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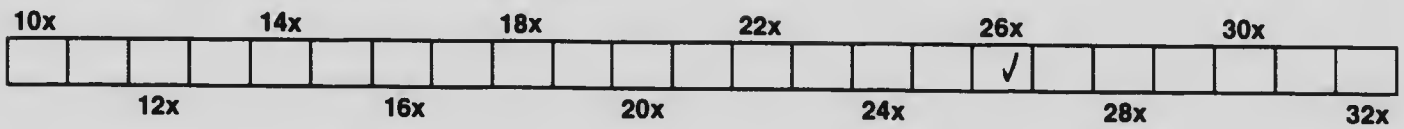

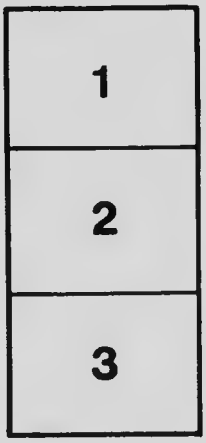

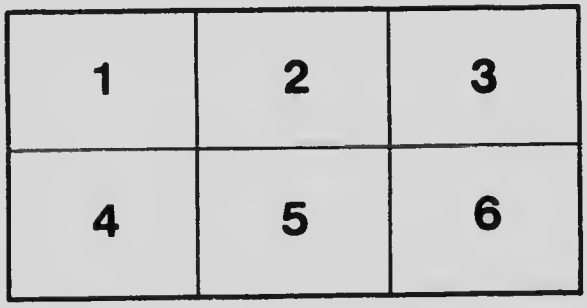

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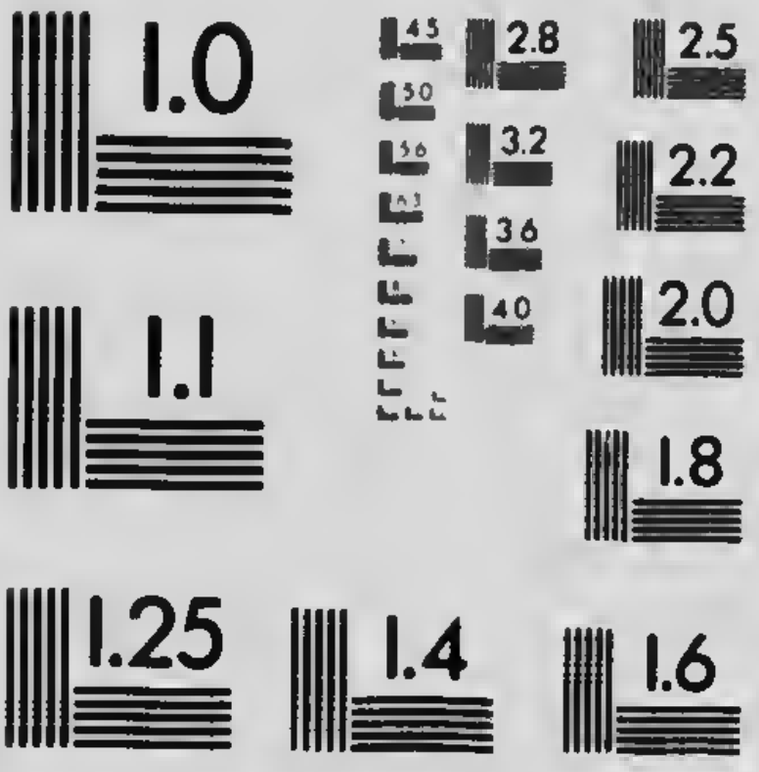

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PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF AGRICULTURE
(LIVE STOCK BRANCH)

BULLETIN No. 72

MILK-TESTING AND DAIRY RECORDS

—BY—

T. A. F. WIANCKO

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1916.

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1916.

Department of Agriculture,

Victoria, B.C., October 30th, 1916.

To His Honour Frank Stillman Barnard,

Lieutenant-Governor of the Province of British Columbia.

May it please Your Honour:

I have the honour to submit herewith for your consideration Bulletin No. 72, "Milk-testing and Dairy Records," prepared by T. A. F. Wiancko, Provincial Dairy Instructor, under the direction of Wm. E. Scott, Deputy Minister of Agriculture.

WM. MANSON,

Minister of Agriculture.

DEPARTMENT OF AGRICULTURE,

VICTORIA, B.C., October 30th, 1916.

Hon. Wm. Manson,

Minister of Agriculture, Victoria, B.C.

SIR,—I have the honour to submit herewith for your approval Bulletin No. 72, entitled "Milk-testing and Dairy Records," which has been prepared by T. A. F. Wianecko, Provincial Dairy Instructor, of the Live Stock Branch of the Agricultural Department.

I have the honour to be,

Sir,

Your obedient servant,

WM. E. SCOTT,

Deputy Minister of Agriculture.

PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE (LIVE STOCK BRANCH).

HON. WM. MANSON,
Minister of Agriculture.

WM. E. SCOTT,
Deputy Minister of Agriculture.

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WM. J. BONAVIA,
Secretary to the Department.

* Granted leave of absence for overseas service.

MILK-TESTING AND DAIRY RECORDS.

THE need of a bulletin dealing with the testing of milk and the keeping of records of the performance of dairy cows has long been felt, and it is for the purpose of giving in a simple and concise way instructions respecting these that this circular is written.

The Babcock test was invented in the year 1890 by Dr. S. M. Babcock, of the University of Wisconsin, and its use has now become general on this continent wherever milk or cream is bought or sold on a basis of the butter-fat contained therein.

THEORY OF THE TEST.

The underlying principle of the Babcock test is very simple. Owing to being lighter than the other constituents of the milk, the fat-globules will, upon standing, rise more or less perfectly to the surface, forming a layer of cream. They do not, however, all rise by gravity, owing to the viscosity of the milk. Sulphuric acid when mixed with milk dissolves or burns up the other milk solids without affecting the fat, and leaves the fat-globules in suspension, permitting them to rise to the surface more readily. Heat is generated by chemical action. This acid and milk or cream appears as a hot, coffee-coloured mixture. By whirling this mixture by centrifugal force at a high rate of speed, this process of gathering the fat-globules can be much hastened and much more effectively accomplished, and hence the use of the centrifugal machine, or tester.

APPARATUS FOR MAKING TEST.

The apparatus used in making the test consists of:—

(1.) A milk-pipette of 17.6 c.c. capacity for measuring the sample of milk to be tested. (Fig. 1.)

(2.) Milk-test bottles, having a graduated scale of 10 per cent. and with subdivisions of 0.2 per cent. (Fig. 2.)

(3.) An acid measure of 17.5 c.c. capacity. (Fig. 3.)

(4.) A tester in which to whirl the test-bottles. (Fig. 4.)

(5.) A tempering vat, or can, for keeping samples warm.

Besides the above, it is well to be provided with a tin cup with a sharp spout for adding hot water to the test-bottles; a pair of dividers for measuring the fat column; a test-bottle brush for cleaning the bottles; sample bottles; preservative tablets and washing-powder.

Such an apparatus for farm use may be purchased at about $7.50 for a four-bottle outfit, up to $18 for a twelve-bottle outfit.

MAKING THE TEST.

Outline of Process.

1. Secure a representative sample of the milk to be tested.

2. Mix thoroughly by pouring from one vessel to another.

3. The milk should be at a temperature of 60° to 70° Fahr.

4. By means of the 17.6-c.c. pipette, accurately measure this quantity of milk into a milk-test bottle.

5. Add 17.5 c.c. of commercial sulphuric acid having a specific gravity of 1.82 to 1.83 and at a temperature of 60° to 70° Fahr.

6. Mix the milk and acid thoroughly by a gentle rotary motion.

7. Place the bottles in the machine, making sure that they are properly balanced, and whirl for five minutes at proper speed (700 to 1,200 revolutions per minute, according to the diameter of the machine).

8. Add hot water at a temperature not lower than 140° Fahr., filling the bottle just to the neck.

9. Whirl two minutes.

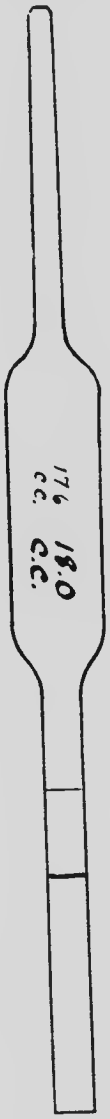

Fig. 1.

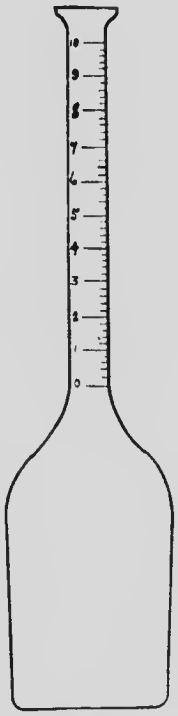

Fig. 2.
(1.) Pipette for measuring milk.
(2.) Milk-test bottle.
(3.) Acid measure.

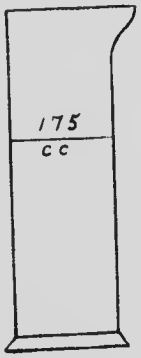

Fig. 3.

10. Fill with hot water to about the 8-per-cent. mark on the neck of the bottle.

11. Finish by whirling one minute.

12. Place the bottles in a bath of hot water (130° to 140° Fahr.) for five minutes.

13. Read from the highest to the lowest part of the fat column.

14. Empty test-bottles and wash thoroughly.

GETTING AN ACCURATE SAMPLE.

Before making the test an accurate or representative sample should be taken. Too great care cannot be exercised at this step. *A test is of no value whatever if this point is overlooked.* If milk stands for even a very few minutes the cream

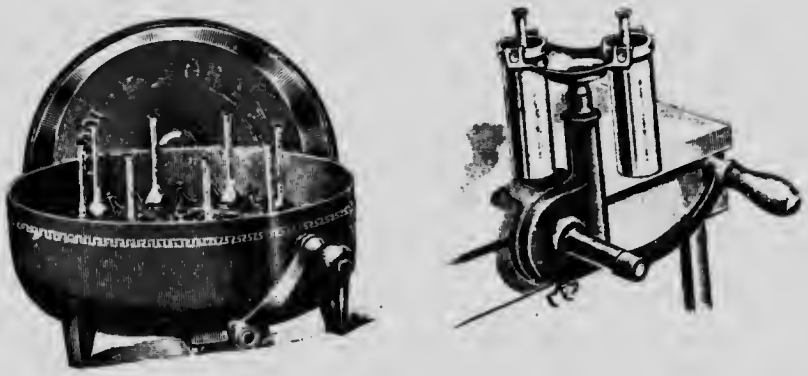

Fig. 4.
Types of Babcock testers, in which the test-bottles are whirled.

begins to rise, so that the top layer will contain more butter-fat than the rest of the milk. A representative sample means one that is mixed by pouring and stirring until it is uniform and homogeneous in richness.

USE OF PRESERVATIVES.

If for any reason the milk cannot be tested within a few hours after the sample is taken, a preservative may be added to prevent souring or curdling. Tablets of corrosive sublimate, bichromate of potash, or some other efficient preservative should be used. Most of these are poisonous and must be used with caution. About fifteen drops of formalin makes a very satisfactory preservative when samples are not to be held for more than two weeks.

TAKING THE SAMPLE.

The proper temperature of the milk for testing is from 60° to 70° Fahr. At this temperature too violent chemical reaction in mixing the milk and acid is avoided, and enables one to obtain a clear, bright-yellow fat column in the neck of the test-bottle.

After thoroughly mixing the sample of milk to be tested, insert the pipette in the sample and draw the milk up to above the 17.6-c.c. mark. Place the fore-finger over the upper end, then release the pressure slowly so as to allow the milk to run down to the mark. The pipette will then hold the required amount, and it can be transferred to the test-bottle. The test-bottle should be held in a slanting position (Fig. 5) to allow the milk to run down slowly in the neck of the bottle and at the same time

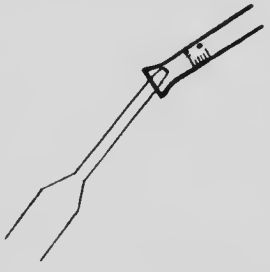

Fig. 5. This illustrates angle at which the milk-bottle and the pipette should be held when transferring milk to the bottle.

allow the air to pass out of the bottle. Blow lightly through the pipette to ensure that the last drops of milk run into the bottle. It is very important that no milk is lost during the process by mixing, measuring, and transferring to the test-bottle, as the Babcock test is essentially quantitative and the slightest loss affects its accuracy.

ADDING THE ACID.

The next step is adding the acid. For this purpose commercial sulphuric acid is commonly used. This can be purchased from any reliable dairy-supply house. It must be handled very carefully, as it is extremely corrosive. If acid gets on the hands or clothes it should be immediately washed off with cold water. The acid absorbs water very readily, and for this reason should be kept in a tightly stoppered bottle.

The exact amount of acid to use will depend largely upon the strength of the acid and the temperature of the milk to be tested, but under ordinary conditions 17.5 c.c. will be found approximately correct.

The temperature of both the acid and the milk should be about 60° to 70° Fahr. If too warm, the acid will act too vigorously and some of the milk solids will be charred, causing a black substance to rise with the fat and obscure the test. On the other hand, if too cold, all the solids will not be fully dissolved, and a clouded fat column will result. With a little individual experimenting the operator can soon discover the proper amount to use.

To prevent the charring or the burning of any part of the milk, the acid should be poured slowly down the side of the bottle until all has been added, slowly revolving the test-bottle during the process in order to wash down the milk which clings to the neck of the bottle. The acid and milk should be mixed by thorough shaking with a gentle rotary motion, so that the acid will act uniformly on all parts of the milk. Mixing should be continued until all the curd is dissolved and the liquid has turned to a dark, coffee-coloured brown, which soon changes to black. At this stage considerable heat has been produced. This high temperature keeps the fat in a finely suspended liquid state, so that it can be readily separated from the remainder of the liquid.

WHIRLING THE BOTTLES.

It is important that the bottles be placed in the machine before they become cool, otherwise they should be placed in warm water to maintain an even temperature. The bottles should be placed in the machine opposite each other, so as to evenly balance the machine. The samples should be whirled at full speed, according to the directions on the body or on the crank of the machine, for five minutes. The object of this whirling is to separate the fat from the remainder of the liquid, so that it can be gathered into the neck of the bottle and measured. It is important to keep the bottles hot during the entire process, and for this reason the machine should be operated in a warm place during the colder seasons and with hot water in the machine.

After the five minutes' whirling the machine is stopped for the purpose of adding hot water to each bottle for the purpose of floating the fat up to the neck of the bottle. Soft water is preferable, and it should have a temperature of not less than 140° Fahr. Enough water is added to bring the fat up to the neck of the bottle. A pipette, or small pitcher, or a cup with a V-shaped spout can be used to add the water.

Whirl again for two minutes at full speed. Then add sufficient hot water to bring the fat above the zero, but not above the 8- or 10-per-cent. mark. Whirl one minute more to finish the operation. The bottles should now be removed from the tester and placed in a hot-water bath, having a temperature of 120° to 140° Fahr., to avoid too rapid cooling of the fat. This should be done in all but the warmest weather. Butter-fat expands and contracts rapidly with changes of temperature,

which explains why they should be placed in the hot water. This allows the volume of fat to adjust itself and become uniform throughout before the final readings are made.

NOTE.—Care should be taken that the water in the tempering-vat stands above the fat column in the necks of the test-bottles.

READING THE TEST.

To read the amount of fat, take out one bottle at a time and hold in an upright position with the graduated scale on the bottle on a level with the eye. The difference between the highest and lowest points of the butter-fat column is the amount of butter-fat expressed in per cent. direct. Fig 6 illustrates the method of reading the test in the ordinary 10-per-cent. bottle. The use of dividers greatly facilitates the reading of the test, in that one point of the dividers can be placed at the lower end of the fat column and the other point at the upper end of the column, after which the lower point is placed at the zero mark and the percentage read direct at the point where the upper point touches the graduated scale.

The scale on the neck of the 10-per-cent. bottle is divided into ten large divisions. Each of these is divided into five small divisions. Each large division represents 1 per cent. and the small division 0.2 per cent.

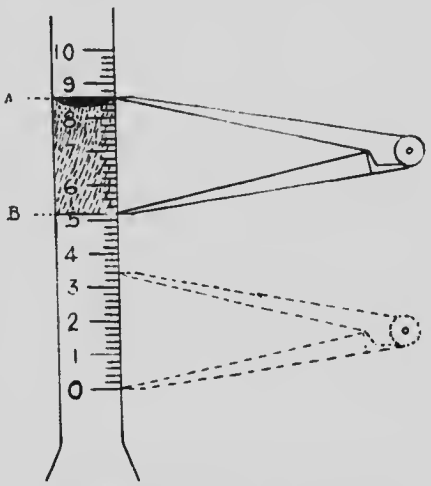

Fig. 6. Reading is made from A to B. A pair of dividers simplifies the reading of the fat column.

Example.—If the fat column covers three large and three and a half small divisions on the neck of the bottle, the test would be 3.7 per cent. This means that 100 lb. of milk testing 3.7 per cent. contains 3.7 lb. of butter-fat.

NOTE.—To find the number of pounds of butter-fat in any given quantity of milk, multiply the pounds of milk by the test, and divide by 100.

Example.—340 lb. milk testing 4.3 per cent.$= \frac{340 \times 4.3}{100} = 14.62$ lb. fat.

COLOUR OF THE TEST.

If the testing has been properly carried out, the butter-fat column will be perfectly clear and of a rich, golden colour, and free from charred material or [illegible] the line separating it from the acid being perfectly clear and distinct.

Burnt or cloudy readings may be caused by:—

(1.) Milk or acid at too high a temperature:

(2.) Too much or too strong acid:

(3.) Acid falling directly on the milk;

(4.) Shaking too violently in mixing.

Light-coloured readings and floating particles of curd are due to:—

(1.) Milk or acid at too low temperature:

(2.) Too little or too weak acid:

(3.) Insufficient shaking of the bottle to unite the milk and acid thoroughly.

Bubbles and foam sometimes appear on the surface of the fat column. These are caused chiefly by the use of hard water. The carbonates, when acted on by the

sulphuric acid, break down, liberating carbon-dioxide gas, which, rising through the fat column, gathers on its surface in the form of air-bubbles. If a few drops of sulphuric acid are added to every half-pint of water that is to be added to the bottles, this trouble may be avoided, or at least largely overcome.

TESTING CREAM.

In testing cream the principle is the same as in testing milk. Cream-test bottles, with specially graduated necks to contain 30, 40, or 50 per cent. of the quantity taken, are used.

The varying thickness of cream, viscosity, specific gravity, and amount of air-bubbles which it contains makes it almost impossible to obtain accurate or reliable results in testing if the sample is measured with a pipette. The same weight of cream as milk is necessary—namely, 18 grams; but since cream has a less specific gravity, or is lighter than milk, due to the larger proportion of butter-fat, it is necessary to use more than 17.6 c.c. A pipette graduated to 18 c.c. would be more nearly correct, and fairly accurate results can be obtained by its use in testing cream which contains up to about 25 per cent. of fat. Very rich, overripe, or gassy cream, or cream fresh from the cream-separator, cannot be accurately measured. Where strict accuracy is essential, as in the case of creameries or dairies buying cream on a butter-fat basis, it is necessary to weigh such cream on a very finely balanced scale.

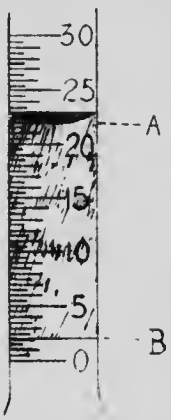

Fig. 7. In reading cream tests the fat column should be read from A to B.

For the purpose of testing cream on the farm, where sensitive cream-scales are lacking, and where there is no particular need of maximum accuracy, the cream may be measured into the test-bottle by means of an 18-c.c. pipette instead of being weighed. In this case, however, the pipette should be rinsed with warm water and this also added to the test-bottle. If care is used in making the test, the pipette method gives fully accurate results. It should be understood, however, that the results are only approximate, and are not entirely comparable with the more accurate way of weighing the cream which is practised in the creamery or city milk plant.

The other operations of the test are carried out the same as in testing milk. The reading of the cream test should be from the extreme bottom to the bottom of the upper curve (meniscus) of the fat column. (Fig. 7.)

TESTING SKIM-MILK AND BUTTERMILK.

Skim-milk and buttermilk are tested the same as whole milk, excepting that a double-necked special test-bottle is used. As the amount of butter-fat in skim-milk and buttermilk is small, it is necessary that the test-bottle have a neck in which a very small amount of fat may be read in terms of per cent. The total graduation of these bottles is usually 0.5 per cent., and the subdivisions represent 0.01 per cent. each.

NOTE.—In testing skim-milk or buttermilk, it is very necessary to have all the glassware perfectly clean, as a slight amount of fat in the pipette or bottle would seriously affect the results.

WASHING THE TEST-BOTTLES.

This is a very important consideration, as the slightest amount of fat left in unclean bottles will affect subsequent tests, and may cause variations of 0.1 to 0.2 per cent. in the reading of the fat column. As soon as the tests have been recorded the bottles should be emptied while still hot and before the fat has solidified in the necks. Shaking the bottles while emptying them will aid in removing the sediment

in the bottom. Wash in hot water to which a small quantity of soda, borax, or some other alkali has been added. A test-bottle brush will be found very useful to swab out the necks of the bottles during the process. Rinse the bottles in hot soft water.

MILK RECORDS.

The farmers of British Columbia are realizing the importance and possibilities of systematic improvement of their dairy herds. How to increase the profits from our cows is a problem of growing importance, if we wish to keep up with the gradual increase in the price of feedstuffs and other factors which increase the cost of producing milk and butter-fat. The factor which finally determines whether a dairy is on a paying or losing basis is the amount of milk and butter-fat that each individual cow in the herd produces. This is the first step in herd improvement. Then, if we keep cost accounts of the feed consumed, we can readily determine the relative cost of producing a pound of butter-fat or a gallon of milk.

VALUE OF DAIRY RECORDS.

Records of the performance of dairy cows form the only accurate and safe basis for judging their value. Improvement depends largely upon culling the herd and getting rid of the unprofitable animals.

From the breeder's standpoint, records are especially valuable in assisting in finding purchasers for their stock. The discriminating buyer of to-day insists upon seeing records of dairy performance before purchasing.

A record is also of great help to the feeder, as it enables him to feed each cow according to her milk yield. This is the only way to feed most economically. A daily milk record enables the dairyman to detect the approach of sickness in a cow, so that treatment may be begun early.

It is well known that there is great difference in the amount of milk different cows will produce. One cow may produce from two to three times as much milk and butter in a year as another cow a third to a half as much feed. One cow may be losing the dairyman as much money as another is making for him. Again, a cow may give a large flow of thin milk for three or four months, and for the remainder of her lactation period she may give only a small flow. Another cow may give a fair amount of rich milk during her entire lactation period, and in the year's work may prove to be much more profitable.

Records of dairy performance are much more easily kept than is generally supposed, and the time and cost of keeping them is so small as to be only a trifle in comparison with their value.

NECESSARY EQUIPMENT.

The necessary equipment to enable the dairyman to determine whether or not his cows are profitable consists of:—

(1.) Scales. (Fig. 8.)
(2.) Milk sheets.
(3.) Babcock testing outfit.
(4.) A sample bottle for each cow to be tested. (Fig. 9.)
(5.) Preservative tablets.
(6.) A small dipper (1 oz. capacity) for taking samples. (Fig. 10.)

SCALES.

A good spring balance such as is shown in Fig. 8 is best for ordinary farm use. They can be obtained from a dairy-supply house at small cost. These may be obtained on which the dial is divided into pounds and ounces, or pounds and tenths, as preferred. The latter is much more convenient in adding up the totals. These balances weigh 30 or 60 lb., and are made with a loose pointer which, by means of a thumb-screw on the centre, may be set anywhere on the dial, thus taking the tare of the milk-pail. These scales should be hung in a convenient place near the milk sheet, in the barn or dairy-house, and at such a height that the figures will be opposite the eye and easily read.

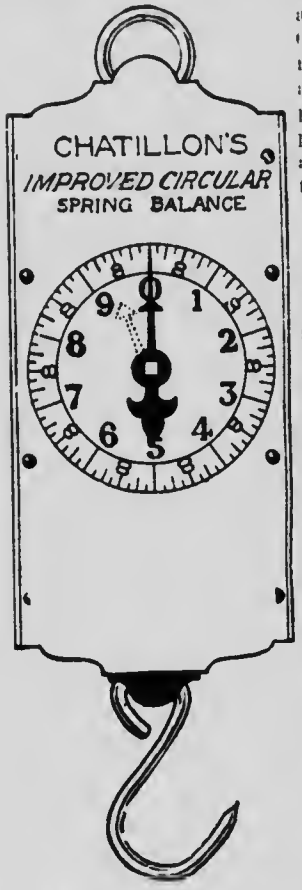

Fig. 8. A good type of spring scales used in weighing milk. Capacity 30 to 60 lb.

THE MILK RECORD SHEET.

Fig. 11 shows a very convenient form of Milk Record sheet. These may be obtained free of cost upon application to the Live Stock Branch, Department of Agriculture, Victoria.

Daily weighing of the milk from each cow is recommended, because it is, after all, about as convenient as weighing at intervals, and the record is of more value in that the dairyman can closely follow daily fluctuations in the milk yield and study more closely the results of his feeding.

TAKING SAMPLES FOR TESTING.

It is not necessary, in order to obtain approximate results, to test a sample of milk from each milking. This would involve more labour and expense than the average dairyman would care to give. Experiments show that if the milk from a cow is sampled and tested two or three days out of each month and the production of the month calculated from these figures, the results will be within a very small fraction of her actual performance.

During two or three days each month a sample should be taken from each milking and put into a bottle corresponding to the name or number of the cow milked. In order to ensure a representative sample of the cow's milk, it should be thoroughly mixed by pouring from one vessel to another before taking the sample with the small dipper which should be provided for the purpose. The sample bottle should be kept tightly stoppered or covered to prevent evaporation. A preservative tablet should be placed in each sample bottle before the first sample of milk is taken.

Caution.—Most preservatives used for this purpose are *deadly poison*, hence should be kept away from children or other inquisitive persons.

TESTING THE SAMPLES.

The handling of the Babcock test has been fully described in the first part of this bulletin. The test is simple, accurate, and easily mastered by any one who will give the matter careful study and attention.

The per cent. of fat should be posted on the month's record sheet and multiplied by the pounds of milk. The product represents the amount of fat produced for the month by the cow under test.

OCCASIONAL TESTS.

Fig. 9. Covered bottle for milk sample.

While the definite knowledge obtained from the regular daily weighing and monthly testing is much more satisfactory in every way than getting an occasional test during the year, various investigators have recommended methods of estimating the yearly production from a few weighings and tests. Some of these have proved practical and reasonably accurate. These are adapted for use by those who feel they cannot spend the time necessary to take daily records. The milk may be weighed from each individual cow for three days about the middle of each month, and a composite or average sample for testing is taken during the same time. The average milk and fat produced for the three days is taken as the average for that month.

Again, the milk may be weighed and samples for testing taken at intervals of ten days; for instance, on the 5th, 15th, and 25th of the month; and the totals of these weights multiplied by ten will give quite closely the total yield of milk for thirty days.

The Wisconsin Station recommends weighing and sampling the milk one day each week during the entire lactation period. The Illinois Station suggests weighing and sampling each cow's milk for fourteen consecutive milkings every seventh week. When only two tests are to be made during one lactation, the Vermont Station recommends that the first be taken ten weeks after calving, and the second five and one-half to seven months.

NOTES.

The scales and the Babcock test are essential requisites for every true dairyman.

Experience shows clearly the impracticability of trying to determine the profitable cows by mere guesswork.

Records are valuable because they assist the dairyman to distinguish the good from the poor cows, assist the feeder in preparing rations economically, and give inspiration to those who watch carefully for improvement.

It is impossible to feed a cow economically unless her daily milk production can be taken into account, and unless a daily record is available there is no basis upon which to estimate the quantity of feed the individual cow requires.

The records of dairy animals should include not only the dairy performance, but also a concise history and description of each animal, and a record at least of approximate accuracy of the cost of the feed of every cow, so that the economy of production may be determined.

Dairy-record keeping demonstrates that many good cows can be kept at a smaller cost of feed. This is not stinginess, but economy.

Keeping records abundantly proves that it pays handsomely to give dairy cows the best of care and kind treatment; this includes regularity of milking, early stabling in the fall, protection from cold rains, and attention to cleanliness, light, and ventilation in the stable.

Keeping records teaches the dairyman that, instead of the old way of feeding all cows alike, regardless of the amount of milk produced, the individual cow must receive feed according to her need in keeping up the milk-supply.

Fig. 10. Small dipper for taking milk sample.

BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE (LIVE STOCK BRANCH—DAIRY DIVISION).

DAILY MILK RECORD OF INDIVIDUAL COWS FOR ONE MONTH.

Herd of ..... Address ..... Month ..... 19.....

No. of Cows.	1	2	3	4	5	Etc.	19	20	
Date.									Daily Herd Total.
1 a.m.									
p.m.									
2 a.m.									
p.m.									
3 a.m.									
p.m.									
4 a.m.									
p.m.									
Etc.									
30 a.m.									
31									
p.m.									
Total									
Test									
Butter-fat ...									

Fig. 11. Milk Record sheet.

BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE (LIVE STOCK BRANCH—DAIRY DIVISION).

Name ..... P.O. .....

Thirty d ending .. ..

Description of Cows.					Three Days' Weights of Milk.	Total Milk calculated	Butter-fat.	
Name.	Breed.	No.	Age.	Date Last Calf			Per Cent.	Total Lb.
		1			a.m.			
					p.m.			
		2			a.m.			
					p.m.			
		3			a.m.			
					p.m.			
		4			a.m.			
					p.m.			
		5			a.m.			
					p.m.			
		6			a.m.			
					p.m.			
		7			a.m.			
					p.m.			
		8			a.m.			
					p.m.			
		9			a.m.			
					p.m.			
		10			a.m.			
					p.m.			
		11			a.m.			
					p.m.			
		12			a.m.			

Form for keeping Milk i weighing three days per month.

BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE (LIVE STOCK BRANCH—DAIRY DIVISION).

Name of cow ..... Number ..... Breed ..... Type .....

Weight ..... Age ..... Date of calving ..... Calf sex .....Disposal .....

Testing Period.	Pounds Milk daily.	Yield during Testing Period.						Feed fed in Testing Period.						Cost of Roughage.	Cost of Grain.	Total Cost of Feed.	Profit.	Loss.	Cost of producing 100 lb. Milk.	Cost of Producing 1 lb. Fat.	Returns for $1 ex-pended for Feed.	
		Pounds Milk.	Average Test.	Pounds Butter-fat.	Price Butter-fat.	Value Butter-fat.																
						$	c.															
Total																						

A method of keeping permanent individual records, including costs.

SERVICE RECORD.

Name or Number of Cow.	Date.	Name of Bull.	Date Calf is due.	Date Calf was born.	Sex of Calf.	Name or Number given Calf.	Remarks.
Blossom	April 1, 1915....	King Segis	Jan. 8, 1916	Jan. 6, 1916.....	Heifer	Blossom II.	
Nancy II.	April 10, 1915...	Monarch	Jan. 17, 1916....	Jan. 14, 1916....	Bull	..	Sold for veal.
Johanna De Kol ..	May 16, 1915 ..	Sir Canary 2nd..	Feb. 22, 1916....	Feb. 25, 1916...	Bull	Sir Canary De Kol.	
Merry Maid	June 1, 1915....	Sir Canary 2nd..	March 10, 1916..	March 5, 1916 ..	Heifer	Beauty.	

A convenient method of keeping complete breeding records.

GESTATION TABLE.

This table will aid in determining when cows are due to calve.

Calculated at the average period of 282 days, for every day in the year. The period may actually be several days shorter or longer.

Jan.	Due.	Feb.	Due	March.	Due.	April.	Due.	May.	Due.	June.	Due.
Bred	Oct.	Bred	Nov	Bred.	Dec.	Bred	Jan.	Bred	Feb.	Bred	March.
1	10	1	10	1	8	1	8	1	7	1	10
2	11	2	11	2	9	2	9	2	8	2	11
3	12	3	12	3	10	3	10	3	9	3	12
4	13	4	13	4	11	4	11	4	10	4	13
5	14	5	14	5	12	5	12	5	11	5	14
6	15	6	15	6	13	6	13	6	12	6	15
7	16	7	16	7	14	7	14	7	13	7	16
8	17	8	17	8	15	8	15	8	14	8	17
9	18	9	18	9	16	9	16	9	15	9	18
10	19	10	19	10	17	10	17	10	16	10	19
11	20	11	20	11	18	11	18	11	17	11	20
12	21	12	21	12	19	12	19	12	18	12	21
13	22	13	22	13	20	13	20	13	19	13	22
14	23	14	23	14	21	14	21	14	20	14	23
15	24	15	24	15	22	15	22	15	21	15	24
16	25	16	25	16	23	16	23	16	22	16	25
17	26	17	26	17	24	17	24	17	23	17	26
18	27	18	27	18	25	18	25	18	24	18	27
19	28	19	28	19	26	19	26	19	25	19	28
20	29	20	29	20	27	20	27	20	26	20	29
21	30	21	30	21	28	21	28	21	27	21	30
22	31		Dec.	22	29	22	29	22	28		31
23	Nov. 1	23	1	23	30	23	30	23	29	23	April. 1
24	2	24	2	24	31	24	31	24	March. 1	24	2
25	3	25	3	25	Jan. 1	25	Feb. 1	25	2	25	3
26	4	26	4	26	2	26	2	26	3	26	4
27	5	27	5	27	3	27	3	27	4	27	5
28	6	28	6	28	4	28	4	28	5	28	6
29	7	29	7	29	5	29	5	29	6	29	7
30	8			30	6	30	6	30	7	30	8
31	9			31	7			31	8		

GESTATION TABLE—*Concluded.*

July.	Due.	Aug.	Due.	Sept.	Due.	Oct.	Due.	Nov.	Due.	Dec.	Due.
Bred.	April	Bred	May.	Bred	June	Bred	July.	Bred	Aug.	Bred.	Sept.
1	9	1	10	1	10	1	10	1	10	1	9
2	10	2	11	2	11	2	11	2	11	2	10
3	11	3	12	3	12	3	12	3	12	3	11
4	12	4	13	4	13	4	13	4	13	4	12
5	13	5	14	5	14	5	14	5	14	5	13
6	14	6	15	6	15	6	15	6	15	6	14
7	15	7	16	7	16	7	16	7	16	7	15
8	16	8	17	8	17	8	17	8	17	8	16
9	17	9	18	9	18	9	18	9	18	9	17
10	18	10	19	10	19	10	19	10	19	10	18
11	19	11	20	11	20	11	20	11	20	11	19
12	20	12	21	12	21	12	21	12	21	12	20
13	21	13	22	13	22	13	22	13	22	13	21
14	22	14	23	14	23	14	23	14	23	14	22
15	23	15	24	15	24	15	24	15	24	15	23
16	24	16	25	16	25	16	25	16	25	16	24
17	25	17	26	17	26	17	26	17	26	17	25
18	26	18	27	18	27	18	27	18	27	18	26
19	27	19	28	19	28	19	28	19	28	19	27
20	28	20	29	20	29	20	29	20	29	20	28
21	29	21	30	21	30	21	30	21	30	21	29
22	30	22	31		July.	22	31	22	31	22	30
	May.		June.	22	1		Aug.		Sept.		Oct.
23	1	23	1	23	2	23	1	23	1	23	1
24	2	24	2	24	3	24	2	24	2	24	2
25	3	25	3	25	4	25	3	25	3	25	3
26	4	26	4	26	5	26	4	26	4	26	4
27	5	27	5	27	6	27	5	27	5	27	5
28	6	28	6	28	7	28	6	28	6	28	6
29	7	29	7	29	8	29	7	29	7	29	7
30	8	30	8	30	9	30	8	30	8	30	8
31	9	31	9			31	9			31	9

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