to eat less, she has less to return to us after she has cared for herself and we suffer from our neglect or lack of intelligence. The cow does not know which it is, but she does know that something is wrong and cannot prevent showing it if she would.

Sound Silage Does Not Taint Milk.—In my early experience with corn silage as feed for cows producing milk for butter-making, I had a few tubs of butter made from silage-fed-milk and sent it to New York with a weekly shipment from one of my creameries, marking the tubs so they could be described and having them scored as numbered, the scorer knowing nothing of the difference in feed. In this case there was not one point brought out against the silage. The flavor of the silage butter was fully equal to the flavor of the dry feed butter.



FILLING SILO IN BARN ON CLOVER FARM

When I commenced to produce certified milk (pure milk) for infant feeding in Chicago I felt that I must learn more about the influence of silage, as in the work that I had done butter only had been considered, and in this new enterprise the whole milk was to be used as an article of human food, used for children whose entire diet would consist of milk.

All the first winter that I shipped my certified milk to Chicago I fed no silage to the cows that produced the milk for the babies, but I fed one stable of cows entirely on corn silage as a coarse fodder and brought to my residence daily samples of the milk from the two stables, the bottles being marked so that no one except myself could know one from the other. These samples were examined at the breakfast table by my wife and daughters and by myself several times per week for four months. As a rule we could tell no difference between them, but invariably when we did it was in favor of the silage milk. This convinced me that silage was the nearest to a perfect food for the dairy cows that we have.

Sound silage will never contaminate the milk through the cows, although the milk may contract or absorb the silage odor after it is drawn from the cows if it is exposed to a silage atmosphere. This should not be done. Silage should not be left in the mangers at milking time, nor

should it be where the odor of it cannot be excluded from the cow stable at milking time.

Perfect silage (silage put up in the proper stage of maturity) has very little odor to impart if it has been stored in an up-to-date silo under careful supervision.

Silage and Fresh-cut Corn.—There were so many mistakes made in the early work with silos and silage that it is a wonder that the work survived, and the fact that it did is proof that value and merit were back of it. One great surprise that is repeated annually to me is that when I change from the cured silage to the fresh-cut corn in the same mechanical condition the cows give a decreased flow of milk. I know of other dairymen that have the same experience. I expected to find with this change of feed an increase in the flow of milk but actually found a loss. I have found this fact and have no theory that fits it.

Another point in favor of silage is the small risk of having it damaged in harvesting, as we are practically independent of the weather because we need have none damaged in the process of harvesting it.

Amount to Feed.—The amount of silage to feed depends on conditions—whether we have it in plenty and are short of hay, or have hay in plenty and are short of silage. Whatever these conditions may be, the milk will be good if the

food is suitable. At times I have no hay for my cows, but I prefer to have alfalfa or clover hay to feed with the silage.

CHAPTER XVI.

MILKING BY HAND.

I find it more difficult to get men to do good milking than any other work on the farm. There is no place where inefficient work does so much damage and there is no place where it is so difficult to detect a poor grade of work. Comparatively few dairymen realize the importance of securing good milkers—those that will be kind to the cows, neat about their work, and careful to secure all the milk.

Kind Treatment.—The cow should be treated kindly at all times and in all places. Do not allow her to be brought from the pasture on the run with the dog so excited that she does not know where her stall is, and if she gets into the wrong one to be put out with a blow and cross words. The cow pays you for this kind of treatment at the next milking. She cannot help it if she would, and if she would she certainly is constituted differently from her owner, and he has no right to expect the cow to be his superior. There should be a kindly feeling between the cow and the man who milks and cares for her,



CLEANSING UDDERS PREPARATORY TO MILKING

and the best results cannot be secured unless this is the case. When the cows and the men enjoy one another's company we may be sure that good work is being done, work that pays the owner of the cows in dollars, and pays the man that is doing the work by the reputation that he is making, as it will certainly bring him an advance in wages.

When I discover that my cows are afraid of the men that are caring for them I know there is something radically wrong. I know the cows have been abused some time just as well as though I had seen it done.

Cleaning and Washing before Milking.—We are coming to realize more and more the importance of cleanliness about the cows, the need of keeping the stable clean, and the cow clean as well. The consumers of milk are realizing more and more that pure milk has no unpleasant odor, and that the so-called animal odors are filth odors. There are seasons when it is hard to keep the cows out of the mud in the pasture, but we must plan to have the cow clean when she is milked; and if we cannot keep her out of the mud and filth we must clean her before we milk her. For many years I have practiced having each milker wash the udders of his cows before milking when they are not clean. The only objection to this is that the manipulation of the udder in washing stimulates the secretion of

milk, and if we do not commence at that time to milk we do not secure the best results from the cow, as we must work with nature if we wish to induce her to do her best. When there is a herd of sufficient number it is best to have a man to do this cleaning of the udders for all the milkers and do it just in advance of the milking. But there are few herds of sufficient numbers to warrant this, and in such cases it is best to require each milker to have a pail of water and a cloth with which to cleanse the udders before he commences to milk. This requires only a little time and it is necessary if we are to have our milk as clean as we have other articles of food.

Regularity in Milking.—There is no place where system pays better than in caring for and milking cows. Each cow should have her regular stall and should be milked by the same milker at regular hours. Women make the best milkers as they are kinder to the cows and realize that the cow is a mother, which some men apparently fail to do, or if they do they have little respect for motherhood. If I were a woman I would not marry a man that I knew to be ugly to a cow, for he is not to be trusted; he is as much of a brute as the cow if not more so. Never allow promiscuous milking.

Milk Quietly with Dry Hands.—The milkers should do their talking before they begin to milk and then attend strictly to their milking



MILKER IN WHITE UNIFORM

and do the work as fast as they practically can. Always milk with dry hands. Do not dip your fingers in the milk or allow it to be done. A person can milk better with dry hands as soon as he becomes accustomed to doing so. I was taught to milk with wet hands but broke myself of the bad habit. Dipping the fingers in the milk or froth is an uncleanly habit.

It is best to milk in the stable summer and winter, as it should be cleaner there than in the yard, especially if the milker commences at the right end of the row, that is, the end where his back will be to the wall and no cow behind him, so as to turn out the cow as soon as milked and not have her standing behind him to help to give him a swat and perhaps kick him in the back. The only time I ever got hurt in milking was by the cow behind kicking me in the back.

Find the Cause of a Cow's Kicking.—When a cow kicks, the first thing the milker should do is to look for the cause. Do not fly into a rage and scold the cow, but remember that the cow must have had cause for kicking. You may think the cause was not sufficient, especially if she hit you where it hurt, as she probably did for cows have a faculty of doing that. When a cow kicks she is either frightened or hurt, and if she is frightened and kicked you it is strong circumstantial evidence that you have some time

hurt her and she is afraid that you are going to hurt her again, and she feels that her safety depends on her ability to defend herself. It is possible that if strict justice were to be done you might need to be kicked out of the stable.

Twenty-five years ago I had a friend in the village where I did business who had a choice cow and he often told me of her good qualities, but one day he said to me that his cow had contracted the habit of kicking and he could not milk her and would have to sell her. I told him there was some cause for this change, but he could not think what it could be, and was positive that it was pure viciousness. This I would not believe, and told him to put a little linseed oil on her teats every time he finished milking her. The next time I met him he laughed and said his cow was cured, as a few applications of the oil had remedied the trouble and showed him what it was. The cause in this case was a pond of water in the pasture in which the cow stood fighting flies, getting her teats wet and causing them to chap, but not so deeply that the milker discovered it until the healing process had commenced. Then he discovered the cause and was made happy, as well as the cow.

There is always a cause for a cow's kicking and it is not to our credit not to be able to find it. In case you cannot find and remove the cause of a cow's kicking, the cow should be

taken from the herd, as a kicking cow is too severe a test on the milker's patience and the disturbance has a bad effect on all the cows and milkers in the stable.

Profit from Clean Milking.—The difference in milkers is both surprising and alarming. I am surprised at the facts and alarmed at the results. I have had milkers in my employ who would secure from fifteen cows enough more milk than other milkers to pay their wages. This may seem a large statement, but it will surprise no one more than the facts surprised me when I discovered them. I demonstrated this matter before I would believe it myself. I followed the work of three milkers two and a half months to convince myself of the truth of the statement.

I test all my cows periodically, and at the same time I watch the milkers. This takes no extra time, except in the matter of looking up the record, as each milker has his regular cows to milk; and at the end of the season it can be very readily calculated how each milker has made his cows "hold out," as we term it, with their milk. The following figures are from my books giving the record of the work done during one winter:

Milker No. 1, Dec. 17, cows gave 356 pounds;
Feb. 28, 258 pounds.

Milker No. 2, Dec. 17, cows gave 298 pounds;
Feb. 28, 244 pounds.

Milker No. 3, Dec. 17, cows gave 304 pounds; Feb. 28, 204 pounds.

During this time the cows of milker No. 1 shrank 98 pounds; milker No. 2's cows shrank 54 pounds and milker No. 3's cows 100 pounds. The shrinkage per cow from Dec. 17 to Feb. 28 was for No. 1, 7 pounds; No. 2, 5 pounds and No. 3, $9\frac{1}{2}$ pounds.

Milking for Prizes.—After studying over this milking question for two years trying to devise some plan by which I could interest my milkers in their work, thereby securing better service, I decided to offer prizes. I had five milkers and I offered three prizes to be awarded on the percentage of shrinkage for a term of months. The first prize was \$10, the second \$5, and the third \$2.50. My milkers were greatly interested in this work during the whole time of the contest, and the results showed careful work.

I had a plain talk with my milkers when the prize work commenced, telling them of the need of kindness, care and regularity of time in milking; also the necessity of securing all of the milk. I told them that if at any time the totals of milk at the barn and the creamery did not agree, each milker would be furnished with separate cans and would be expected to make his milk at the barn and creamery compare, and that if at any time I learned of any man's unfair work to get an advantage I should ex-

clude him from the competition. I am now pleased to be able to say that nothing of the kind was discovered.

One milker who milked twelve cows had a variation of seven pounds from highest to lowest daily weight of milk during a week. Another milker who had fourteen cows to milk had as low a variation as seven and one-half pounds in the daily milk of his cows in a week. My total milk, which reached 1,850 pounds daily, varied less than some of the patrons who had 250 to 300 pounds daily. This was the result of careful systematic work, and work that pays.

The young man who won the first prize had a shrinkage of 1.85 pounds per cow in three months. The winner of the second prize made a shrinkage of two pounds per cow, and the third prize winner made a shrinkage of 2.6 pounds per cow for the three months. This work when compared with the work of the previous winter for the same months and under the same conditions as nearly as possible is interesting to say the least. Some of the work of the previous winters was alarming, though it was doubtless as good as the average milker. I have the record of one milker for three months in 1892 and 1893, also in 1893 and 1894. In the first winter the percentage of shrinkage for the three months was $27\frac{1}{2}$, and the following winter when competing for a prize his shrinkage was

9½ per cent for the same months. When not competing for a prize his shrinkage was seven pounds per cow in three months; when competing it was 2.6 pounds—a difference of 4.4 pounds.

Losses from Poor Milk.—The difference between the poorest work of the winter of 1892 and 1893 and the best work of 1893 and 1894 rolls up in a way to frighten me and make me doubt my own figures. The poorest work shows a shrinkage of 9½ pounds per cow in three months, and the best work shows a shrinkage of 1.88 pounds per cow for the same length of time. This difference is 7.62 pounds per cow daily. I think it fair to suppose that the average difference of shrinkage for the three months would be one-half as much as it was at the end of the three months. This would be 3.81 pounds per day for ninety days, or 343 pounds.

Now we will suppose the shrinkage after the three months is the same in both cases, and we have 200 days at 7.62 pounds, or 1,524 pounds plus 343 pounds equals 1,867 pounds per cow, and for fifteen cows 28,005 pounds of milk, which valued at \$1 per hundred pounds would amount to \$280.05. I do not think this comparison is an exaggeration. I have supposed that the shrinkage in both cases was alike after the three months, which is not fair to the best milker, as it is more than probable that the

shrinkage of the poor milker kept on increasing over the good milker and that his cows were dried a month earlier than were the cows of the good milker.

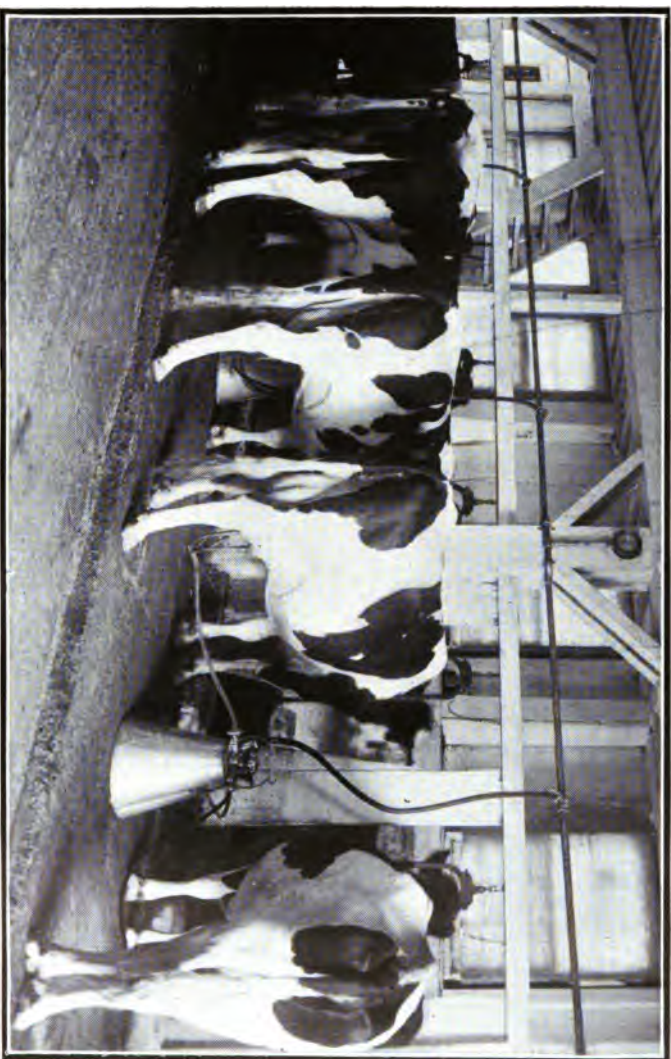
There are milkers that cannot do good milking when they try their best, but there are many more that do not try. Just as it is in all lines of work and business, some can see their opportunities and improve them, others see them but have not the energy and perseverance to improve them, while a few both see and act on the opportunities and get to the front. The other men say they are lucky, and I think that is true, as they were lucky in being well born, in inheriting traits that enable them to see opportunities and prove themselves victors.

CHAPTER XVII.

MILKING BY MACHINERY.

After waiting for thirty years for a practical milking machine and reaching the conclusion that we should never have one, I was agreeably surprised to be informed that cows were being successfully milked by machinery. An investigation convinced me that this was a fact and I ordered six machines which were installed Dec. 6, 1905, and proved so satisfactory after six months' use that I ordered seven more.

Operation of the Machine.—The work of the machine was watched with care and intense interest, as it meant so much to me if I could get good results from it. One of our first surprises was to learn that the cows that kicked when milked by hand did not kick when milked by the machine. Hand milking hurts a sore teat and the machine does not. Some cows' teats are not sore but are tender and cause the cows to kick when being milked. These cows take kindly to the machines. Heifers with their first calves accept the machine much more readily than they do hand milking. These points were brought out early in my experience and con-



THE BURRELL-LAWRENCE-KENNEDY MILKING MACHINE AT WORK

vinced me that the cow, when she became acquainted with the machine, would accept it as a friend. We made some mistakes accidentally and some were made purposely by men who wished to prove the machine a failure that their predictions might become true.

Comparison of Results.—We had some cows milked by hand to compare the shrinkage in flow with those milked by machine as the cows passed along in their periods of lactation. A few months' work revealed that the machine-milked cows made a smaller percentage shrinkage than did the hand-milked cows. We also watched the cows when they freshened after one milking period by the machine and by hand and found a larger percentage of damaged udders among the hand-milked cows.

The machines attracted visitors to the farm to such an extent that I was compelled to prohibit company in the stables at milking time. I had learned that visitors were a cause of shrinkage in milk flow when the cows were milked by hand and believed the result would be the same when the machines were used, but waited for proof of it before putting prohibition into effect and was finally compelled to make the order.

I was at this time producing certified milk and was very anxious to learn the comparative numbers of bacteria in our hand-drawn milk and machine-drawn milk. I paid \$150 for bac-

teriological work to demonstrate the point and learned that by the use of the machine we reduced the bacteria more than one-half the number we had when doing our best at hand-milking. We find it entirely practical to keep the machine in a sanitary condition. There are full directions with the machines for their care and if they are followed there will be no trouble as to their sanitary condition. When the machine-drawn milk contains more bacteria than the hand-drawn milk, it is strong evidence that there is neglect in caring for or in operating the machines. It is conclusive evidence of carelessness somewhere.

Intelligence Required in Operator.—Some persons will not succeed with the milking machine and I do not know of any kind of machinery with which every operator becomes an expert. I have paid high for the knowledge that many hand-milkers are utter failures, while many more are only fairly good milkers, and a very small percentage are expert. The expert machine-milker will do as good work as the expert hand-milker and will cut the expense of milking in half at least. In a few years we will have a supply of efficient machine-milkers without doubt and they will command better pay than the average farm hands, as they will be worth more.

Hall & Hall, Aurora, Ill., have in use milking

stalls, the cows coming to the machines in stalls to be milked. They use two machines and Mr. Hall has milked 30 cows in an hour with the two machines. I am much pleased with this plan of operating the machines.

The Burrell-Lawrence-Kennedy milking machine is a very close imitation of the sucking calf in its action and is very pleasant to the cow when handled intelligently; but it will not go alone; it is not fool-proof.

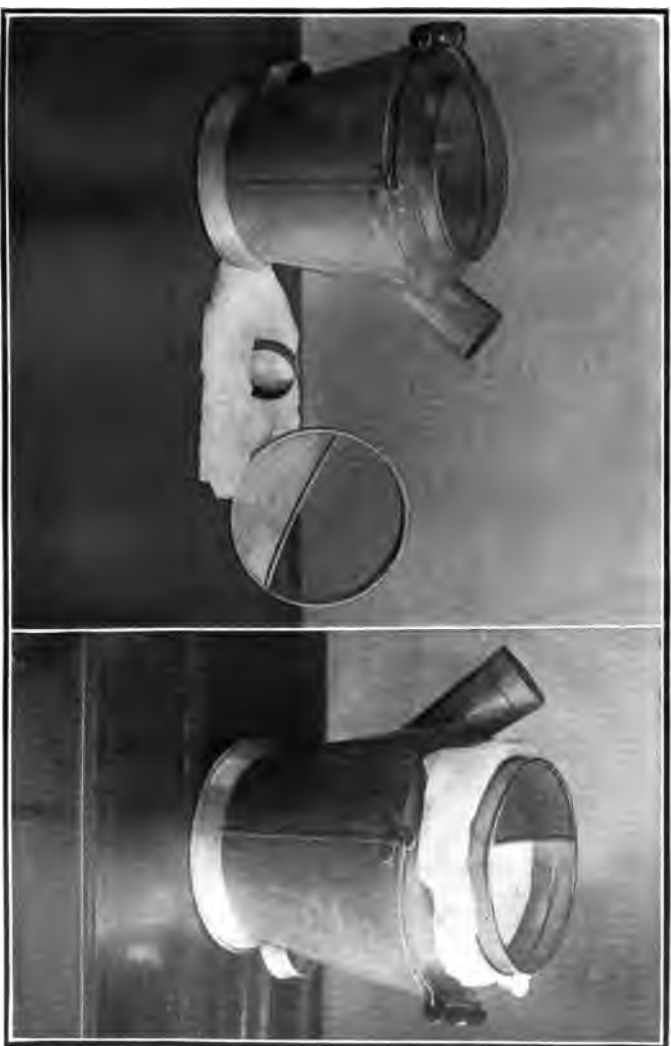
CHAPTER XVIII.

HANDLING THE MILK.

As soon as the cow is milked, strain the milk through a wire strainer into a can which is to be used to convey the milk to the milk-house or the room where it is to be set to raise the cream or put through the separator to separate the cream from the milk. There it should be strained through a cloth strainer.

Flannel Strainers.—When I made butter at my farm I used woolen strainers for this purpose. They do thorough work but require considerable care to prevent them thickening or fulling so the milk will not run through them. Cotton strainers will do more thorough work than a wire strainer, and I prefer them in a milk room. When the shallow-pan system is used the milk should be set as soon as is practicable after it is strained, as the cream raises the fastest while the milk is cooling and the sooner set after milking the more benefit we get from the cooling process.

Pure Air.—Care must be exercised to secure pure air in the milk room as the milk quickly absorbs odors from the surrounding atmosphere.



THE GURLER MILK PAIL, WITH ABSORBENT COTTON STRAINER

I have known milk to absorb odors from the hog pen which were detected when the milk was delivered at the creamery.

Temperature of Room.—The temperature of the room in which the milk is set should be 60 to 65 deg. so that the milk shall be sour but not thickened, except at the bottom of the pans, when it is to be skimmed. I believe the most thorough creaming is secured when the milk sets 36 hours to reach this proper stage for skimming. I have sometimes in the winter time allowed it to set 48 hours and warmed the milk at the end of 12 hours and warmed it the second time at the end of twenty-four hours.

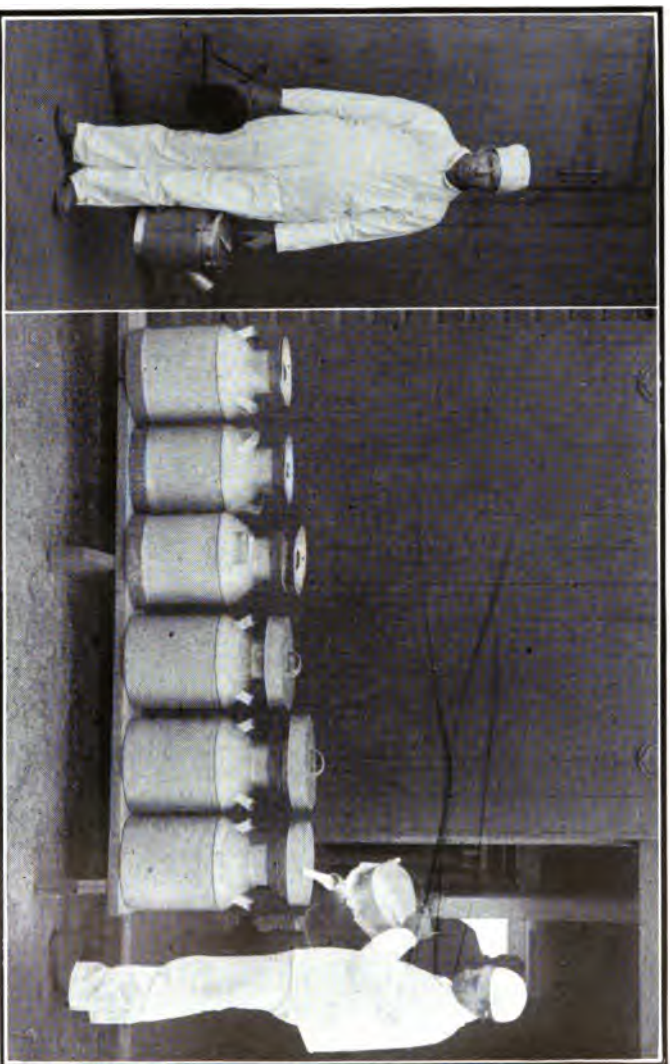
Repeated Cooling Gives Thorough Creaming.
—In this way we repeat the cooling process and secure very thorough creaming—the most perfect of any plan except the centrifugal separator. I used large shallow pans, holding 500 lbs. of milk, and these pans were surrounded by a water pan for heating and cooling the milk. This plan of heating and cooling gave the richest cream I have ever seen. I practiced cutting the cream into squares with a knife, and picked them up with a tin ladle, as pancakes would be taken up. I remember some instances when it would not pour out of a can 8 inches in diameter when I put it into the churn. Such cream cannot be churned until reduced with skim-milk.

The advantage that comes from such a qual-

ity of cream is the thorough creaming that is secured. I have not found it practicable to treat the milk this way in the summer months. Such cream as this is ripe and ready to churn when taken from the milk, but it can be held two or three days with safety if kept at a low temperature. It contains but a small per cent of milk, and for that reason does not sour or ripen so fast as cream that has a larger per cent of milk in it.

. When milk is set in small shallow pans it can be treated to this heating and cooling process by placing the pans in a vessel of hot water or over boiling water and heat with steam. When this is practiced the temperature of the milk room must be held down as low as 40 deg. Fah., if possible, or the milk will sour too soon. My practice was to open the windows and get the temperature down near the freezing point until the milk was cooled.

Do not skim the milk until it is ready to be skimmed. The cream cannot be taken off from shallow pans without considerable loss. It should stand until the cream thickens and the temperature of the room should be such as to cause it to thicken before it is old enough to suffer in flavor. Observation and experience teach a person about these matters. It is also important that the milk should be skimmed as soon as it is ready; if not there is danger of loss in flavor.



STRAINING THE MILK INTO CANS

Submerged Plan.—If the submerged or deep cold system is used for cream-raising the milk should be set as soon as it is practicable after it is milked and strained. The sooner it is set and the cooler the water it is set in, the better the results. The warming and cooling process can be used to advantage with this system. Cream raises fastest while the milk is cooling, and if we can repeat the cooling process, we accomplish more efficient work.

There is a variety of opinions as to the necessary time for milk to set to secure the best results by the deep and cold-setting system. My experience is that a larger yield of butter is secured when it is held 24 hours in ice water than when held 12 hours, and if held in water at 60 deg. Fah. it is best to let it set 36 hours and in some cases 48 hours.

The breed of the cows and period of lactation have much influence on the cream raising. The cream globules are larger in the milk of some breeds than others, and this fact must be taken into account in the gravity methods of cream-raising. The milk of all cows creams more readily when they are fresh than when they are advanced in the period of lactation. The period of lactation has much influence on the flavor of butter. When the cows are nearly dry the butter has not as good flavor as when the cows are fresh. This will apply to all methods of cream-

ing, whether the shallow-pan, the deep cold system, or the separator, although the separator will secure a larger increase of butter over the gravity method when we have a hard-skimming milk than when we have a milk that creams readily. The conditions must be the most favorable to secure thorough creaming with the gravity methods, but the separator can be adjusted to get practically all the cream from any and all milk.

Care in Skimming.—The skimming of the Cooley and “shot-gun” deep-setting cans is very different. In the Cooley can the skim-milk is drawn from the bottom and the cream is not disturbed except as it settles as the milk is drawn out of the can, but with the “shot-gun” can the cream is taken off the top with a conical dipper and great care is necessary to avoid mixing the cream and milk during the process of skimming.

Centrifugal Separators.—When a centrifugal separator is to be used, I would recommend that some power be used, either water, steam, some animal or gasoline power. Do not calculate on the hired man, the boy or the proprietor doing this work. If you have cows enough so you can afford to have a separator, you can afford to have some power to operate it. I have had just enough experience in this line to know that it is hard work. It is the kind of work that does



CREAM SEPARATOR, BOWL TYPE

not induce the boy to remain on the farm. If any person should do this work it certainly should be the proprietor.

The most practical power for operating the separator is a tread power on which the bull can be used. This exercise for the bull helps to keep him in good condition and increases his usefulness. The Illinois experiment station uses tread power to exercise the bulls when there is no work to be done by the process.

I do not wish to be understood as opposed to the separator, as I know very well that it will secure for us the most effectual work possible. I believe that we can make butter with a more delicate flavor or, if you please, a higher flavor, when the separator is used than with gravity methods of creaming. Especially will this be the case in the dairy, as the milk will be separated immediately after milking and the quicker it is done the better. With the utmost cleanliness there is liable to be and at times will be elements in the milk from contact with which it is best that the cream should be removed. Any one who has operated and cleaned separators for a few months can realize this point fully. In proof of this point, it has been learned that milk for cheese-making is improved by running it through a separator without separating the cream. I believe Dr. Babcock has practiced this in an experimental way.

When the separator is to be used it is best to separate as soon after milking as is practicable. If power of some kind is used the separator can be put in operation soon after milking has commenced or at least commenced in time to have continuous work for the separator and get through separating as soon as practicable after the milking is done. The milk as it comes from the cow is in the best possible condition to separate.

Farm Skim-milk.—There is a great variety in the quality of work done in the line of skimming by farmers. I have tested farmers' skim-milk from the gravity process that contained $1\frac{1}{2}$ per cent of fat. They had recovered less than two-thirds of the fat in the milk. This quality of work makes an enormous loss. No business except farming could stand such losses. The dairyman of the future is not going to make such wastes. It is only quite recently that we have any practical method of knowing what losses were being made and now we are stopping these leaks rapidly.



CREAM SEPARATOR, TUBULAR TYPE

CHAPTER XIX.

RIPENING AND CHURNING.

We will now suppose we have the cream separated from the milk by some one of the processes. The cream from the shallow setting when the milk was sour at the time the skimming was done may be churned as soon as convenient after it is taken from the milk, as it has ripened on the milk and is in good condition to churn.

Holding Cream.—It may also be put in a can and held for two or three days, if held at a low temperature—50 deg.—and cream may be added from each succeeding skimming and thoroughly mixed with the cream already in the cream can. The cream can should be large enough to hold a churning, then we are quite sure that the cream is all of a uniform ripeness. This is necessary to secure the most exhaustive churning.

When we mix cream of different degrees of ripeness in the churn there is sure to be a large loss in the buttermilk. If the churning is done at a low temperature the loss will be less than if done at 60 or 62 deg. This rule will hold good with all kinds of cream and all degrees of ripeness.

Some kind of a vessel about the same depth as the cream can and several inches larger in diameter is needed to put the cream can in and surround it with water, warm or cold, as needed to warm or cool the cream. A wooden vat may be used for this purpose.

Deep Cold-setting Cream.—The cream from the deep cold-setting will be, or should be, at a low temperature when taken from the milk. This may be put in the cream can or vat and held at a low temperature, as low as 50 deg., if practical, adding the cream from each succeeding skimming until a churning is secured, or from two to four days, giving the cream a thorough stirring every time fresh cream is added. About eighteen to twenty hours before you wish to churn warm this cream to 65 deg. and hold it at this temperature until ripened, which will be about eighteen hours.

Separator Cream.—The cream from the separator should be immediately cooled to a low temperature, the degree depending on when it is to be churned. If to be held two or three days, cool it to 50 deg., or as nearly as practical. If ice is used 40 deg. can be reached. The cream from each successive skimming may be added to the can and thoroughly mixed at each addition of cream. This cream may be ripened the same as the cream from the deep cold system.

Different Temperatures for Churning.—We now have the cream from the shallow setting, the deep setting and from the separator, ripened ready to churn. The next point is to secure the proper temperature before putting it in the churn. It is best to cool the cream from the shallow setting system to 54 or 56 deg. before churning. This cream is rich in fat and can be churned at this temperature without any difficulty. Let the cream stand at low temperature before churning long enough for the fats to solidify or harden.

The cream from the deep-cold system has a much larger per cent of milk in it, and consequently a smaller per cent of fat, and will need to be churned at a higher temperature. If we undertake to churn this cream below 55 deg. we will probably have trouble from its swelling and will find the churn full of frothy cream. The proper temperature for this cream is 60 to 62 deg. in winter and 58 to 60 deg. in summer.

The separator cream should be cooled to a temperature to correspond with the per cent of fat it contains. If the separator is adjusted to take from one-seventh to one-eighth of the whole milk as cream, it will contain sufficient fat so we can churn it at a temperature below 55 deg., but if the separator is adjusted to take one-fourth to one-fifth of the milk as cream, we shall have need to churn at the temperature of

58 to 60 deg. This kind of cream gives us more buttermilk with more fat in it. Rich cream and low temperature give the most exhaustive churning.

Preparing to Churn.—When the cream is being cooled, get the churn ready by first scalding with water that is above 180 deg. and if it boils all the better, as it will then surely scald. After scalding cool thoroughly with cold water and ice if you have it. When cooled the churn is ready for the cream. Never fill the churn more than half full, as it will require more time and not do so thorough churning.

When cream is ready to churn it has a mild acid. It should not reach the acetic acid. It should not reach the stage of whey accumulating in the bottom of the can.

Straining and Churning.—Strain the cream into the churn. A perforated tin strainer is good for this work. Straining breaks any dried cream there may be, also the curd if there is any, and enables us to wash it out of the granular butter with less labor and care. There should be no curd in the cream and if it has been agitated frequently and not allowed to become too sour there will be none.

In case you have allowed the cream to become so sour that there are hard curd specks in it, be sure to stop the churn when the butter is in small granules or as soon as the butter will all float.

Draw off most of the buttermilk and add water and agitate gently with a swaying motion and draw off the water, repeating this process two or three times. The curd is heavier than the water and will settle to the bottom of the churn when it can be drawn out with the water. There is always a loss of flavor when the cream has become so sour as to have curd specks.

Butter Color.—If the butter needs coloring to satisfy your trade put it into your cream before starting to churn. When purchasing butter color be sure that you get fresh goods, as it will sometimes become stale with age and injure the flavor of the butter. If you buy the small bottles at your grocery store you will need to look well after this point. I have had butter color that would impart a flavor to the cream that could be detected before the churn was started. In case you forget to add the color to the cream, you can add it to the salt, using the same quantity that would be used in the cream. By stirring the salt as the color is added it will take the color and impart it to the butter very well.

The Churn.—Use some churn that revolves, as there is no place for cream to accumulate and cause a loss of fat in the buttermilk. The sealed churn holds the temperature best during the process of churning, which is an advantage.

Temperature of Churn Room.—Have the temperature of the room in which the churning is

to be done as cold as the cream if possible, and if it is 10 to 15 deg. colder all the better, as the cream will then not become warm during the churning process. But if the churn room is up to 75 or 80 deg. the cream will warm up very fast and the butter will not be in as good con-



Barrel Churn.

dition. It will need much more washing than when it gathers cold.

Washing the Butter.—The churn should be stopped when the granules of butter are the size of wheat. If the churning is continued until the butter is gathered into a solid mass, it cannot be washed to remove the buttermilk or curd

specks, in case there are any. Draw the buttermilk through a fine sieve, and wash it as little as practical to remove the buttermilk. Here is where the cold churning has the advantage, as the butter will not need so much washing. When the butter gathers at 62 to 64 deg. it will need three washings to remove the buttermilk and it will then show milky when it is worked; but if it gathers at 52 to 54 deg. it will require but one washing, if any, and I am confident we will have a better flavor if not washed at all. When washing do not allow the butter to remain in the water any longer than is absolutely necessary. Remove the water as soon as it has done its work. Allowing butter to lie in water is a vital mistake, as it removes flavor.

Low Temperature.—Churning at 50 to 52 deg. is a radical change from the general practice and there are still many who do not believe it practical, but it is the daily practice in our creameries in cold weather. It is not unusual but rather the rule that our butter will stand as low as 54 deg. in winter when the buttermilk is removed. To avoid too much washing, churn at as low temperature as possible. To secure the most exhaustive churning, churn at low temperature. To churn at low temperature it is necessary to have a rich cream. Do not attempt to churn poor or thin cream at a low temperature, as you will have trouble. I have many

times in my early experience had cream from deep cold setting that was too cold and swelled so as to fill the churn too full, thereby preventing churning, and I was compelled to draw out one-half of it and make two churnings. This will require less time and much less patience than it will to churn or try to, when the churn is so full that there is no concussion.

Handle with Ladle.—Keep the butter in the granular form until it is put on the worker and the salt is added. . Keep your hands out of the butter and handle it with a wooden scoop and ladle.

CHAPTER XX.

SALTING AND FINISHING THE PRINT.

The salting may be done in the churn or on the worker. If the box or barrel churn is used it can be salted very nicely in the churn. Use a sieve and put the salt through it into the granular butter, then revolve the churn very slowly and the salt can be thoroughly mixed with the butter before it is taken from the churn and while it is in the granular form. The main objection I have to salting granular butter in the churn is the uncertainty as to the amount or weight of the butter. When a small churn is to be used this can be overcome by weighing the churn with the butter in it. This was my practice until my dairy increased so as to require a churn of a size that could not be readily handled and weighed. The advantage of churning at a low temperature comes in here too, as the butter at a low temperature does not pack so readily and the salt can be mixed with less working.

Amount of Salt.—Use sufficient salt to suit your trade. Our experience is with a trade that wants three-quarters to one ounce per pound.

Butter-Workers.—Work the butter once or twice as you like. Take the butter out of the churn with a wooden scoop. A small scoop can be secured for dairy work. Some style of a hand butter-worker should be used. There are several styles that are all right.

Once Working.—The butter should be worked enough to incorporate the salt thoroughly so that when it has stood twenty-four hours it will not show mottled or streaked when bored or cut with a ladle. If at any time you find this appearance in your butter you may know that it is not thoroughly worked and it is best to rework butter that has much of this appearance.

Twice Working.—If twice working is practiced it should be worked sufficiently at the first working to get the salt well incorporated with the butter; then it should stand long enough to allow the salt to dissolve, when it is ready for the final working. At this working the butter is sufficiently worked when there are no streaks of white to be seen when cut with the ladle and held to the light.

Do not confound this mottled or streaked appearance that comes from insufficient working with the white curd specks that come from too sour cream. With cream from shallow pans there is some danger of parts becoming so dry that they go through the churning process and we find them in the butter as dried cream and

when color has been used they will show as light spots though not white as the curd will. Straining the cream will remedy this trouble. You can readily tell the difference, as one is fat and will readily dissolve between the thumb and finger and the other is curd and will not dissolve either in the mouth or by heat.

Kind of Packages.—Use a package to suit your trade, but whatever you use be sure that it is clean and sweet. Stone and earthen jars must be looked after very carefully, especially if they have been previously used, as they quickly get out of condition if not properly cared for. Wooden packages should not be used a second time for packed butter. Most of them are cheaply made and are intended to be used but once, and it is a very difficult matter to have them kept so that it is safe to use them a second time.

The dairyman will have more of this to contend with than the creamery man will, and he must look sharply after it. I have had bad smelling packages come from the best families. The mistress cannot attend to everything, but must trust to some one and she is often deceived on this point.

Butter Prints.—The practice of printing butter has grown remarkably during the past fifteen years and now (1908) most of the butter that is retailed is put up in one pound prints

which are wrapped with parchment paper, which carries the name of the farm or the



Butter Printer.

maker. I find that the retailer prefers this form to the solid packed as he can handle it like canned goods in filling orders. I have been told by grocerymen that when they sell small quantities from a large package three cent margin is necessary to get back the money they paid for the butter. Another point in favor of the print butter is its better appearance. When it is nicely printed and wrapped in parchment paper it looks very neat and attractive. It can also be more readily put in shape for the table.

Shipping-Boxes.—There are shipping-boxes for print butter for sale by dairy implement



Butter Shipping-Box.

dealers, some with ice-box attachments and others without.

CHAPTER XXI.

MARKETING DAIRY BUTTER.

There are many ways of marketing dairy butter. At times it may be sold to good advantage at the country store, but this is the exception, not the rule. The country store does not usually pay for butter on its merits. The seller is often a customer and they do not want to offend and so they pay more for poor butter than it is worth, and to balance up must pay less for good butter than it is worth.

In many places a good market may be secured among the citizens of the village or city where you trade. Many are anxious to have a reliable source of supply, and are willing to pay well for butter that satisfies them.

Poor Butter Makes a Loss.—Poor butter makes a loss to the maker and usually to every one down the line that has anything to do with it excepting the commission houses, and it makes them tired. The dealer makes his profit on the fine goods. Now all low grades go to the process factories to be renovated. All butter that goes to the renovators has made a loss

to the maker or dealer who has handled it and many times to both.

Fine Butter Makes a Profit.—There is no trouble in selling fine butter. The trouble will come from not being able to supply the demand. When you have reached this condition you are in position to secure an advance in price. This is what you have been working for. Now you have the move in the game and should try to keep it. This you can do only by continually trying to do better work. It will not answer to think you have reached the top and can remain there without an effort, as this feeling leads to defeat.

Commission Houses.—A good way is to consign to a reliable commission house. Here your butter will sell on its merits, and if there is anything wrong with it, you can learn what the trouble is, and when you are told do not be offended about it but go to work and remedy the trouble. In selecting a commission firm to sell your butter be careful not to make a mistake. There are plenty of reliable firms that advertise in the dairy papers. Many dairy papers will not receive an advertisement from a firm that they do not know to be reliable. And this is right.

When you have decided to let a commission man handle your butter and have selected your man, remember that you and the commission

man are both interested in having good sales made, and you can help him by shipping your butter on a regular day, as often as once per week. The commission man will soon have customers for your butter and they will depend upon it.

Have a brand for your butter, and be sure you keep the quality up to standard. If at any time you have butter that is not up to standard, keep your brand off it. Consign it to your regular man and tell him what the trouble is, if you know, and if you do not ask him to help you over the difficulty; in many cases he will be able to do it. Treat him as a friend and in nine cases out of ten, he will prove a friend.

In my early dairy experience I had private customers, but I somehow drifted away from them. Sometimes I had a surplus to consign and at other times I did not have enough to fill my orders, and if I bought to meet the demand there was in many cases dissatisfaction.

Butter Has Individuality.—There is an individuality about butter as much as in persons and when customers become acquainted with a certain brand they prefer it to some other make that is equally good. This individuality must be preserved. If at any time you think it best to make a change in any of the details of your work let the change be made gradually, so the customers will adapt themselves to the change

and probably be pleased with it, when if you had made an abrupt change they would not have liked it. I recently had the pleasure of examining some butter made near one of our large cities. This butter was selling for seventy cents per pound. This caused me to examine it very carefully. The butter was very fine. It had a peculiar flavor, different from any flavor I had ever discovered in butter before. I was told that this peculiar flavor was virtually a trademark; that the consumer soon learned to like it and preferred it to any other flavor. I mention this in proof of the statement that customers prefer what they have become accustomed to rather than anything different that is equally good.

Care Pays Well.—Do not be afraid that extra time spent in fitting your butter for market will not pay. Remember that you are building a reputation that will enable you to secure a better price and cause your butter to sell readily at all times. On a dull and declining market especially will it do you good, as your goods will move in time to escape a large part of the decline. Poor butter always gets caught when the market declines. This leaves it to go from bad to worse, and it will go at a terrible gait, as we become well aware when the returns come.

CHAPTER XXII.

UTENSILS FOR THE DAIRY.

Milk pails should always be of tin. When purchasing tinware of any kind have your tinner solder around all rims and open joints where dirt can accumulate. The cost of this will be saved many times over in the labor required to wash them. I never had sufficient patience to fool away my time trying to get a dishcloth into every corner and around rims and ears of pails, when I knew a few cents spent at the tin shop would put the tinware in shape that the dishcloth will reach all parts and time is not required to dig dirt out of holes that need not be. Clean all utensils as soon as possible after using them. The longer they remain without being cleaned, the more time will be required to do the work.

Washing Tinware.—When washing tinware about the dairy always use first cool or tepid water, as hot water applied to milk vessels cooks the milk onto the tin and gives them an appearance that you will not take pride in displaying. After they are washed in tepid or cold water,



CREAM VAT.



BUTTER WORKER.



SIEVE FOR GRANULATED BUTTER.
SOME UTENSILS FOR THE DAIRY



1-LB. BUTTER MOLD.

wash them in hot water, then scald them with boiling water or steam if it is available. When steam is used there is no guess work about it, as it reaches all parts and does thorough work. When hot water is used there is often too much guess work about the temperature.

After scalding, the vessels should be put in the sun to dry and air. When thoroughly scalded there is sufficient heat to cause the dishes or vessels to dry without wiping. Have a place for all the tin and woodenware in the sun for a time after cleaning and scalding. Never put the covers on tin vessels after scalding them, neither will it answer to put them in a position that will prevent a circulation of air. Dead air is far from sweet-smelling.

Churn and Worker.—The churn and butter-worker and all other wooden utensils should be first washed in hot water, then scalded with boiling water or steam. Wooden utensils must not be left in the sun long enough to cause them to warp or crack.

Preparing Wooden Utensils.—Before using the churn and all other woodenware it should be scalded, then thoroughly cooled. Scalding wooden utensils and then thoroughly cooling with cold water will prevent the butter sticking to them. When the butter sticks to a wooden vessel or utensil it is positive proof that it has not been properly prepared before using and the

only way is to do this work over in a proper manner.

Return Milk in Barrels.—Great care is necessary in cleansing cans that are used in drawing milk to a creamery, especially if skim-milk or whey is returned in them. The best way is to take the milk back to the farm in barrels and have the cans washed at the creamery before being returned to the patrons. But in many cases this is not practicable, as the milk comes in loads and the skim-milk must go back in cans, if it is taken, which it surely should be. These cans should be treated as any other milk vessels, but more care is necessary, as in many cases the milk has become sour before reaching home and adheres to the can. A brush is an excellent tool to use for this work, as it will get at the corners much better than a dishcloth. Lack of care in this line soon gives foul cans and bad milk. All vessels must be kept sweet and clean or there will be serious trouble in a very short time.

CHAPTER XXIII.

MAKING CERTIFIED MILK.

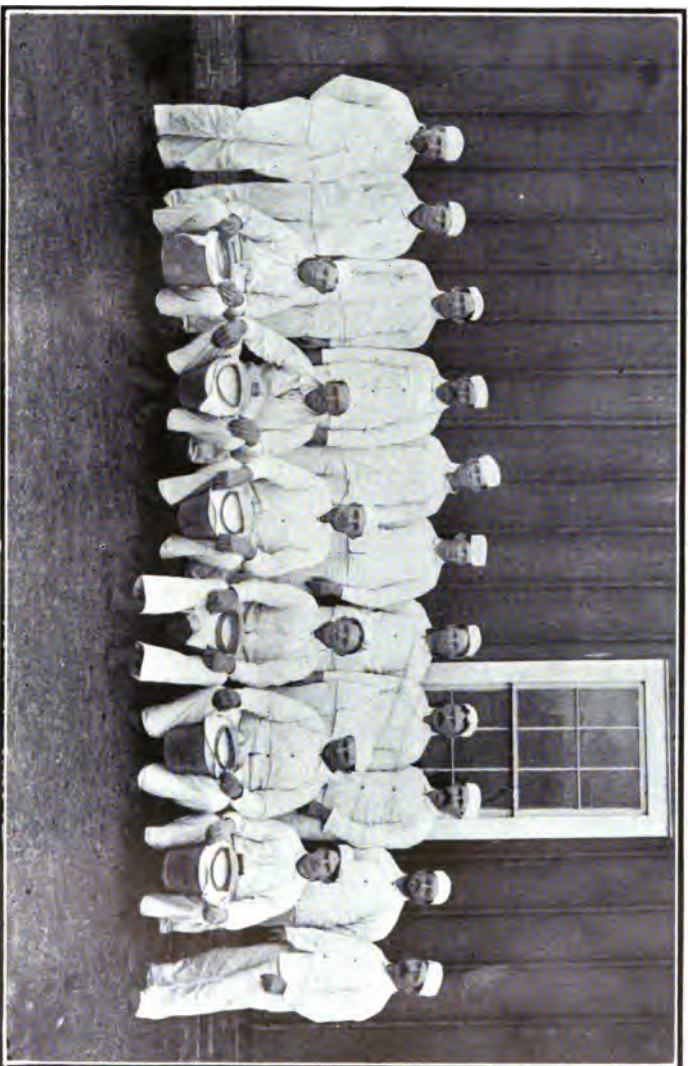
Having sold my certified milk business after eleven years' experience, I feel free to discuss it in all of its details. I was induced to embark in the business by some of the leading Chicago physicians who were anxious to secure a pure milk for infants and invalids. They labored with me a year and a half before I decided that it was safe from a financial point for me to undertake the business.

A Delivery System Essential.—I was the pioneer in the business in Chicago and like other pioneers had many obstacles to overcome. One of the first points in connection with the city end was how to deliver the milk to the customers. I foresaw that the cost of delivering to all parts of the city with my own wagons would be so much that it would mean financial failure and conceived of the plan of making agents of the milk dealers whose wagons were delivering milk in all portions of the city where milk was needed. The medical profession induced me to embark in the business and were to create the

demand for my milk, therefore I must fill their orders regardless of location. This method of delivering was the salvation of the business as I could not have made a success of it following any other plan.

Difficulties Encountered.—As an illustration of the nature of some of the opposition I met, I could not at first induce the dealers to act as agents to deliver my milk on a commission of three cents per quart. Some of them laughed at me when I offered them the agency. They were determined not to have me in the business. One large firm gave me thirty days to do business in the city, but the business kept on growing in spite of the opposition and agents learned that when a doctor prescribed the milk they had no influence in stopping its delivery; the order would be filled as a prescription would be filled at a drug store. Some small dealers were so venomous towards me that they would break all my bottles they could get into their possession and other small dealers transacted business with the use of my bottles. It cost me five-eighths of a cent for every quart of milk shipped to keep up my stock of bottles.

As the business developed the dealers saw that it was an aid to securing more business and became anxious to obtain the agencies for my milk, as it took them into families they could not reach in any other way, giving them the op-



UNIFORMED MILKERS READY FOR WORK AT CLOVER FARM

portunity to secure all the milk business of the family.

The Farm End of the Certified Milk Work.—

The first important matter in the farm end of the work is to apply the tuberculin test to the cows in the herd. In the first application of the test to my herd, we found three per cent of the cows tuberculous. All of the tuberculous cows had been bought one and a half years previous to the application of the test and not one of the herd raised on the farm was found to be tuberculous. I found tuberculous cows frequently among those bought even when I selected them myself. It is well known at the present time that a cow may be tuberculous and there be no outward indication of it.

Responsibility of Dealers.—Those who wish to undertake the production of this kind of milk for feeding infants and invalids, should realize the responsibility of this work before entering the field. They should realize that they have human lives entrusted to them to the same extent as the doctor. They should know that to neglect their work may mean death to some little one that is being fed this milk. They must know that the cow must be fed properly and regularly with food that will keep her always in perfect physical condition. She must have the purest water and kindest treatment and must never become excited by a dog, boy, a man on

horseback or with a whip. Everything must be avoided that might have an unfavorable influence upon the cow. A cow may be so improperly fed that her milk is not fit for feeding to babies or invalids.

I know of one case where a dairyman fed his cows in a way that caused them to become constipated to such a degree that his child being fed upon the milk became sick. I fully believe that cows can be so well fed and cared for that the milk is safer food for the child than the mother's milk, in a majority of cases. The mother may be so situated in life that she must labor at times until her blood is heated. She may be worried with household cares or unpleasant family relations to such extent that the nursing babe must suffer.

Standardizing Milk.—I practiced standardizing my milk as the doctors told me it was desirable to have it of a uniform standard. This was accomplished with the centrifugal separator by allowing the cream and skim-milk to flow together as they came from the machine. I used a conductor with a double head and in one compartment we put a drip cock which could be set to take automatically the quantity of skim-milk or cream necessary to make the standard what we wished to have it. Our standard was four per cent butter fat and if the milk as it came from the cows was below the four per cent,



A CLEANSED COW STABLE

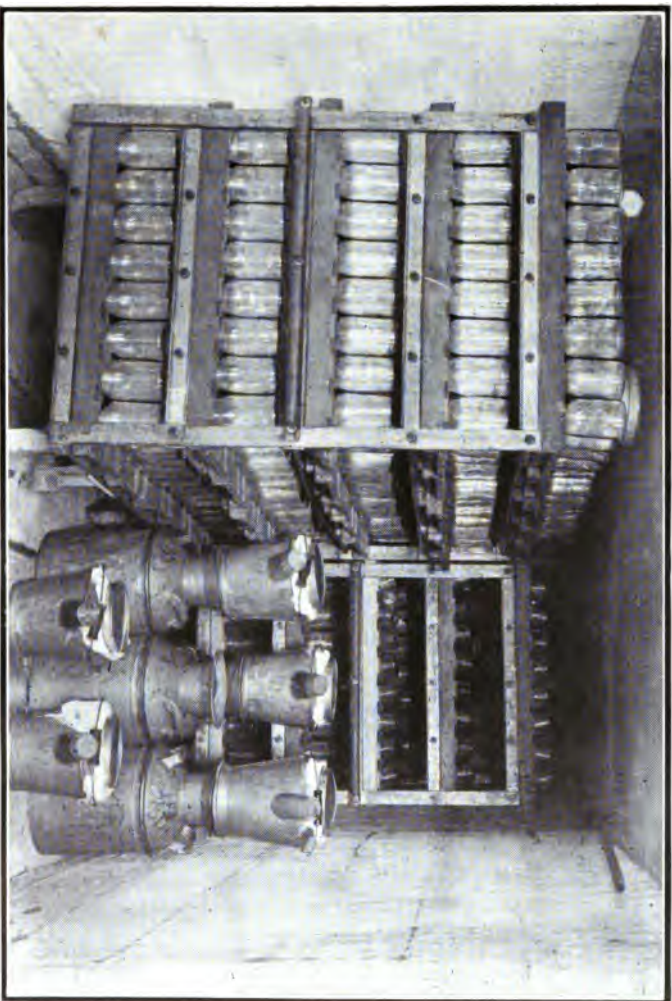
we caught through the drip sufficient skim-milk to bring the fat standard up to four per cent. In case the milk had four and two-tenths or more of butter fat we turned the cream into the compartment with the drip and drew out sufficient cream to lower the fat standard to four per cent. In this work each day's milk was tested and made the guide for the following day's work.

Dating the Milk Bottles.—I used a metal cap and seal on my milk bottles on which the date of bottling was stamped. In this way the age of the milk was carried by every bottle. The age of the milk is very important in infant feeding. It is not sufficient that it be sweet. It must be fresh. Milk may be unfit for feeding a baby before it is sour to the taste. Each bottle carrying the date of bottling on a metal cap which cannot be removed and returned without detection, is a very desirable method as it helps to establish confidence among the consumers and this is a necessity in the high grade milk business. The mother who is feeding her babe on cow's milk has a right to know all about it and the producer who does not meet this demand openly and fairly will never succeed.

Best Man for the Business.—The man who has the best chance to succeed in the certified or pure milk business is the intelligent farmer, one who lives on his farm and is a worker, one who has practical information that fits him to over-

see what is being done if he does not do it himself. This kind of a man having charge of the farm end of the work will succeed. He will use metal caps and seals on his milk bottles. The caps should have the date of bottling stamped on them. Then he will sell the milk to some reputable milk dealer or make an agent of some dealer who will guarantee his pay for the milk. It is too much for one man to look after both the producing and distributing unless the milk is sold in a nearby city where he delivers his milk from his own wagons.

Equipment for the Work.—An expensive stable is not a necessity in the production of pure milk, but it is necessary to have it well lighted, well ventilated and it must be kept in a sanitary condition. The platform on which the cow stands, the gutters and the walks should be thoroughly scrubbed daily, using plenty of water. The gutters should have connection with a sewer so the wash water can be conveyed away from the barn. The cows should be thoroughly groomed one half hour before milking time, thus giving time for the dust to settle. Their udders should be washed or wiped with a damp cloth just before milking. It is not best to do the washing of the udders much in advance of milking as the manipulation stimulates the secretion of milk and to secure the best results we must work with nature. A delay of a few min-



STERILIZING ROOM IN MAKING CERTIFIED MILK

utes at this stage of the work causes the cow to make a second effort which is not as satisfactory as the first.

Cleanliness in Milking.—White suits should be worn and the milkers should have a clean suit daily. There should be a supply of water in the stables and the milkers required to clean their hands after milking each cow. The first three or four streams of milk from each teat should be rejected as this contains many more bacteria than the milk drawn afterward.

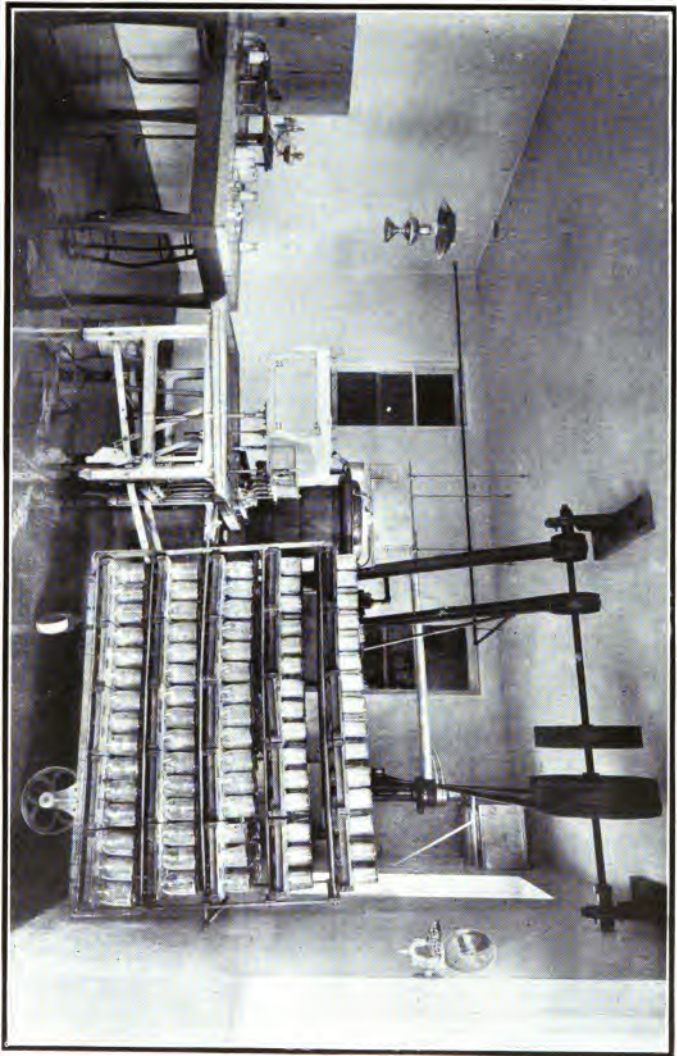
Straining the Milk.—Absorbent cotton should be used on the milk pail, confining it between two layers of the thinnest gauze. If the goods used to confine the cotton is too thick, the milk will spatter when it strikes it, but when very thin gauze is used the milk passes through it to the cotton. The layer of cotton used should be as thick as the milk will pass through readily, and it should be used for one milking only. The gauze may be cleaned and sterilized and used until worn out.

The milk must be removed from the stable and poured through an absorbent cotton strainer into some closed vessel into which it is to be conveyed to the bottling room, where it should be cooled as soon as possible to a temperature of 40 deg. or below, then bottled and placed in cases with chopped ice added which will continue the cooling to about 35 deg. if plenty of fine ice is used.

Remarkable Record for Certified Milk.—The writer shipped some of his certified milk to the Paris Exposition. It was seventeen days in transit and kept sweet until the twenty-first day after it left the farm at DeKalb, Ill. This was the month of August, and the milk was shipped by express to New York when it was placed into a refrigerator on board a vessel. The French officials could not believe this milk had not been embalmed until it was analyzed.

Separator the Best Cleanser.—I believe the cleanest milk it is possible to produce is improved by being put through a centrifugal separator. I do not believe it possible to secure milk that will not leave a deposit on the wall of the separator after it has been run through it. The claim that the separator breaks the fat globules in the milk I believe is an argument in favor of the use of the separator, as the smaller the globules of fat, the easier it will be digested by the babe.

Sterilizing Utensils.—All utensils used about the milk must be thoroughly washed and rinsed and then sterilized. I found in my experience that a concrete sterilizing room is best, as concrete is not affected by heat as much as wood or metal. My sterilizing room was large enough to contain all the utensils including the cans, pails, cooler, bottler and bottles. This room was between the wash room and the bottling room, so



BOTTLING ROOM FOR CERTIFIED MILK

that we filled it as the washing was done. When ready live steam was turned into the room until it reached a temperature of 212 deg. which was maintained for thirty minutes and the room was kept closed until time to use the utensils at milking time, when the cans and pails were taken out through the wash room and everything used in the bottling room was taken directly from the sterilizing room into the bottling room.

Bottling the Milk.—No person should be allowed in the bottling room while the milk is being bottled except the workmen in that department. The milk should be emptied from the cans in a room built for that purpose and allowed to flow through a conductor into the bottling room.

Financial Side of Certified Milk.—I had invested \$70,000 in the farm, the cows and heifers that were being grown on the farm, the horses, the farm machinery and utensils used in the milk business. The business was paying all operating expenses including labor, supplies, repairs, transportation on the milk to Chicago, commission to my agents who delivered the milk, taxes on the farm and stock, 5 per cent interest on the total investment, and left me for my services superintending the business \$3,500 a year. I spent my time partly at the farm looking after the producing end of the business, and partly in Chicago looking after the consumers'

end. I learned that the consumers' end needed attention as there at times arose conditions that no one except the producer of the milk could explain to the satisfaction of the customers.

Demand for Pure Milk.—The consumers of milk are being educated rapidly as to the importance of clean milk, and are nearing the time when they will demand that their milk shall be as clean as their other food. Many times I have had visitors at my farm who said they could not drink milk, but when induced to taste the pure milk they would drink two or more glasses before leaving the farm.

Never before was there so much interest and development in the milk field as in 1908.



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