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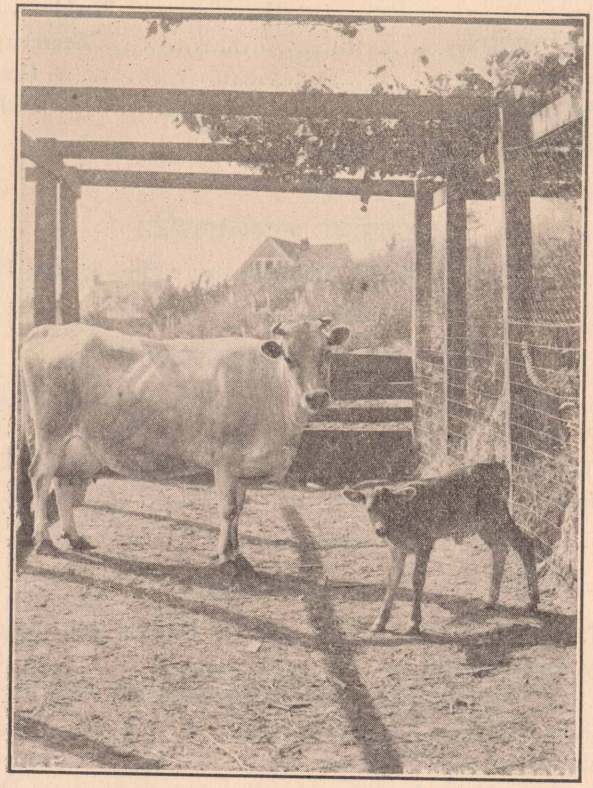

BETTER DAIRY METHODS

By J. H. FRANDSON

Idaho Experiment Station

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BETTER DAIRY METHODS

By J. H. FRANDSON

Introduction

Perhaps no other state has ever experienced such an inrush of new settlers as Idaho has witnessed during the last few years. Certainly no agricultural section has ever attracted a more cosmopolitan population. Induced by the possibilities of Idaho land, scores and scores of men of professional training have settled on Idaho farms. College men from nearly every state in the Union are to be found here, together with hundreds and hundreds of men fresh from the shops and stores of our congested cities—all anxious and willing to grapple with the new problems that come with the change of vocation and which confront even the expert farmer in a new country.

Investigations carried on by the Dairy Department of the University of Idaho show that not only in the newly settled sections but throughout the state many cows are kept at an actual loss, largely because the farmer has not realized the importance of keeping records of the productive capacity of his herd and has failed to give such attention to details as the importance of the business warrants. It is only a small percentage of the farms of the state that are as yet equipped so as to carry on the business to the best advantage. In many instances common observation shows that no attempt is made to prolong the milking periods beyond the summer months. Thus but little winter dairying is done. The question of providing suitable feeds to supplement alfalfa is one of the problems demanding more attention. In order that our dairy products may take higher rank it is necessary that more attention be given to health and sanitation as relates to the herd, to the barn and to the general methods of handling the milk.

It is with the hope of giving such suggestions as will make dairying more profitable and more desirable as a business and with a view of giving such information as is so much needed by the new settler, that this bulletin has been written.

IDAHO AS A DAIRY STATE.

Many sections of Idaho possess conditions especially favorable to dairying. Here are found cheap land, plenty of good cheap feed, rich in protein, good water and a mild and healthful climate. The land is so productive that more cows can be kept on the same amount of land here than elsewhere. The various industries in the state, such as mining and lumbering, besides the demands of the Alaskan and Oriental trade, tend always to give us a ready market at good prices for dairy products.

PROFITS.

It is generally a conceded fact that dairying yields a larger profit than can be expected from any other branch of farming. A good cow will annually yield not much less than 300 pounds of butter which at 28 cents a pound is worth $84.00. Adding to this the value of 6,000 pounds of skim milk at 20 cents per 100 pounds, and ten dollars which ought to be a fair value for the calf, we would have a total of $106.00. Allowing $50.00 as a fair allowance for feed consumed, we still have $56.00 as a profit to pay for the labor and interest on the investment.

SOIL FERTILITY.

However, in addition to this direct profit, we must not fail to lay stress on the importance of dairying as a means of retaining the fertility of the soil. By feeding the raw materials of the farm to the dairy cows, we are not only manufacturing high priced products but we are retaining upon the farm almost the entire amount of fertilizing material taken from the soil by the growing crops.

By selling only cream, or butter, fully 95 per cent of the fertilizing material contained in the feed is retained on the farm. One ton of oats takes from the soil as much fertility as 4.1 tons of cream. As much fertility would be taken from the soil in $26 worth of wheat as in $390 worth of cream.

Those living on the richer soils hardly appreciate the true significance of the importance of soil fertility. This question, however, has but to be mentioned to be understood by the people who have lived in the east. Several of our eastern states are even now, spending

annually more than 7,000,000 dollars for fertilizing material to help them produce crops. In many parts of our own state people are realizing that crops are steadily decreasing, and that if the present system of cropping continues our soil must soon be replenished with artificial fertilizers.

By dairying only about 5 per cent of fertility is taken from the soil, the balance of the finished product being made by plant life from water, air, and sunshine, and as a result, dairy farms in Europe have succeeded in maintaining their soil fertility for more than 1,000 years, while some of our grain farms have been almost exhausted in 50 years.

START BUSINESS RIGHT.

It is certainly true in dairying as in any other business that one's success in a large measure is gauged by his love and interest for the business. The personal equation is an important factor here as else-

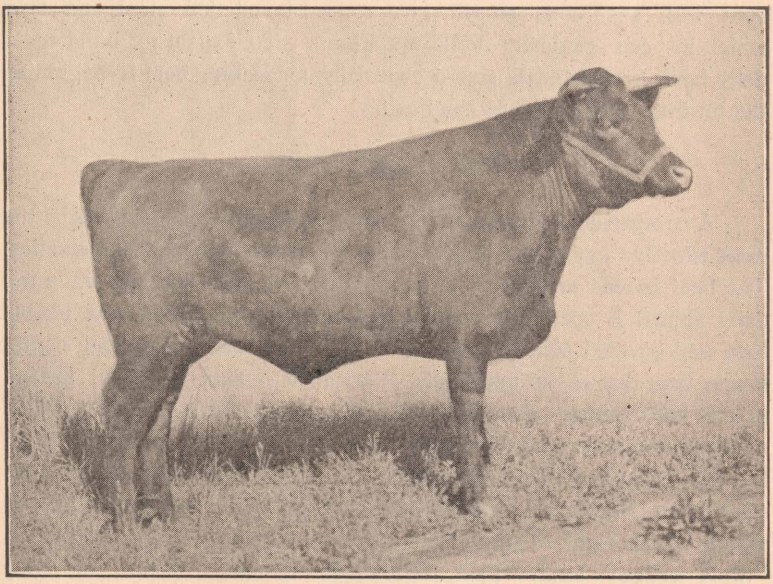


Fig. 1—Age 20 Months. Weight, 1500. A Good Beef Type, but not Desirable from a Dairy Standpoint.

where. Success or failure to a large extent depends on the kind of man in charge of the business. If a man has no natural inclination toward the cow, if he is unwilling, so to speak, to form a partnership with her, his chances for profit from her products are quite remote. First of all it is essential that the dairyman shall have a personal liking for the breed which he selects.

A careful study of the various breeds of cattle shows us that some have been bred for centuries and centuries with a view of fixing those characteristics that are desirable from a beef standpoint—the putting on of large quantities of meat and fixing it on that part of the animal that will bring the highest price on the block.

On the other hand men who were interested in securing more and better milk, have by careful selection and breeding succeeded in fixing the characteristics that go into the makeup of a good dairy cow. If one would be successful in the dairy business he must necessarily start with such cows as will give a good foundation stock and from which he can gradually build up a herd. To expect to build up a dairy herd from animals suited especially for making beef is beginning the business with a serious handicap.

THE DAIRY TYPE.

A comparison of the beef and dairy types of animal is perhaps the most effective way of showing what are the distinct dairy characteristics. The beef breeds are blocky in form, are heavy and sluggish while the dairy animal is spare and angular and refined with a soft and pliable hide well covered with smooth, soft hair. The head is lean and a little longer than that of the beef type. The neck is long and lean, joining to the body rather abruptly. The withers are sharp, with the spinal column prominent and the barrel long and capacious indicating good feeding capacity. The ribs are sprung down and outward and wide spaced, the heart and loin girth large and the tail fine with a heavy switch. The form of the dairy cow is frequently spoken of as the "triple wedge" form. First, she shows increased depth of body towards the rear when viewed from one side. Secondly, she widens gradually from the breast to the points of the hips. Thirdly, looking

down on the back the form widens gradually downward like a wedge. The udder is well developed and evenly quartered; is soft and pliable but not flabby when emptied. The milk veins are large and tortuous and enter the abdominal wall in two or more large milk wells.

The dairy type can be found in many of the breeds but most characteristically in the distinct dairy breeds. By the dairy breeds are meant those that have become most noted for uniformly conforming to the true dairy type. They are the Holsteins, Jerseys, Guernseys and Ayrshires. Owing to the careful work of the breeders in maintaining the purity of the breeds and fixing their characteristics, these breeds can, in most cases, be counted on to reproduce their dairy qualities and their ability to produce butter-fat in large quantities. It is largely for this reason that the dairyman who desires success to follow his efforts should stick close to one of the dairy breeds.

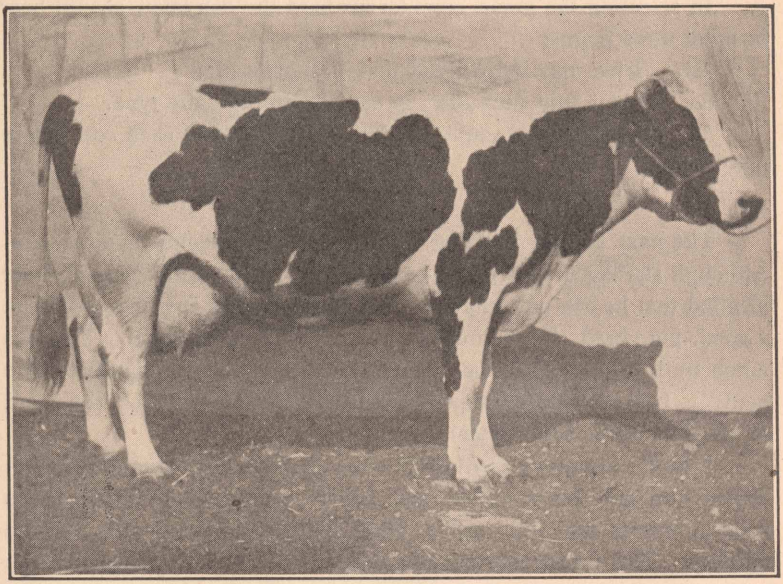


Fig 2—COLANTHA'S 4th JOHANNA
A Splendid Type of Dairy Cow

HOW TO BUILD UP THE HERD.

Choosing the Cow.

The question is frequently asked by the man who contemplates going into the dairy business "With my limited capital and experience would I be justified in starting in with pure-bred animals?" The writer firmly believes that the inexperienced man with small capital should start with grade cows. His limited capital, will in this way enable him to secure a much larger herd than he could in any other way, since good grade cows can be purchased for a fraction of the cost of pure-bred animals. While he is yet new in the business his profits would come largely from the sale of milk products. For these he can readily secure a market. If he has an inclination to handle pure bred stock he can work into this as fast as his acquired experience and capital will permit.

In selecting the grade cows for his herd the dairyman should bear in mind three points:

1st. Select that dairy breed that best suits him.

2d. Select only such cows as conform to the dairy type.

3d. Investigate carefully the butter-fat record of each cow before purchasing.

Sire.

The next step in building up the herd is to secure a good sire. Although starting in with grade cows, the dairyman should certainly bear in mind that he can not afford to head his herd with anything less than a good, pure-bred sire, one capable of building up the herd. There is much truth in the expression frequently used—"The sire equals half the herd." Indeed, he often equals more than three-fourths of the herd so far as its future value is concerned.

Take for instance a herd of 25 cows headed by a pure-bred sire. Experience has demonstrated that heifers as a result of having had a good pure bred sire will readily yield 2 lbs. additional milk at each milking. This means four pounds of additional milk per day from the heifer as a direct result of the better sire. Supposing the cow milks approximately 300 days a year and the average milking period of a cow s 6 years the increase in milk production due to the better sire would

be 4x300x6 or 7,200 pounds of milk. Estimating this at $1.00 per 100 pounds at the very lowest, would give us $72 per cow additional profit. From the herd of 25 cows it is reasonable to suppose that about 10 heifer calves be raised per year, which would give us a profit of $720. A sire can do service in the same herd for 3 years thus in this time increasing the number of heifers raised to 30 and increasing the profits due to the better sire to $2,160. After making due allowance for

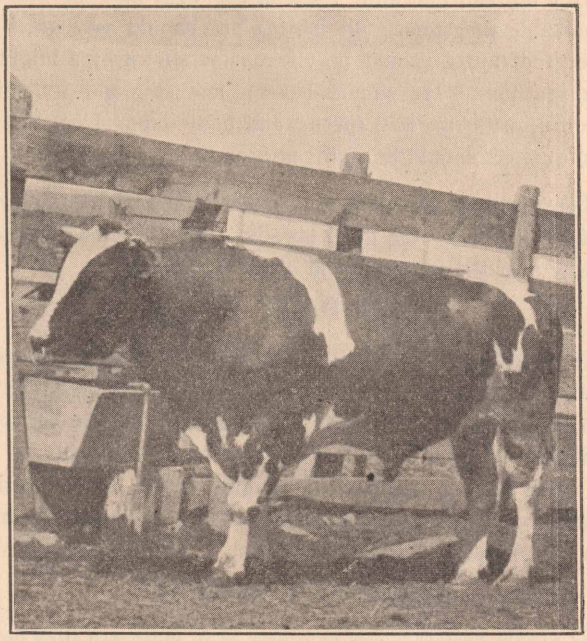


Fig. 3—SIR PIETERTJE POSCH ---Type of a Gooa Dairy Sire

increased cost of a pure-bred sire and interest on the money invested it will readily be seen that the investment nets a handsome dividend. So there can be no doubt that this is the cheapest, quickest and most practical way of building up the dairy herd. The value of the dairy sire has been most strikingly brought out in a recent bulletin published by Professor Fraser of the Illinois station. In the selection of a sire the dairy-

man must keep in mind that pedigree alone does not count for much. In fact, some of the very poorest animals are the "Pure-bred Scrub." The purchaser of a bull should select an animal that is a good individual and whose dam and granddam on his sire's side have good butter-fat records. His sire must, of course, show the characteristics of the good dairy type. If these ancestors are first class in every way the question of pedigree ought to be settled sufficiently. It is immediate ancestry that counts rather than the fact that away back in the hazy past the bull had some few remarkable ancestors. Briefly, the bull should have good pedigree, be a good individual, should be vigorous as shown by a bright eye and active disposition. He should have a fine skin and soft, silky hair; chest broad, with ribs well sprung and body deep. Last, but not least, the hind quarters should be light, not too fleshy.

When the right animal is found bear in mind that the price is not much of an object for the good pure-bred bull will readily manifest his prepotency over the weaker blood of the grade stock.

BEST DAIRY BREED.

The question naturally arises "What is the best dairy breed?" In a general way it is quite safe to say, select that dairy breed that you like the best, and stick stubbornly to it unless there is the best of reasons for a change. Promiscuous cross breeding never leads to desirable results. It is only by persistently clinging to the characteristics of any of the dairy breeds, and by careful breeding to fix those characteristics that the herd is really materially built up.

COMMUNITY BREEDING.

It is highly desirable not only that each dairyman stick by a certain breed but that a community, so far as possible, should favor a particular breed. If nearly all the breeds are represented in a sparsely settled community it means that there are not many of any one breed and as a result whenever new blood is desired for a herd it is necessary to send away, frequently long distances, to secure what is desired. Another distinct advantage of community breeding, especially where the herds are small, is that the farmers of a community can jointly purchase the sire and use him for their herds. The cost of purchasing and

maintaining a good pure-bred sire will in this way be reduced to a minimum. The further advantage to a district or locality in sticking to one breed is that the demand for that particular breed may be supplied in carload lots, and in this way the district will gradually work up a reputation that will readily enable it to dispose of any surplus stock. In a great measure the success of our European friends is due to the fact that they have as a country, been faithful to and develloped that particular breed which seemed most suitable to their environment.

VALUE OF THE TEST IN SELECTING THE HERD.

In order to know definitely that the cows used for breeding purposes are good producers it is necessary to use the Scales and Babcock Test. A good dairyman can invariably tell a good cow from a poor one but as has been well said, "Few judges can by eye pick out a cow yielding 300 pounds of butter fat from the one yielding 200 pounds." This was well exemplified in a recent contest when a judge placed a certain cow first, which, afterwards in a carefully conducted contest, was placed fifth.

That there is a surprisingly marked difference in the yield of butter fat from cows in the same herd under the same conditions has been noted by many of our Experiment Stations and by numerous farmers who have kept records. In this state the writer has tested many herds, and has thus found interesting data showing the value of testing. The following table gives a complete record of an Idaho herd of 10 cows, for the last year, tested by the Department of Dairying:

TABLE NO. I.

HERD RECORD FOR ONE YEAR

No. of Cows	Year	Pounds of Milk	Average Test	Lbs. of Fat	Av'ge Price	Value of Fat	Average Cost	Profit
No. 1	1907	9812.3 lbs.	3.6 per cent	353.24	31c	$109.50	$40.00	$69.50
No. 2	1907	6758.7	3.5 per cent	236.55	31	73.33	40.00	33.33
No. 3	1907	6857.5	3.2 per cent	219.44	31	68.01	40.00	28.01
No. 4	1907	5840.7	3.7 per cent	216.1	31	66.99	40.00	26.99
No. 5	1907	6244.8	3.3 per cent	206.07	31	63.88	40.00	23.88
No. 6	1907	5323.6	3.45 per cent	182.66	31	56.62	40.00	16.62
No. 7	1907	4984.1	3.3 per cent	164.47	31	50.98	40.00	10.98
No. 8	1907	4179.7	3.6 per cent	150.46	31	46.64	40.00	6.64
No. 9	1907	4561.6	3.27 per cent	149.16	31	46.23	40.00	6.23 Loss
No. 10	1907	3151.6	3.6 per cent	113.45	31	35.16	40.00	4.84
Total		57714.6	3.45 per cent	1991.64		$617.34	$400.00	217.34

Average per Cow for the Entire Herd

		Pounds of Milk		Lbs of Fat	Av'ge Price	Value of Fat	Average Cost	Profits
		5771.46 lbs.		199.16	31c	$61.73	$40.00	$21.73

A careful study of this table reveals the fact that there is a striking difference in the profits derived from the individual cows of this herd. There is a variation from a profit of $69.50 to an actual loss of $4.84. In this connection it is well to bear in mind that these cows were all cared for by the same herdsman and under identical conditions. Although a detailed record of the actual amount of feed consumed by each cow was not kept the feeder estimates that the poorest cow consumed practically the same amount of feed as the best cow.

TABLE NO. II.

RECORD OF THE FIVE BEST COWS FOR ONE YEAR

No. of Cows	Year	Pounds of Milk	Average Test	Lbs. of Fat	Av'ge Price	Value of Fat	Est. Av. Cost	Profit
No. 1	1907	9812.3 lbs.	3.6 per cent	353.24	31c	$109.50	$40.00	$69.50
No. 2	1907	6758.7	3.5 per cent	236.55	31	73.33	40.00	33.33
No. 3	1907	6857.5	3.2 per cent	219.44	31	68.01	40.00	28.01
No. 4	1907	5840.7	3.7 per cent	216.1	31	66.99	40.00	26.99
No. 5	1907	6244.8	3.3 per cent	206.07	31	63.88	40.00	23.88
Totals		35514.0	3.4 per cent	1231.4		$381.71	$200.00	181.71
Average per Cow per Year		7102.8	3.4 per cent	246.28		$76.34	$40.00	$36.34

Table No. II illustrates very forcibly the practical value of testing milk and keeping records of the amount produced. This table shows the record of the five best cows of this same herd. By weeding out the five poorest cows of this herd it will be noticed that the average profit per cow for butter fat is thus raised from $21.73 to $36.34.

TABLE NO. III.

RECORD OF THE FIVE POOREST COWS

No. of Cow	Year	Pounds of Milk	Average Test	Lbs. of Fat	Av'ge Price	Value of Fat	Est. Av. Cost	Profit
No. 6	1907	5323.6 lbs.	3.45 per cent	182.66	31c	$ 56.62	$ 40.00	$16.62
No. 7	1907	4984.1	3.3 per cent	164.47	31	50.98	40.00	10.98
No. 8	1907	4179.7	3.6 per eent	150.46	31	46.64	40.00	6.64
No. 9	1907	4561.6	3.27 per cent	149.16	31	46.23	40.00	6.23
No. 10	1907	3151.6	3.6 per cent	113.45	31	35.16	40.00	*loss*4.84
Totals		22200.6		760.2		$235.63	$200.00	$35.63
Average per Cow per Year		4440.1		152.0	31c	$ 47.12	$ 40.00	$ 7.12

*Note

Table No. III shows the record of the five poorest cows of this herd. Here there is a variation ranging from a profit of only $16.62 to an actual loss of $4.84 on butter-fat produced. The average profit on each cow as shown in this table has dwindled down to $7.12.

A careful comparison of these tables shows how the productive capacity of the herd can be materially increased by a careful and systematic use of the scales and test. By weeding out the five poorest cows the average profit on each cow of the herd has been increased $14.61.

* Note. In estimating the profits of this herd no allowance has been made for the value of the skim milk and the calf. The farmer should of course bear in mind that both of these have a specific value. Many of our best feeding authorities agree that under ordinary conditions skim-milk has a value of not less than 20 cents per hundred lbs.

The reader can readily see that the profit derived from the five best cows for butter-fat produced lacks only $35.63 of being as great as the profit of the original herd of ten cows. In addition to this it is well to bear in mind that the cost of labor is greatly reduced since there are only half as many cows to milk and care for. The progressive farmer, who farms with brain as well as muscle, readily sees the benefits

that may accrue from a small investment in scales and testing apparatus, and a little intelligent work along this line. Nowhere is the result of this work of weeding out and selecting so apparent as in some European countries where dairying has been carried on successfully on land costing as much as $1,000 per acre and where much of the feed stuff is imported. In Denmark for instance, largely as a result of this method of weeding out poor animals the yield has in 5 years increased per cow from 252 pounds to 300 pounds of butter-fat. It has been estimated that if Idaho farmers would pay as much attention to their cows, and carefully test and then breed from the better ones only that the additional dairy income for the State would figure something like $2,000,000 annually.

TESTING OUTFIT

A complete testing outfit including everything from the tester to the bottle brush can be purchased from any of our dairy supply houses or from the leading hardware stores at a price not exceeding $5.00. As to the process of testing, it is not such a mysterious operation as some people are inclined to think. The use of strong acid and a carefully graduated bottle does not infer that a man needs an elaborate education to secure accurate results. It should, however, be distinctly understood that unless the person testing, exercises due care in all the details from the taking of the sample to the reading of the test, the work will be of no value whatever.

It is not within the province of this bulletin to take up the method of testing since that is fully described in Bulletin 63, recently issued by this Station, and which can be had by anyone requesting it. Suffice it to say that the work is so simple that anyone willing to give it a little time and attention can easily master all the details. The writer's observation leads him to believe that so far as securing an average test is concerned, sufficiently accurate results are obtained by testing the milk of each cow once a month, provided the sample represents the milk from four milkings.

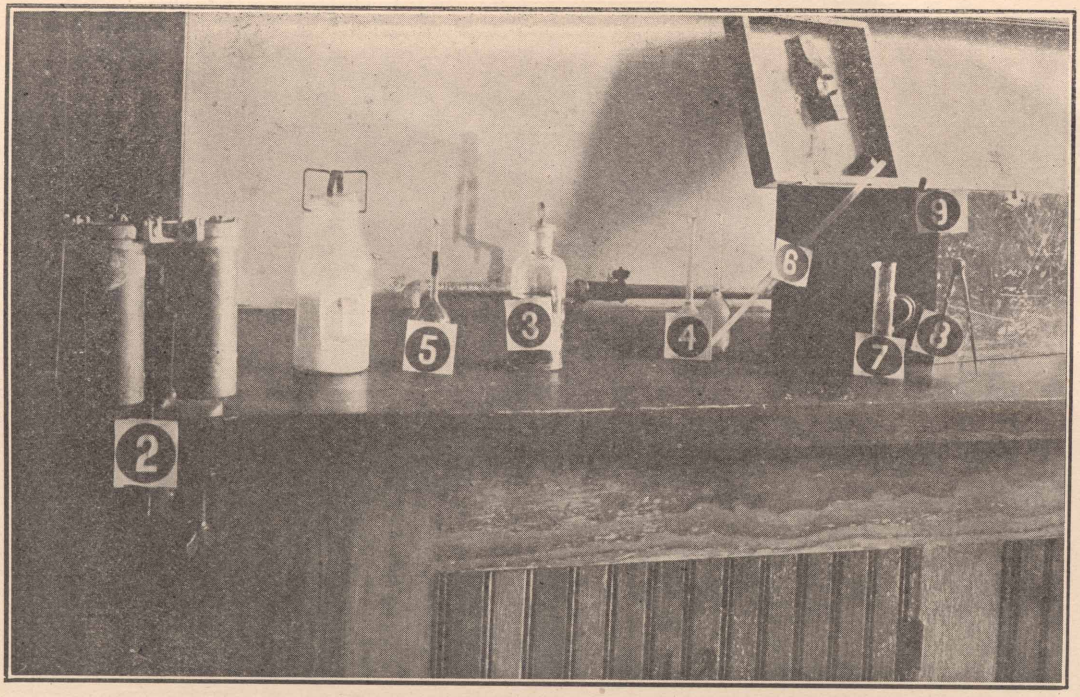


Fig. 4—BABCOCK TESTING OUTFIT. 1 Milk Sample Jar; 2 Hand Tester; 3 Sulfuric acid; 4 Test bottle; 5 Test Bottle showing completed test; 6 Pipette; 7 Acid Measure; 8 Dividers; 9 Test Case.

IMPORTANCE OF SAMPLE

The accuracy and value of the test depend quite as much upon the proper taking of the sample as upon the actual testing. If the sampling is improperly done the results are of little value. For example, the writer has known farmers who, when desiring to test the milk of an individual cow, have taken the sample by milking directly into the sample bottle. To avoid such mistakes it should be understood that the first part of a cow's milk is largely water and the last part or strippings are very rich in fat and therefore a sample taken in the above manner would be of no value whatever in determining the actual richness of that particular cow's milk. All the milk the cow gives at one milking should be poured from one pail or can into another several times, or carefully stirred with a stirrer until it is of a uniform mixture. The sample is then immediately taken preferably with a small long-handled dipper and placed in the sample bottle. Not less than 3 ounces of milk should be taken. If the testing can not be done soon after the sample is taken it must be placed in an air tight jar (a small Mason jar can be used for the purpose) and some preservative added to keep it sweet. This preservative can be bought in tablet form from any dairy supply house, one tablet to be used in each sample.

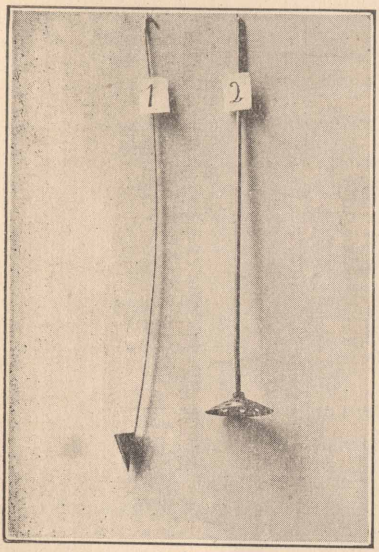


Fig. 5—No. 1 shows good sample dipper. No. 2 shows a cheap efficient stirrer.

WEIGHING THE MILK

To ascertain the amount of butter-fat a cow yields during the year, it is necessary not only to test the richness of her milk but it is fully as important to know the amount of milk she gives. The fact

that a cow gives 4 per cent. milk does not necessarily mean that she is more profitable than one giving milk testing 3 1-2 per cent. To correctly determine the amount of milk a cow gives the milk should be weighed after *each* milking and a record of these weights kept for each cow. Approximate results, however, may be obtained by weighing the milk of each cow twice a day for three days during each month, say the 10th, 20th and 30th of each month. Any other three days could be selected. The important feature is that each dairyman should have some system, and stick to that system. Many prefer to weigh the milk after each milking as it enables them to closely study the effects of feeds used and to note the general condition of the cows. It also serves as an easy way of checking the work of the various milkers. In order that the work of weighing the milk be done as easily as possible the apparatus should be conveniently arranged.

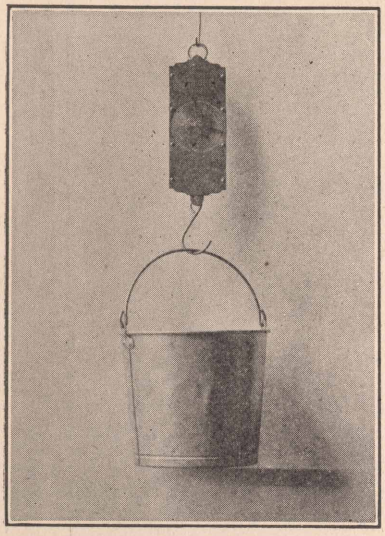


Fig. 6---A good reliable form of spring scale graduated in pounds and tenths of pounds.

For weighing the milk a good reliable spring balance, graduated into pounds and tenths of a pound will be found most convenient. The scale should be suspended from the ceiling of the milk room and be provided with a hook to receive the milk pail. With the record sheet and pencil hanging close by, it is but the work of a moment to record the weight of the milk.

A plain simple record sheet something like the one illustrated will be found most convenient.

In answer to the objection frequently raised that too much time is consumed in the weighing and testing of the milk it has been estimated that the entire time consumed in weighing and testing the milk from

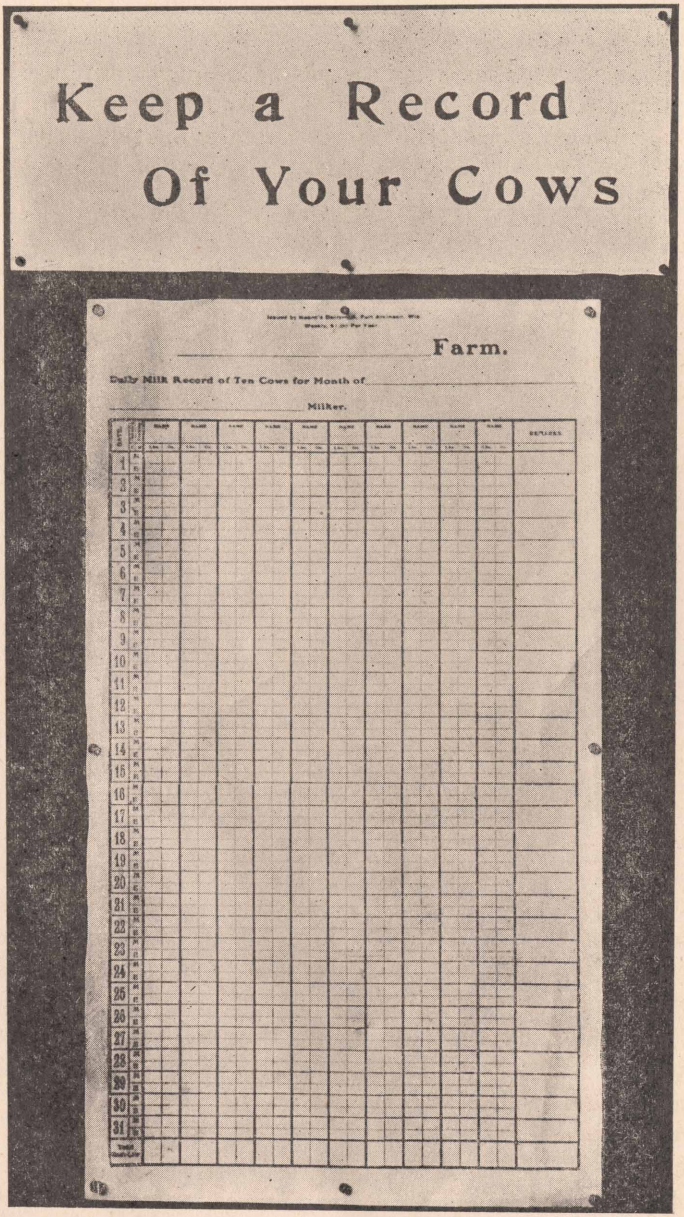


Fig. 7.--Record Sheet like here shown is inexpensive and can be secured from any local printer.

twenty cows for one whole year would not be more than one day. Thus when the system has once become a part of the regular routine of milking-time with everything conveniently arranged, the extra time consumed will not be considered a serious objection.

TESTING ASSOCIATIONS

If there are enough people in the community interested in this work and if they desire to co-operate in order to stimulate interest and lessen the expense of testing, this can be done very successfully through the organization of Co-operative Testing Associations, in which one person takes charge of all the testing and records. Most remarkable results have been secured by many of these associations in Denmark, and in many localities in Canada. Many associations are now being organized in various parts of the United States. Realizing the possibilities of testing associations in this state, the writer has urged their establishment in the dairy localities of Idaho, wherever practical. The Dairy Department will be glad to give its hearty co-operation to any community desiring one organized.

DAIRY BARNS

Through mistaken ideas of some writers, many of our farmers have developed the idea that to keep cows healthy and comfortable and to produce sanitary milk it is absolutely necessary to have expensive barns. As a matter of fact many of the dairy barns where sanitation is the primary object are quite inexpensive.

On the other hand if it is to be conveniently arranged to embody the most accepted sanitary features, it is very essential that some attention be given to the plans and specifications of the barn that is to house the dairy herd to the best advantage. Every detail of a new barn should be carefully worked out before actual construction takes place.

The plan here shown will, it is hoped, give the builder some new idea as to how the barn can be made more sanitary, how it can be more conveniently arranged, and how it can be more economically built. It is not the writer's desire to give the impression that these suggestions represent the only desirable ones in barn construction. They are simply intended to be suggestive of new and better ideas. The plans must be

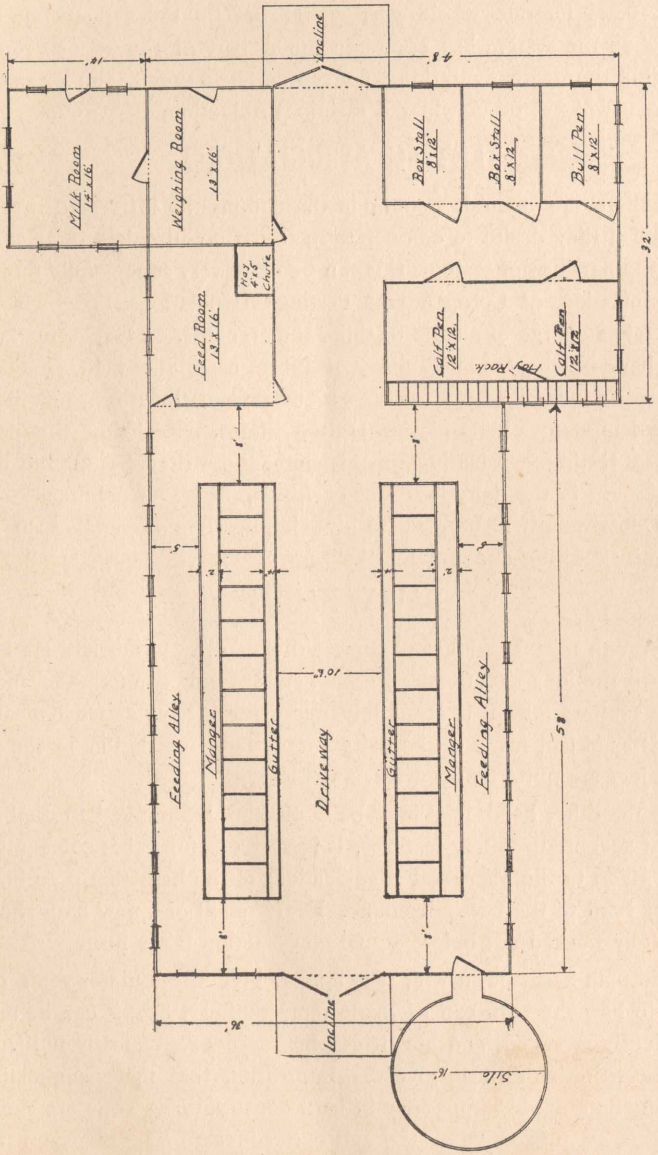


Fig. 8---Floor plan of a good modern dairy barn

worked out to suit different conditions and locations. Hardly any two sites would permit exactly the same plan being used.

Location and Drainage of the Barn and Yards

If wholesome and sanitary milk is to be produced the farmer should realize that the cows must be kept out of the mud as much as possible. Conditions in and around the barn can, in many cases, be greatly improved by draining and grading. Draining is not of itself sufficient as the tramping of the cattle soon puddles the surface thus practically preventing the water from reaching the tiles below.

The barnyard should have good slope such as will insure good surface drainage and should have a good top layer of gravel or cinders. In many places this may involve a great deal of work but even if the grading cannot all be done in one year arrangements should be made by which at least part of it is done every year.

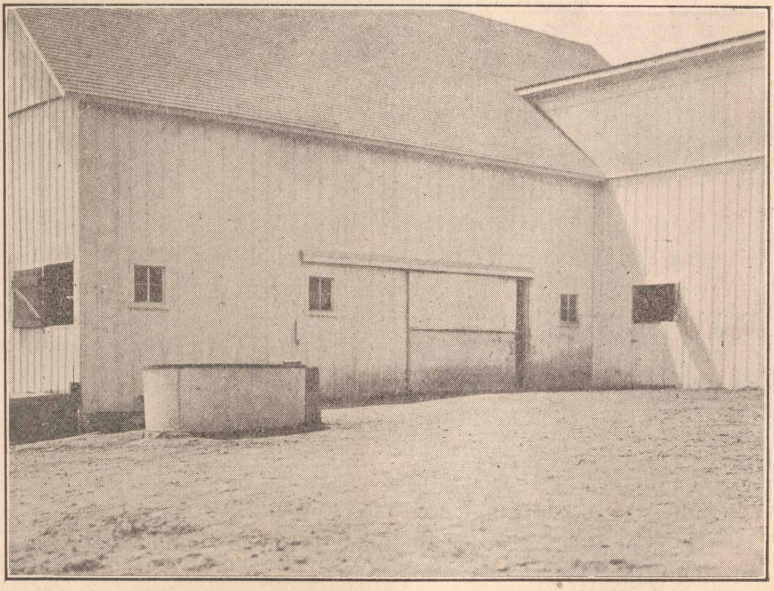


Fig. 9---Shows a desirable barn yard. Made so by providing good surface drainage and by the application of sand and gravel.

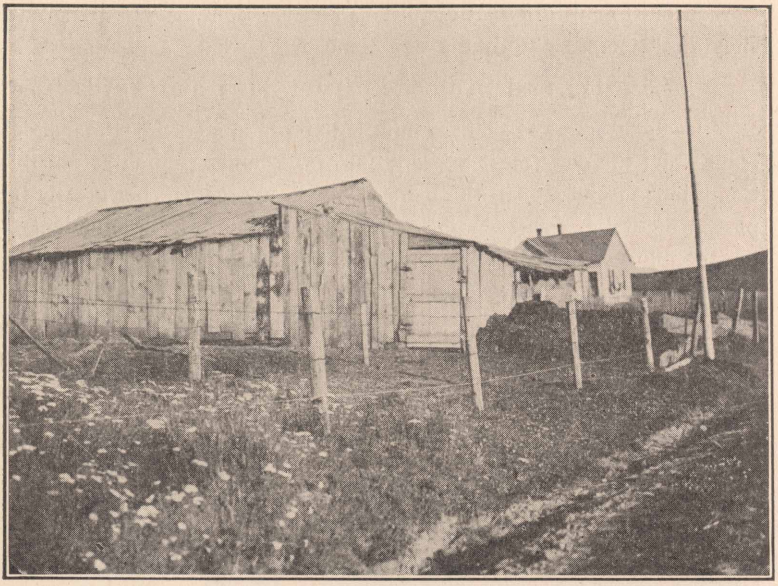


Fig. 10---Shows a type of barn yard altogether too common in many localities

Light

Too much stress cannot be laid on the fact that we have no better disinfectant than good, old-fashioned sunlight. For this reason in planning our barns much more attention should be paid to the question of securing sufficient light. A score card recently issued by the Dairy Division of the United States Department of Agriculture, based on exhaustive experiments, suggests that four square feet of glass should be allowed for each cow in the barn. Long windows reaching well to the ceiling have been found the most satisfactory for the reason that the light coming through them can reach all parts of the barn better than if the short windows are used. It is also of importance to remember that there is no better way of preventing the spread of tuberculosis in our herds, than by admitting plenty of sunlight and fresh air into the barn.

Ceilings

The height to ceiling differs somewhat according to different ideas

and the severity of the climate. In a climate as mild as that of Idaho it is not necessary to have a very low ceiling. The material used for the ceiling should be smooth and well matched so that there will be no place for dust and cobwebs to collect. The old-fashioned loft floor gives a chance for dust, cobwebs, and dirt to collect on the rafters as well as on the hay that invariably hangs down through the cracks, making it practically impossible to secure sanitary conditions. If a tight ceiling is used, there is no chance for dust to fall, even when work is being done in the loft.

Floor

Under most conditions concrete is the best material for flooring. It is certainly the most durable and most sanitary and in the long run these two qualities make it the most economical. It is as comfortable for the animals as any floor, provided a reasonable amount of bedding is used. The floor should be about 10 inches above the level of the ground so as to prevent heavy rains from seeping into the barn.

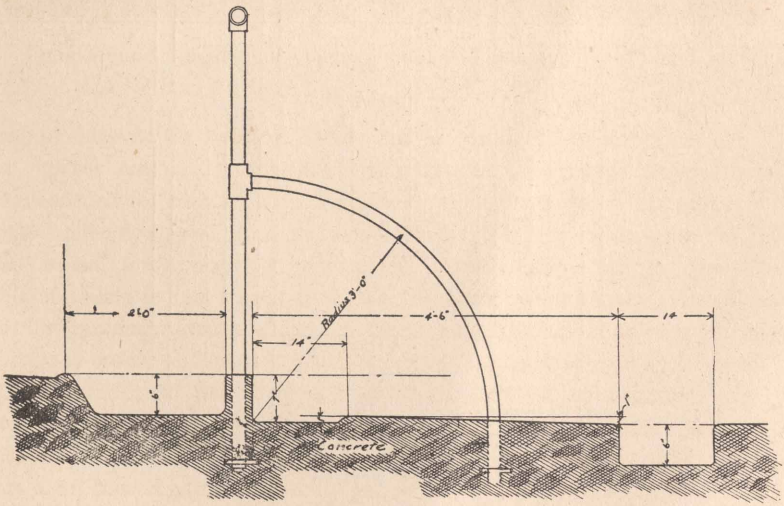


Fig. 11---Side view of good sanitary stall. Stalls of this kind are now used in many of our most modern barns. Note the slope towards gutter. The slight depression near front feet is so that the animal may stand level and so that it can rise without feet slipping.

Stalls and Stanchions

There are many and varied styles of stalls several of which are good. It is best to select such a stall as will give comfort to both the cow and milker. The construction should be such as to permit good light in the stall. It should be built of such material and in such a way as will leave only a minimum space on which dust can collect. Solid wooden stall partitions are very objectionable because they obstruct light and collect a large amount of dust. There are many different kinds of stanchions and various other ways of tying cows now in use. Many of these are comparatively free from objections. The new builder, however, should carefully investigate some of the best types of swinging stanchions now on the market. These are being installed with much satisfaction in many of the most modern barns. In behalf of the swing-

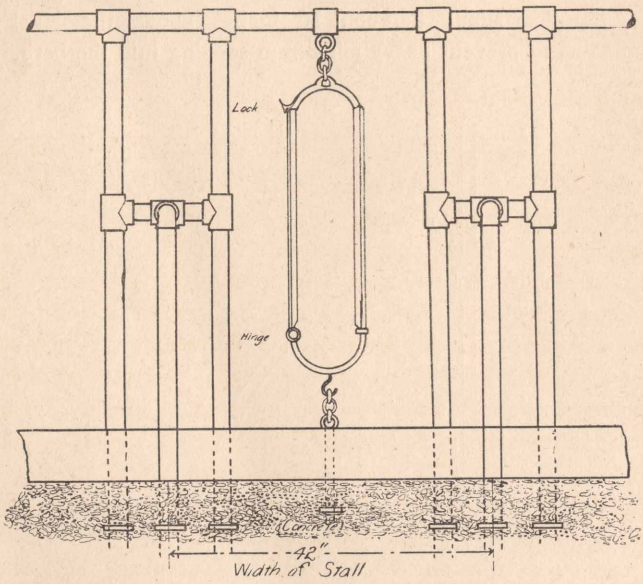


Fig. 12---Shows front view of a modern sanitary and comfortable swinging stachion. The iron pipe finishings reduce to a minimum material on which dust can collect and which would tend to obstruct sunlight.

ing stanchions it can be said that they give the cow considerable freedom, and yet are sufficiently rigid so that practically all the manure is dropped into the gutter thus keeping the cows clean and reducing the labor of barn cleaning to the minimum.

Ventilation

The important features of a good system of ventilation are that it provides a constant supply of pure, fresh air, that the fresh air is admitted near the ceiling and that the impure air is taken out near the floor. The fresh cold air should be admitted near the ceiling so that it may, by contact with the warm air, be tempered before reaching the cows. By forcing the impure air out near the floor less heat is lost and as is claimed by most authorities the major part of the impure air is found near the floor where the cows are constantly depositing many of the impurities given off in breathing. A damp stable favors the breeding of disease germs. A good system of ventilation will carry away all extra moisture. No system of ventilation can be successful in a barn where the cracks and crevices in the walls permit cross-currents to interfere with the work of the ventilating flues.

FEEDS

One of the most important factors which has to do with the economical production of milk concerns the amount and character of feeds consumed. Dairy feeders speak of "The ration of maintenance." By this is meant the amount of feed needed to furnish heat and energy and to rebuild wornout tissue. While the amount of feed necessary to supply actual body needs is about the same whether the cow is milking or not milking, it must be borne in mind that every pound of milk produced requires an additional amount of feed. Roughly speaking, in the case of an ordinary dairy cow fully one-half of the ration fed goes to supply body needs. Perhaps the poor feeder makes no more frequent mistake than to refuse to give that additional part of the ration that would be exclusively used for milk production. No matter how good a cow may be so far as breed is concerned, she cannot be expected to give in her product what she does not get in her feed. In a general way then, economical milk production means liberal, but not wasteful feeding.

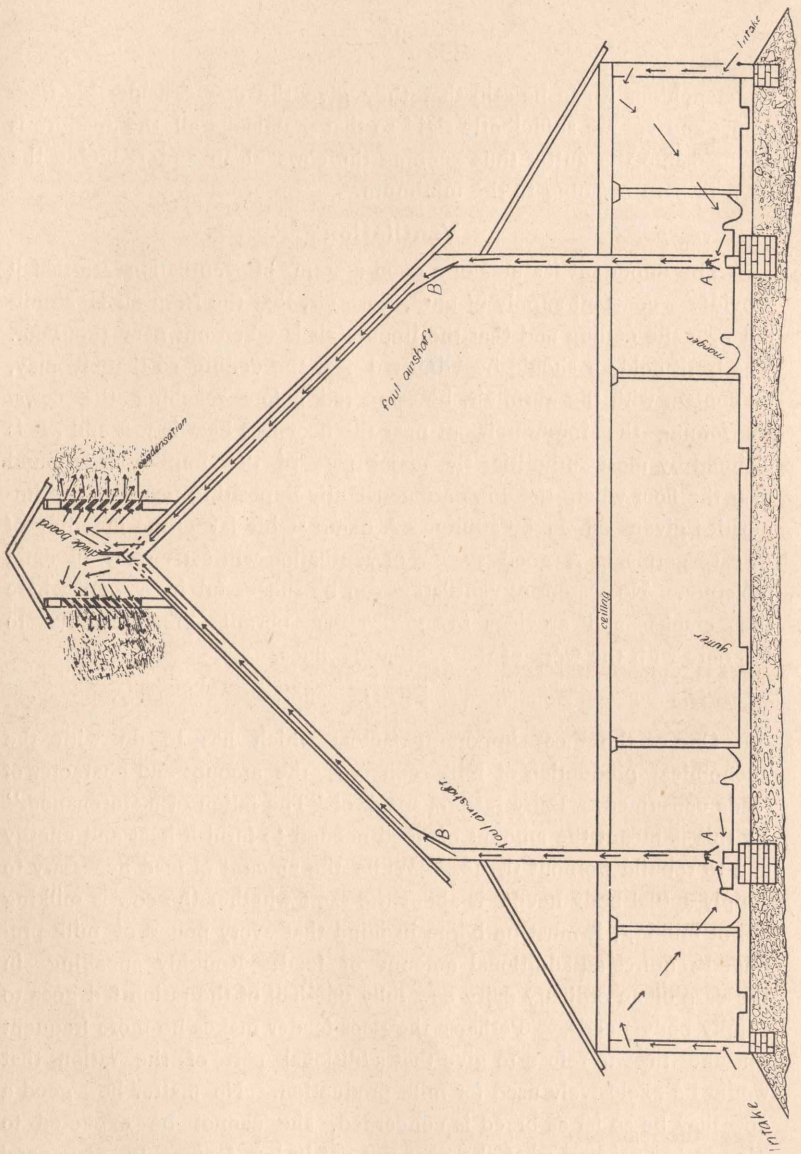


Fig. 13---Shows method of running ventilator flues. Fresh air is admitted as shown at intake. Foul air is taken out at flues marked A. B. Foul air shaft should be made of galvanized iron or combination of paper and lumber. Should be made with as few turns as possible.

The Balanced Ration

The feeder who is familiar with the many demands made on the system of a dairy cow readily realizes why it is desirable to feed a "balanced ration." By a "balanced ration" is meant "one in which the proteins and carbohydrates are in such proportion as will best suit the needs of the animal." In order to feed intelligently and economically it is essential that the farmer knows something about the constituents of the different kinds of feeds and the proportion in which these must be used in order to have a balanced ration. It must now be remembered that we are speaking of dairy cows exclusively, and that a balanced ration for a dairy cow is in no sense a balanced ration for any other animal—as a beef steer or a growing calf. In fact a balanced ration is not to be regarded as fixed in any case. It is simply an approximate standard which must be varied to suit the individuality of the animal according to the best judgment of the feeder.

Nutrients

The nutrients or food parts, found in all feeding stuffs, in the bodies of animals and in milk may be classed as follows:

Water.

Mineral substances (found in all plants).

Protein (compounds of nitrogen.) Carbohydrates (starches, sugars, etc.)

Fats (oils, etc).

The first of these two required nutrients, viz. water and mineral, while very necessary to good feeding, can usually be supplied without much trouble. An animal fed with the right proportion of the other nutrients will receive sufficient mineral matter since it is found in all feeding stuffs. Pure water should, of course, be supplied in abundance.

Protein

Protein is the name given to those constituents of feeds which contain nitrogen. Good examples of protein are gluten in wheat, the white of egg, the lean part of beef and the casein of milk.

The principal feeds which contain large amounts of protein are the legumes such as alfalfa, clover and peas, and various meals as oil meal, cottonseed meal, gluten meal. In the animal body the chief use of

protein to build up muscle, and to form the casein of milk. It is important that the required amount of protein be fed since no other constituent can take its place in the formation of muscle and milk.

Carbohydrates

Carbohydrates is the name given a group of feed constituents which contain carbon. In this group are found starch, sugar, and crude fiber. Carbohydrates furnish the energy needed to perform the bodily functions. They are also the source of the heat of the system. Carbohydrates also normally furnish the constituents needed for forming milk sugar and the fat in milk.

Fat

In the body fat performs the same function as do carbohydrates. The chief difference being that fat is a more concentrated form of food, one pound of it being equal to 2.4 pounds of carbohydrates. The two are interchangable; that is, one can be made to serve the purpose of the other.

CLASSES OF FEEDS

Inasmuch as protein and carbohydrates are the two constituents with which the feeder is most concerned it will be of value to roughly classify some of the most common Idaho feeding stuffs into two classes:

1st. Those which contain a large per cent of protein.

2 d. Those which are chiefly carbohydrates.

The feeder can easily see that in order to balance the ration properly it must be made up of feeds from both classes.

Feeds Rich in Protein	*Feeds Rich in Carbohydrates*
Alfalfa hay	Corn
Clover hay	Corn silage
Pea hay	Timothy hay
Bran	Corn fodder
Oil meal	Orchard grass
Cottonseed meal	Wheat straw
Oats	Oat straw
Barley	Carrots
Gluten meal	Sugar beets
Soy beans	Mangel wurzels

Nutritive Ratio—How to Calculate

The next question naturally arising is the exact proportion of carbohydrates and protein that the animal needs to do its best work. The relation existing between the exact amount of carbohydrates and protein needed by the animal is what is scientifically expressed as the "nutritive ratio.' It is determined in the following manner: Divide the digestible carbohydrates plus 2.4 times the digestible fat by the digestible protein. It has been determined that the food value of a pound of fat is 2.4 times as great as the food value of a pound of carbohydrates, and as both serve the same purpose it is desirable to reduce them to the same standard for the sake of comparison.

Take for example a ration containing the following amounts of digestible nutrients:

Digestible protein	2.60 lbs.
Digestible carbohydrates	13.2 lbs.
Digestible fat	.8 lbs.

According to the above definition the nutritive ratio would be determined as follows:

Carbohydrates	13.2 lbs.
Fats, .8 x 2.4	1.92 lbs.
Total carbohydrate value	15.12 lbs.

15.12 (Carbohydrates) divided by 2.6 (Protein) equals 5.8 or one part protein to 5.8 parts carbohydrates; that is, the nutritive ratio equals 1:5.8.

When the ration contains a large amount of carbohydrates in proportion to the protein, it is spoken of as a "wide ration." Where the reverse is true it is called a "narrow ration." For dairy cows anything above 1:7 is "wide" and 1:5 or below is "narrow." The term ration means of course, the amount of feed required by the animal in 24 hours.

In the matter of determining the correct nutritive ratio and amount of protein and carbohydrates necessary for the maintenance of the dairy cow much work has been done by Professor T. L. Haecker. of the Minnesota Experiment Station. He has carried on extended experiments to determing the amount of feed needed per 100 pounds of live weight of cow, and also the additional amount necessary to produce one pound of milk.

No. IV. Table Showing Feeding Standard (Haecker.)

(Digestible nutrients required per day per cwt. of live weight of cow for maintenance and for production of each pound of milk testing a given per cent of butter fat:)

For Maintenance of Cow per 100 lbs Live Weight.	Protein .07	Carbohydrates .7	Fat .01
For Each Lb. Milk Testing			
2.5 per cent fat	.039	.168	.012
2.6 " "	.0396	.172	.0122
2.7 " "	.0402	.176	.0124
2.8 " "	.0408	.18	.0127
2.9 " "	.0414	.185	.013
3.0 " "	.042	.189	.133
3.1 " "	.0426	.193	.136
3.2 " "	.0432	.197	.0139
3.3 " "	.0438	.202	.0142
3.4 " "	.0444	.206	.0146
3.5 " "	.045	.211	.0149
3.6 " "	.0456	.215	.0152
3.7 " "	.0462	.22	.0155
3.8 " "	.0468	.224	.0158
3.9 " "	.0474	.228	.0161
4.0 " "	.048	.233	.0164
4.1 " "	.0486	.237	.0167
4.2 " "	.0492	.241	.017
4.3 " "	.0498	.245	.0173
4.4 " "	.0504	.249	.0176
4.5 " "	.051	.253	.0179
4.6 " "	.0516	.257	.0181
4.7 " "	.0522	.26	.0184
4.8 " "	.0528	.264	.0186
4.9 " "	.0534	.267	.0189
5.0 " "	.054	.271	.0191
5.1 " "	.0546	.275	.0194
5.2 " "	.0552	.278	.0196
5.3 " "	.0558	.282	.0199
5.4 " "	.0564	.285	.0201
5.5 " "	.057	.289	.0204
5.6 " "	.0576	.292	.0206
5.7 " "	.0582	.296	.0209

5.8	"	"	.0588	.3	.0211
5.9	"	"	.0594	.303	.0214
6.0	"	"	.06	.307	.0216
6.1	"	"	.0606	.31	.0219
6.2	"	"	.0612	.314	.0222
6.3	"	"	.0618	.317	.0224
6.4	"	"	.0624	.322	.0227
6.5	"	"	.063	.325	.0229
6.6	"	"	.0636	.328	.0232
6.7	"	"	.0642	.331	.0234
6.8	"	"	.0648	.335	.0237
6.9	"	"	.0654	.339	.0239
7.0	"	"	.066	.341	.0242

As an illustration of the method of using this table suppose we are feeding a 900 lb. cow giving 30 lbs. of milk per day testing 4 per cent butter-fat. From the table we note that for maintenance alone for a 900 lb. cow it will require:

	Lbs. per cwt.	Lbs. for 900 lb. cow
Protein	.07 x 9	equals .63 lbs.
Carbohydrates	.7 x 9	equals 6.30 lbs.
Fat	.01 x 9	equals .09 lbs.

Next it is found that for producing 30 lbs. of milk testing four per cent. the following amounts are required:

	Pounds to produce 1 lb. 4 per cent milk		Pounds to produce 30 lbs. 4 per cent milk
Protein	.048	x	30 equals 1.44 lbs.
Carbohydrates	.233	x	30 equals 6.99 lbs.
Fats	.0164	x	30 equals .492 lbs.

Adding the amount for maintenance to the amount necessary for production of the given amount of milk we have the following results as the necessary amount of digestible feed constituents required by this cow.

	Protein	Carbohydrates	Fats
For maintenance	.63 lbs.	6.30 lbs.	.09 lbs.
For producing 30 lbs. of 4 per cent. milk	1.44 lbs.	6.99 lbs.	.492 lbs.
Total	2.07 lbs.	13.29 lbs.	.582 lbs.

To Find the Nutritive Ratio

13.29 (carbohydrates) plus (2.4 x .582 (fat) equals 14.686 lbs. total carbohydrates. Then 14.686 divided by 2.07 equals 7. Therefore the nutritive ratio is 1:7.

It might be pointed out here that many investigators differ with Professor Haecker as to the best nutritive ratio. Many believe that the best results are obtained when a ratio between 1:5.5 and 1:6 is used. In a general way, it is desirable to feed a little too much rather than not enough protein for the reasons that no other nutrient can take the place of the protein, and that a slight excess of protein can, if necessary, serve the purpose of the carbohydrates in the process of milk production. Then again, investigations show that a slight increase in the protein content of a ration has a tendency to increase its digestibility. In view of these facts, here in the West where alfalfa is so cheap and so abundant it would seem advisable to feed a ration the nutritive ratio of which is between 1:5.5 and 1:6.

By the use of the table given the farmer can determine approximately the digestible nutrients required by each cow in his herd. He must of course, always remember that there is no attempt made to lay down a hard and fast rule since there are several factors aside from the necessary amounts of digestible nutrients, that must be considered in scientific feeding. The *judgment* of the feeder must in all cases be considered important. He must study the *individuality* of the cow and vary the ration accordingly. He must supply a ration which contains sufficient roughage to give the cow the bulk that is necessary to keep her digestive tract in good condition. The ration must also be *palatable,* for if the cow will not eat the food placed before her it matters little how nutritious chemical analysis shows it to be.

Calculating Rations

As before stated, by ration is meant the actual amount of feed required by a cow during a period of 24 hours. In calculating a ration we simply mean selecting such an amount of the feeds at our disposal as will contain the right amount of digestible nutrients. The practical feeder will naturally select as a basis for his ration the best and cheapest feed available in his community. Here in Idaho where alfalfa rich in protein grows in such abundance it would certainly be folly to

buy expensive concentrates to supply the necessary protein content.

As an example, let us now figure the actual feed ration of an Idaho dairy cow weighing 900 pounds and giving 30 lbs. of milk testing 4 per cent. butter-fat. From a previous calculation, Table IV., it was found that such a cow would require approximately 2.07 lbs. digestible protein; 13.29 lbs. digestible carbohydrates and .582 lbs. of digestible fat.

Let it be supposed that the feeding materials on hand are alfalfa hay, corn silage, ground barley, oat straw.

By making several trial calculations we find that the following trial ration comes near enough to our standard for the particular cow in question:

15 lbs. alfalfa hay
30 lbs. corn silage
4 lbs. ground barley
5 lbs. oat straw

The calculation in made from the Table V.

		Amount of Protein in 1 pound			
Protein in 15 lbs. alfalfa hay.....	equals .110	x 15	equals 1.65	lbs.
Protein in 20 lbs. corn silage.....	equals .009	x 20	equals .18	lbs.
Protein in 4 lbs. Barley, ground..	equals .087	x 4	equals .348	lbs.
Protein in 5 lbs. oat straw.....	equals .012	x 5	equals .06	lbs.
Total Protein.....				2.238 lbs.

		Amount of Carbohydrates in 1 pound		
Carbohydrates in 15 lbs. alfalfa.....	equals .396	x 15	equals 5.94	lbs.
Carbohydrates in 20 lbs. corn silage...	equals .113	x 20	equals 2.26	lbs.

Carbohydrates in 4 lbs. barley, ground equals .656 x 4 equals 2.624 lbs.
Carbohydrates in 5 lbs. oat straw.....equals .386 x 5 equals 1.93 lbs.

Total Carbohydrates..... .....12.755 lbs.

Amount in 1 lb.

Fats in 15 lbs. alfalfa .....equals .012 x 15 equals .18 lbs.
Fats in 20 lbs. corn silage.....equals .007 x 20 equals .14 lbs.
Fats in 4 lbs. barley, ground, equals .016 x 4 equals .064 lbs.
Fats in 5 lbs. oat straw.. .....equals .008 x 5 equals .04 lbs.

Total Fats..... .424 lbs.

In this case the nutritive ratio would be:

$$\frac{12.754 \text{ plus } (2.4 \times .424)}{2.238} \text{ equals } 6.1 \text{ or } 1{:}6.1,$$

a ratio that should give good results.

Another sample ration suggested might consist of:

15 lbs. alfalfa hay	8 lbs. oat straw
15 lbs. sugar beets	5 lbs. oats (rolled)

The feeder who familiarizes himself with the calculations here described ought to have no trouble in figuring economical rations for his herd from the feeds available in his community.

Whether or not the feeder is justified in carefully calculating the rations for his individual cows is for him to dicide. It is, however, absolutely necessary to his success that he familiarize himself with the composition of the feeds available so that he may feed such a mixture as will approximately balance and thus supply the needs of the cow that is expected to yield a maximum product.

Table No. V. Digestible Nutrients in Feeding Stuffs.
(Composition as given by Henry.)

Concentrates	Total Dry Matter in 1lb	Digestible Nutrients in one lb.			Nutritive Ratio
		Protein lb	Carbohydrates lb.	Fat lb.	
Corn	.89	.079	.667	.043	1:9.7
Barley	.89	.087	.656	.016	1:7.9
Oats	.89	.092	.473	.042	1:6.2
Rye	.88	.099	.676	.011	1:7.1
Millet	.86	.089	.450	.032	1:5.8
Kaffir Corn	.84	.079	.571	.029	1:8.1
Sorghum	.87	.070	.521	.031	1:8.5
Shorts	.88	.122	.500	.038	1:4.8
Bran	.88	.129	.401	.034	1:3.7
Peas	.90	.168	.518	.007	1:3.2
Gluten Feed	.90	.204	.507	.027	1:3
Oil Meal	.91	.293	.327	.070	1:1.7
Gluten Meal	.88	.258	.422	.025	1:1.5
Cotton, S. M.	.92	.372	.169	.122	1:1.2
Roughage (cured)					
Fodder corn	.58	.025	.346	.012	1:14.9
Stover	.60	.017	.324	.007	1:19.9
Sorghum	.60	024	.321	.016	1:14.9
Timothy	.86	.028	.434	.014	1:16.6
Prairie hay	.80	.029	.415	.012	1:15.3
Red top	.91	.048	.469	.010	1:10.2
Oat hay	.91	.043	.464	.015	1:11.6
Millet		.032	.485	.010	1:15.9
Marsh hay	.88	.024	.299	.009	1:13.3
Soy Bean	.88	.109	.401	.015	1: 4.
Cow Pea	.89	.107	.382	.012	1: 3.8
Clover	.85	.068	.358	.017	1: 5.8
Alsike	.90	.084	.425	.015	1: 5.4
Alfalfa	.92	.110	.396	.012	1: 3.8
Roughage (green)					
Fodder Corn	.20	.010	.016	.004	1:12.5
Sorghum	.20	.006	.122	.004	1:21.9
Oats	.37	.026	.189	.001	1: 8.2
Red top	.34	.021	.212	.006	1:10.7
Clover	.29	.029	.148	.007	1: 5.6
Alsike	.25	.027	.131	.006	1: 5.3
Alfalfa	.28	.039	.127	.005	1: 3.5
Cow pea vine	.16	.018	.087	.002	1: 5.1
Soy bean	.24	.032	.110	.005	1: 3.8

Table No. V Continued.

Silage	Total Dry Matter in 1 lb	Digestible Nutrients in one lb.			Nutritive Ratio
		Protein lb	Carbohydrates lb.	Fat lb	
Corn	.21	.009	.113	.007	1:14.3
Cow pea vine	.20	.015	.086	.009	1: 7.1
Clover	.28	.020	.133	.010	1: 5.6
Soy bean	.25	.027	.087	.013	1: 4.3
Alfalfa	.27	.030	.085	.019	1: 4.3
Miscellaneous					
Potato	.21	.009	.163	.001	1:18.3
Sugar beet	.13	.011	.102	.001	1: 9.4
Mangel wurzel	.09	.011	.054	.001	1: 5.1
Turnip	.10	.010	.072	.002	1: 7.7
Rutabaga	.11	.010	.081	.002	1: 8.5
Cabbage	.15	.018	.082	.004	1: 5.
Pumpkin	.09	.010	.058	.003	1: 6.5
Rape	.14	.015	.081	.002	1: 5.7
Beet pulp	.10	.006	.073	.000	1:12.
Carrot	.11	.008	.078	.002	1:10.3
Sugar beet (leaves	.12	.017	.046	.002	1: 2.9
Straw					
Wheat	.90	.004	.363	.004	1:93.
Oats	.90	.012	.386	.008	1:33.6
Barley	.85	.007	.412	.006	1: 6.

NOTE. In order that the dairy cow may digest her food to the best advantage it must be remembered that she requires a certain bulk. According to the best feeding standards, the ration for a dairy cow should contain from 25 to 29 pounds of dry matter.

SUPPLEMENTING THE PASTURES

The careful observer has often noticed that when a balanced ration containing plenty of palatable, and succulent material is fed the cows are yielding the best returns. This condition is most frequently reached when the cows are in good pasture. This being the case it ought to be the business of every dairyman to approach as closely as possible summer conditions throughout the year.

In some localities of Idaho the pasturing season is quite short. In other parts the land is almost too valuable for pasturing. For these reasons the farmer should provide an abundance of good, cheap, succulent feed for his cows not alone for the winter months but to help out during the dry, hot periods of late summer and fall. In this state, this can be accomplished most economically by growing the various root crops such as sugar beets, mangel-wurzels, carrots, etc., and by raising some good crops for the silo.

In many localities no crop better adapts itself to this purpose nor can be grown more economically than corn. It is quite easy to select varieties that will mature sufficiently to yield succulent feed of high feeding value not only for the silo but for fall feed to supplement the pastures.

SILOS

Some ten or fifteen years ago very few farmers were interested in silos or silage. Now in many parts of the country silos are as common as other farm buildings and many of our best farmers would think as much of dairying without barns as without a well-filled silo. By the use of a silo the farmer is able to retain for feed a larger amount of the food material found in the fodder, than by any other method now in vogue.

The silo furnishes a convenient method of supplying, throughout the year, an abundance of succulent feed for dairy cows. This is especially advantageous, as it does not necessitate any sudden changes of feed with the change of season. It also economizes space as more feed can be stored away in the silo than in any equal amount of space in the barn. No detailed description of the construction of silos will be given in this bulletin as the Experiment Station has under way plans for the publishing of a separate bulletin on silos.

CARE OF MILK AND CREAM

It is not easy to say just what is the most important feature in the production of clean milk. Special stress may be placed upon some particular step, yet if carelessness is allowed to rule at other steps much of the most painstaking care would count for naught in the final results.

Cleanliness

Clean and sanitary conditions are factors of first importance upon

which too much stress cannot be laid. It is impossible to produce good milk or good cream if dirt of any kind is allowed to get into it. Unless some precaution is taken at milking time, dirt and dust will be sure to fall into the milk from the flanks and udder of the cow. The greater part of this filthy matter dissolves in the milk, giving it not only undesirable odors and taints but also innoculating it with bacterial germs.

These germs may have been gathered from stagnant water, muddy pools or miry yards. While the majority of them may not be disease-producing or especially harmful should they be transmitted to the human system, yet, to say the least, they are factors in bringing about decomposition of the milk. Filth and disease germs go hand in hand; the same carelessness that allows the one is likely to give access to the other. Hence, it is of the highest importance that the cow be kept as nearly clean as possible. This can be accomplished largely by brushing off all the loose dirt and dust from the flanks and udder but, if at all convenient, it is even better to wipe the udder with a damp cloth. This will take but a moment and will prevent large quantities of filth from getting into the milk.

The Illinois Experiment Station has carried on some experiments to determine the amount of dirt that falls from the cow's udder and flanks during milking time. The following quotation from Bulletin 84, Illinois, gives some interesting results. "It was determined after several trials with three different milkers on thirty cows that it requires an average of 4½ minutes to milk a cow. A glazed dish eleven inches in diameter, the size of an ordinary milk pail, was placed in the top of a pail and held under the cow's udder in the same position as when milking. For 4½ minutes the milker went through the motions similar to those made in milking but without drawing any milk. The amount of dirt which fell into the dish during the operation was, of course, approximately the same as would have gone into the milk during the milking process. The dirt caught in the dish was then brushed into a small glass weighing tube, the udder washed and the process repeated. The dirt which fell from the washed udder was also carefully brushed into a weighing tube. Both tubes were then placed in a desiccator and after drying twenty-four hours were accurately weighed on a chemical balance."

"Sixty trials were made at different seasons of the year. With udders that were apparently clean it was found that an average of 3½ times as much dirt fell from the unwashed udders as from the same udders after they were washed. With soiled udders the average was 22 times and with muddy udders the average was 94 times as much dirt from the unwashed udders as from the same udders after washing."

It should be well understood that the amount of dirt that gets into the milk is one of the chief causes of its rapid spoiling. Although some farmers think that the creamery-man can, in some mysterious way, remove the dirt and all its attendant evils, it remains a fact that the contamination resulting from dissolved filth cannot be entirely eliminated.

Many milkers who have not as good a conception as they should have of the ease of contaminating milk products, persist in wearing the same suit while milking that, perhaps, has been worn while cleaning the barns, feeding the hogs or, perhaps in some cases even the same suit may have been used in places abounding with disease germs.

Fig. 14---White suits are cheap and most appropriate while handling milk.

The milker interested in a pure wholesome product should insist on wearing a special suit while milking. This suit need not be a white one, but such an one has the advantage of at least showing when it has become soiled and furthermore, if the milker is to keep it clean he will soon be forced to keep everything about him clean.

The warm milk as it comes from the cow offers a splendid medium for the favorable growth of all kinds of bacteria which may gain access to it. In order to lessen this development milking should be done as carefully and quickly as possible and the milk strained hrough a metallic strainer. Do not use a cloth strainer for even under good conditions this soon becomes a hot-bed for bacteria.

Care of Milk Utensils

To thoroughly clean milk utensils they should first be rinsed with cold water to remove all particles of milk. Then they should be thoroughly scrubbed with a brush in warm water containing liberal quantities of good washing powder. After this they should be steamed or at least rinsed in boiling water. No wiping cloth of any kind should be allowed to come in contact with them after the scalding process. Sunlight is one of the best disinfectants and when possible all utensils should be given the benefit of good sunlight and pure air. The separator, of course, must also go through the same cleansing process. No one should place much confidence in any agent's claim of separators being able to wash themselves by simply running water through them. Such claims are not made by men who have the dairymen's interests at heart. Washing a separator is not a very difficult job if done soon after separating. The water for washing should be warm, but not hot enough to cook the curd on any of the parts. If it is not convenient to wash the machine immediataly after separating, the bowl can, at least, be taken apart and immersed in water. This will loosen all the curd and make washing comparatively easy. If the parts are scalded after washing and left in a sweet, clean place to dry, no wiping with a cloth will be necessary.

Milk Utensils

The best milking pail is the one so constructed that it will reduce to a minimum the amount of dirt falling into the milk during the process of milking. The small-top pail may have some objections, but its advantages are so evident that it is rapidly being adopted by most of our prominent dairymen.

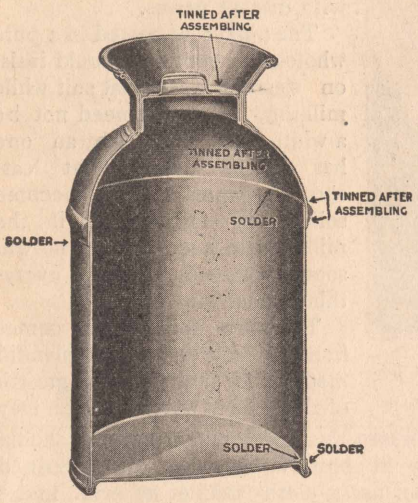


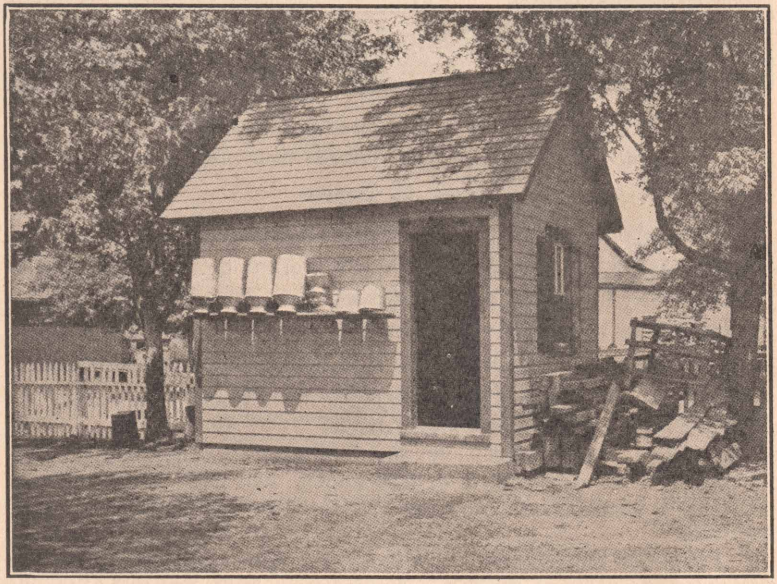
Fig. 15---Note how seams and crevices of this can are flushed full of solaer

All milk utensils should be heavily tinned and as free from seams as it is possible to get them. All crevices and seams should be flushed full and smooth with solder. If pails of this kind cannot be purchased take them to a local tinner and have him fill up all crevices with solder. Wooden pails readily absorb milk particles, making it almost im-

possible to keep them sweet and clean. For this reason they should have no place in the dairy.

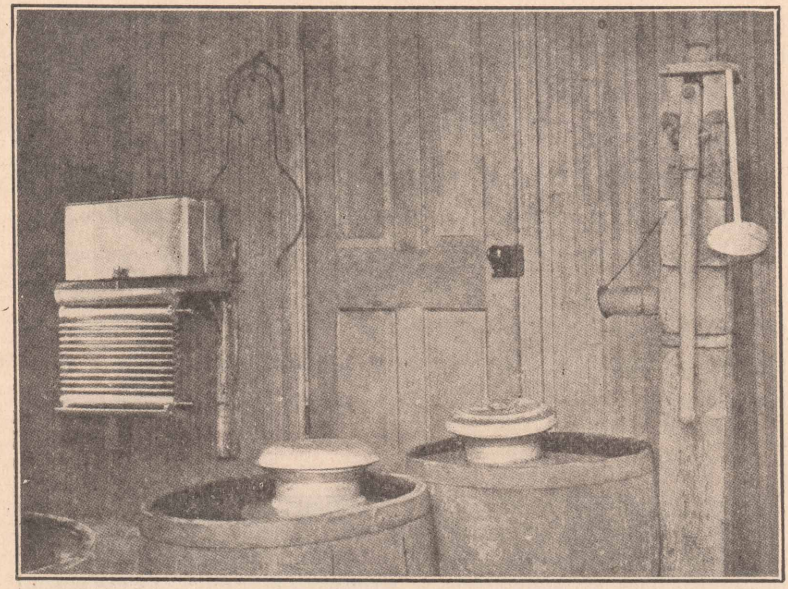
Sanitary Milk House

The milk house or milk room should be separate from the barn, so that no odors from the barn will penetrate it. It need not be expensive, but should be built so that sunlight and ventilation are not obstructed. It should be provided with plenty of cold water, and also with some method of providing hot water or steam for cleaning the utensils. It should have smooth walls and ceilings such as can easily be kept clean. The milk house should not be used as a general store room.



Courtesy of U. S. Department of Agriculture

Fig. 16---A cheap but good milk house---Everything in and about it neat and clean



Courtesy of U. S. Department of Agriculture

Fig. 17---Inside View of a cheap inexpensive Milk House

Care of Cream

Investigators have found that nearly all the chemical and bacteriological changes in cream take place in the serum or milky part, therefore the richer the cream the better it will keep, other conditions being the same By skimming a rich cream more skim milk is left at home for feed and there is also smaller bulk on which to pay express charges. For these reasons it is generally advisable to skim cream testing from 35 per cent to 45 per cent butter-fat.

Frequent experiments have shown that cool (low) temperatures will greatly retard the growth of most germs, and that cream quickly cooled will keep sweet much longer than when it is allowed to cool gradually.

Professors Duclaux and Grotenfelt have carried on experiments to determine the value of cooling. A sample of milk, one-half hour after milking, contained 18,000 germs per cubic centimeter. This sample was divided and carried at different temperatures as given in the following table:

Temp. of Milk.	Time Held	No. of Bacteria per cc.
41° F.	10 hrs.	14,100
57° F.	10 "	719,000
77° F.	9 "	1,926,000
41° F.	24 "	10,800
57° F.	24 "	5,820,000
77° F.	24 "	11,160,000

From this table, the importance of holding the cream at low temperatures can readily be seen.

As soon as separating is finished the cans containing the cream should be placed in cold water and the contents well stirred. *It is well to remember that it is the cooling of the cream and not the mere fact of getting it into water that is so important.* If the cream is stirred faithfully it will in a few minutes be reduced to the same temperature as the water in the tank, while if put into the tank without stirring it may remain warm for several hours. It is needless to say that just so long as the cream remains warm the bacteria which, even under the most sanitary conditions have gained access to the cream, will not be hindered in their growth. The vast majority of milk bacteria, however, grow very slowly at the temperature of ordinary cold water, hence the importance of cooling the cream very quickly.

While the cream is cooling the lid should always be removed from the can thus giving the animal odors a chance to escape. A clean, dry cloth may be substituted as a protection from flies and dust. No vegetable or any substance having strong odors should be allowed close to the cream as such odors are readily absorbed.

When hauling see that a wet sack is thrown over the can. This will enable the cream to reach the station at a much lower temperature than would otherwise be possible.

Some one has well said, "Clean cream, cold cream and rich cream are the three words which tell the secret of producing good cream." It is believed that these few suggestions and such others as will occur to the intelligent farmer will aid him in producing a cream that will be sanitary and wholesome, and one that should easily secure the highest market price.

(In order that there might be some uniform method of comparing Sanitary Conditions of Dairies the National Association of Dairy Instructors, last year, adopted the following score card:)

SANITARY INSPECTION OF DAIRIES

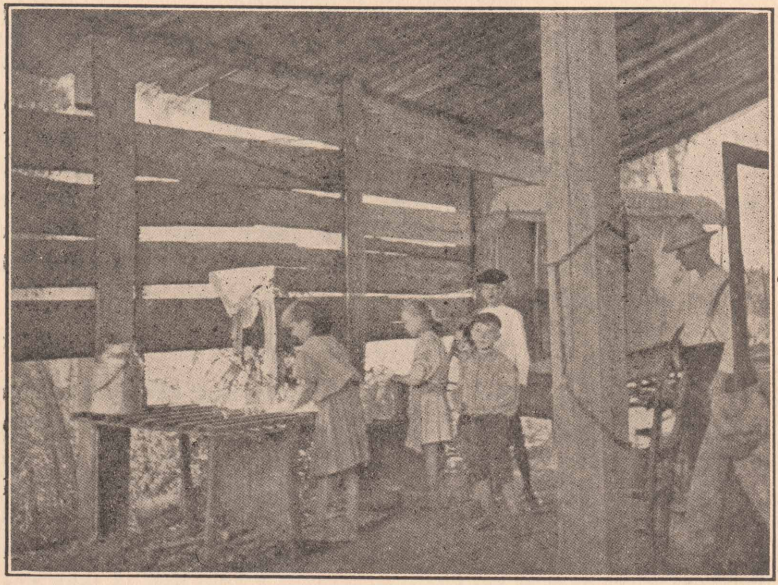
DETAILED SCORE CARD.

EQUIPMENT.	SCORE. Perfect	SCORE. Allowed
COWS.		
Health	6	
Apparently in good health	1	
If tested with tuberculin once a year and no tuberculosis is found, or if tested once in six months and all reacting animals removed	5	
(If tested only once a year and reacting animals found and removed, 2.)		
Comfort	2	
Bedding	1	
Temperature of stable	1	
Food	2	
Water	2	
Clean	1	
Fresh	1	
Light: Four sq. ft. of glass per cow (Three sq. ft., 3: 2 sq. ft., 2: 1 sq. ft., 1. Deduct for uneven distribution.)	4	
Ventilation: Automatic system (Adjustable windows, 1.)	3	
Cubic feet of space for cow: 500 to 1,000 feet	3	
(Less than 500 feet, 2; less than 400 feet, 1; less than 300 feet, 0.)		
STABLES		
Location of stable	2	
Well drained	1	
Free from contaminating surroundings	1	
Construction of stable	4	
Tight, sound floor and proper gutter	2	
Smooth, tight walls and ceiling	1	
Proper stall, tie, and manger	1	
UTENSILS.		
Construction of utensils	1	
Water for cleaning	1	
(Clean, convenient, and abundant.)		
Small-top milking pail	3	
Facilities for hot water or steam	1	
Milk cooler	1	
Clean milking suits	1	
HANDLING THE MILK.		
Location of milk room	2	
Free from contaminating surroundings	1	
Convenient	1	
Construction of milk room	2	
Floor, walls, and ceiling	1	
Light, ventilation, screens	1	
Total	40	

METHODS.	SCORE. Perfect	SCORE. Allowed.
COWS AND STABLES.		
Cleanliness of cows	8	
Cleanliness of stables	6	
Floor	2	
Walls	1	
Mangers and partitions	1	
Ceilings and ledges	1	
Windows	1	
Stable air	6	
Barnyard clean and well drained	2	
Removal of manure daily to field or proper pit	2	
(To 50 feet from stable, 1.)		
UTENSILS AND MILKING		
Care and cleanliness of utensils	8	
Thoroughly cleansed	5	
Inverted in pure air	3	
Cleanliness of milking	9	
Clean, dry hands	3	
Udders washed and dried	6	
(Udders cleaned with moist cloth, 4: cleaned with dry cloth at least 15 minutes before milking, 1.)		
HANDLING THE MILK		
Cleanliness of attendants	1	
Milk removed immediately from stable	2	
Cleanliness of milk room	3	
Prompt cooling. (Cooled immediately after milking each cow)	2	
Efficient cooling; below 50° F. (51° to 55°, 4: 56° to 60°, 2,)	5	
Storage; below 50° F. 51° to 55°, 2; 56° to 60°, 1.)	3	
Transportation; iced	3	
(For jacket or wet blanket allow 2; dry blanket or covered wagon, 1.)		
Total	60	

Score for equipment ..... plus Score for methods ..... equal..... **Final score.**

NOTE 1.—If any filthy condition is found, particularly dirty utensils, the total score shall be limited to 49.
NOTE 2.—If the water is exposed to dangerous contamination or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.



Courtesy of U. S. Department of Agriculture

Fig. 18.—Milk bottles are frequently returned from homes where contagious diseases exist. To prevent the spread of epidemics, the important work of washing milk utensils should not be intrusted to little children.

VALUE OF A SEPARATOR

No dairyman can afford to be without some good separator. A separator will remove practically all the butter fat from the milk while the old method of skimming may leave as much as 25 per cent of all the butter-fat in the skim milk. Butter-fat is certainly too expensive for hog feed. Any good hand separator will leave less than five one-hundredths of one per cent of butter-fat in the skim milk and thus will effect a saving of from $4.50 to $8.00 per month per cow over the old-fashioned gravity systems of creaming. In addition to this it is well to bear in mind that with a hand-separator a richer and better cream can be skimmed and that the skim milk can by this system be fed immediately while still in a warm sweet condition.

Selection of Separators

In selecting the separator the farmer should use the same good judgment that is so necessary in the selection of any kind of machinery. From a practical standpoint there is but little difference in the skimming efficiency of any of the standard makes of centrifugal separators now on the market. Durability, ease of running, ease with which they are cleaned, are the points of primary importance in buying a new separator. There are many cheaply constructed machines now on the market, that are dear at any price, and with which the dairyman cannot afford to take any chances.

WINTER DAIRYING

There are many advantages in having cows come fresh in the winter when all dairy products sell at a high price. Here in Idaho the price of butter is fully 50 per cent higher in winter than in summer.

When the cows calve in the spring they generally milk well until the pastures "dry up" when the flow of milk quickly falls off, so that by the time stable feeds begin the cows are almost "dried up." Now if the cows come fresh in the fall, they produce a good flow of milk during the winter months, and in the spring when they are turned on grass this acts as a second freshening and thus lengthens the period of milk production. Another distinct advantage in winter dairying is that during this season the farmer is not so busy with other work, consequently he can give more time to the care of the cows, the milk, and the cream, than is possible during the busy season of the year. When Winter Dairying becomes more generally practiced the subject of winter feeds will be given more attention. Of these, silage is one of the most important since one acre of good silage material will yield as much feed as three acres of pasture.

MARKETS

There are many different ways of disposing of butter. Frequently the individual farmer succeeds in working up a special demand for his particular butter at a premium price. When such is the case it is undoubtedly to his advantage to cater to this market. However, where the farmer has not the time or the inclination, to secure such a market

it is desirable that he should patronize some creamery. The average country store does not pay for butter according to its merits—the man who delivers the poorest kind of butter and who is a good customer generally gets as good a price as the man who makes a high grade. For these reasons all interested in dairying should do everything possible to discourage the sale of their butter to the country store. Every maker of good butter should make an effort to have his butter sold where its merits will be appreciated. A striking feature noticed in almost every successful dairy district of the east is the absence of so-called "ranch butter" or "country butter." These districts have long ago realized that the creameries are in a position to make it cheaper, and by making it in large quantities can command markets that could not be secured by the individual farmer.

CREAMERIES

No greater injury can be done the dairy industry than that done by the unprincipled "creamery promoter" who in various ways induces the farmers to build creameries in localities long before they are ready for them. Hundreds of creamery failures can be traced to the fact that some "promoter" encouraged the building of a creamery in a locality containing too few cows.

However, when a locality has an assurance of at least 400 cows, and when all the farmers will give it their hearty support, there is no good reason why a creamery should not be entirely successful. Certainly a well managed creamery adds much to the prosperity of a community. Through it the farmer secures a ready cash market for his dairy product. When the creamery is a co-operative one, well and honestly managed, he has the satisfaction of knowing that he is getting all the profits. He can readily see that the creamery making large quantities of butter can make it cheaper per pound than could the farmer making only a few pounds. Again, to make butter that will command the highest price and be uniform in color, texture and flavor, necessitates a certain amount of skill. The creamery organization can afford to secure the services of an experienced butter maker. Another feature in favor of the creamery is that many buyers of butter will purchase in large lots only. Thus in this way the creamery reaches a

market that the individual having only a few cows could not reach.

The writer firmly believes that no one thing does more to lower the price and demand for Idaho butter than the quantity and quality of ranch butter thrown on the market at any price (in trade) the merchant sees fit to offer. Every dairy community with an established reputation for good butter, which always sells at a good price, will be found loyally supporting some good creamery.

ACKNOWLEDGMENTS

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