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State Agricultural College

The Agricultural Experiment Station.

BULLETIN No. 20.

I. The Best Milk Tester for the Practical Use of the Farmer and Dairyman.

II. The Influence of Food Upon the Pure Fat Present in Milk.

Approved by the Station Council.
ALSTON ELLIS, President.

FORT COLLINS, COLORADO.

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FORT COLLINS, COLORADO.

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I.

The Best Milk Tester for the Practical Use of the Farmer and Dairyman.

WALTER J. QUICK.

That time is the present when intelligent farmers and dairymen, like other business men, have discovered the noteworthy fact, that those who make the greatest success, do so by means of that enterprise which introduces or adopts and manipulates into practical utility the most approved methods. Being ever ready for the many and rapid modifications of this advanced age, enables one to place the balance on the right side, perpetuate his business and crown it a success. Those men who lead are ever on the alert for the new, at the same time, the tried and the best, and do not wait until every one has acquired it and reaped the benefit accruing from its adoption. Just now, during the rapid progress of the present century, a simple and practical method for the reliable valuation of milk should be in general use.

Numerous methods have been introduced, and are being employed for ascertaining the amount of butter fat in milk. The poorest is better than none. Churning each cows milk separate will detect unprofitable animals. It is certainly quite as important for the dairyman to know what quality of milk he buys, as for the owners of a beet sugar factory, or a smelter, to ascertain by analysis or assay the quality of the product they purchase. The farmer, too, wants to know the quality of the milk he

sells, that he may receive the proper recompense, and not too little, while perhaps his neighbor for poorer milk receives too much. Both the farmer and the dairyman, by the employment of a milk tester, find the cows it is the part of wisdom to retain, and as readily those which, reducing the profits of the better animals, should be speedily discarded.

The farmer with but a few cows is now ready for such a machine or apparatus, provided it is not too expensive, and he can successfully manipulate it. Does such a method for testing cows exist?

COMPARING METHODS.

As we have said, there are a number of methods that are well known, accurate and approved, but the question arises, Which is the most practical for the farmer and the dairyman?

It is our purpose, then, to compare three methods for determining the fat present in milk, viz., Babcock's, Cochran's, and Shorts', observing the economy of handling the different apparatus, the rapidity of work, simplicity of structure, accuracy, and the cost of the outfit. To do this, we have made from 16 to 32 fat determinations with each apparatus; from each, whole, skim milk and cream, always drawing from the same general sample and source. Our conclusions are summarized below:

Economy of Handling.—Regardless of time, we find the Babcock tester to be much more cheaply manipulated, from the fact that but one reagent is required, commercial sulphuric acid, or oil of vitriol, having a specific gravity of 1.82, or about 90 per cent. pure acid. In addition to this, hot water is always required. The cost is about one-fifth cent per test when the sulphuric acid can be secured wholesale. With each of the other methods the same required for

the Babcock is necessary, and, in addition, for the Cochran examination acetic acid of a specific gravity difficult to procure, and ether, which is highly explosive and must be handled with care. For the Shorts method, besides that necessary for the Babcock, caustic soda, caustic potash and acetic acid must be used.

The apparatus of the last-mentioned is not more breakable than the Babcock, but that of the Cochran is much more delicate, the most careful manipulators often breaking testing flasks.

Rapidity.—With Shorts' method, about five hours are necessary for the analyzing of one set of twelve flasks. This condemns it for the farmer's use.

The Cochran requires, for heating water, transferring from bottles to fat indicators, cleansing, etc., from three-quarters to an hour for a set of nine samples.

With the Babcock, and without assistance, I analyzed ten samples in thirty-nine minutes, being about four minutes to the sample, and, with assistance, in thirty-three minutes, cleansing the entire apparatus in the time. Alone I tested two samples in duplicate in eighteen minutes, and thirty samples—three sets—in one hour and twenty-two minutes, only cleansing such of the apparatus as was necessary between sets. It is claimed that analyzing can be done in half the time with the new Curtis' Babcock tester.

Simplicity of Structure.—All are simple enough, so that the ordinary farmer will experience very little difficulty in handling them. He may break more, perhaps, than the trained chemist. The glassware of the Cochran is the most complicated and easily broken. There is very little, if any, difference in the other two methods in this respect. The Babcock is a centrifugal machine, and requires no heating, and less hot water than either of the others.

Accuracy.—The accuracy of the Babcock was tested by the gravimetric method—it is true by samples taken from ten to twelve hours apart, but under the most favorable conditions of the milk possible, with that consideration. The variations below, though small, would not likely be as much if the samples where taken at the same time.

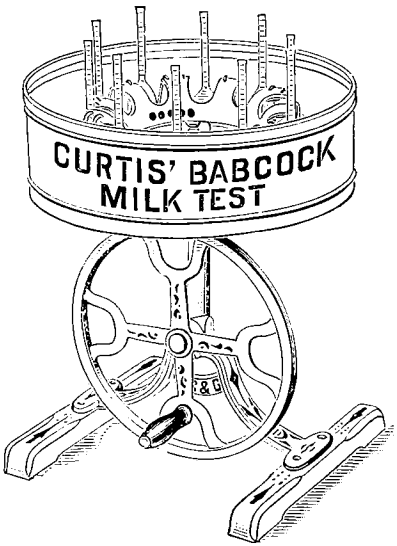
Source of Sample.	Averages of	Per Cent. Butter Fat.		
		Gravimetric.	Babcock.	Difference.
Shorthorn cow.....	7 samples in Feb.	4.14	3.86	.28
Shorthorn cow.....	7 samples in Feb.	3.98	3.28	.70
Jersey cow.....	7 samples in Feb.	3.07	2.94	.13
Jersey cow.....	7 samples in Feb.	4.00	4.04	—.04
Shorthorn cow.....	8 samples in March.	4.01	3.83	.18
Shorthorn cow.....	8 samples in March.	3.60	3.30	.30
Jersey cow.....	8 samples in March.	3.10	2.82	.28
Jersey cow.....	8 samples in March.	4.05	4.17	—.12

Accuracy depends mainly on the careful sampling of the milk, using reagents of the proper strength, and in following directions closely. It is seldom, if ever, that the graduated scales on the test bottles are wrong. By several trials with all in duplicate an error can easily be discovered.

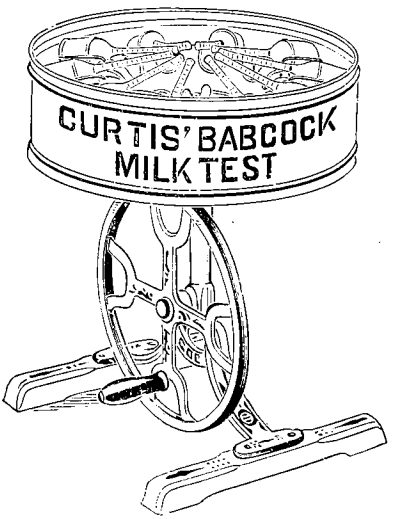
After testing the Babcock with the gravimetric, we then tested the Cochran, Shorts and Babcock together, with the following results, which can be said to be very little better for one than another:

SOURCE OF MILK.	Per Cent. of Fat.		
	Babcock.	Cochran.	Shorts.
Whole milk, Bonnie Louan, Shorthorn, ... averages,	4.56	4.32	4.22
" " Orchard Lark, " .... "	2.65	2.76	2.86
" " Lizzie Lesley, " .... "	3.80	3.80	3.74
" " Kirk. Duchess 29 " .... "	2.70	2.93	2.95
Separated milk, from Shorthorn cow, ...	1.80	1.81	1.83
" " " " "	1.70	1.65	1.83
" " " " "	1.80	1.78	1.83
" " " " "	1.60	1.38	2.01
Milk, separated very close, from College herd, ...	.20	.15	Trace.
" " " " " " "	.15+	.15 —	Trace.
" " " " " " "	.10 —	.10 —	Trace.
" " " " " " "	.10+	.10+	Trace.
Cream, separated, from College herd, ...	14.35	14.06	13.86
" " " " "	19.70	19.68	19.23

Cost of Outfit.—The Babcock method for the use of the ordinary farmer or small dairyman, or creamery, is manufactured in very convenient size, with ten test bottles, at a cost of $15.00. It is also made larger for testing more samples simultaneously. It is not patented, and can this year be procured of almost any dairy supply house. We believe it to be the best milk tester on the market for practical use. On the following page we give a cut of the Babcock apparatus, as improved recently by Mr. Curtis:

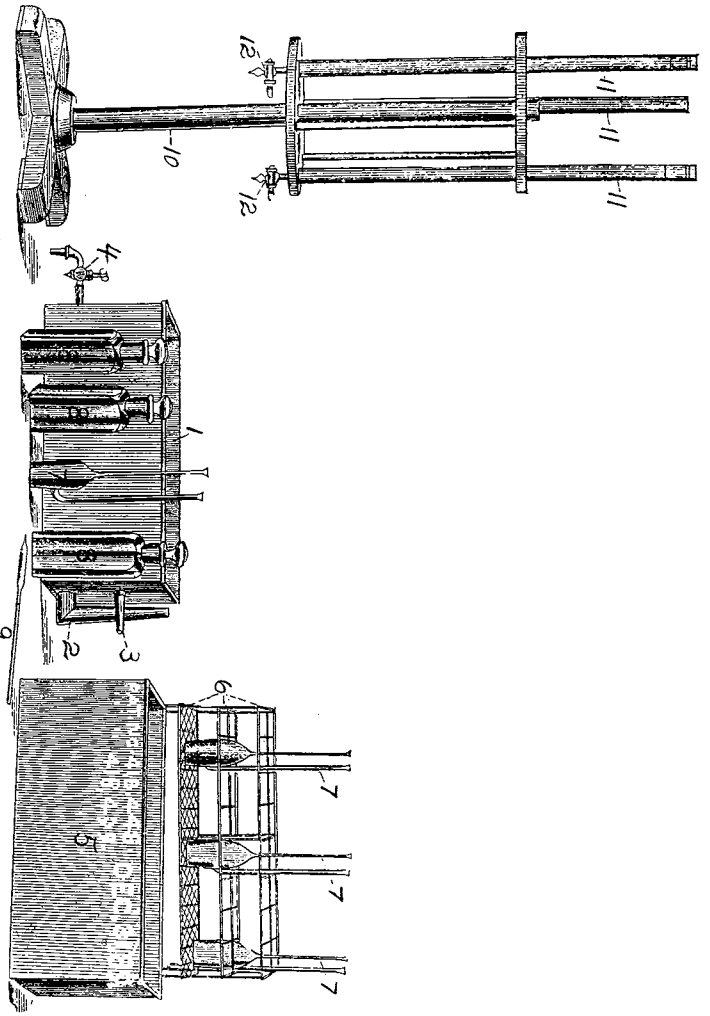


Stationary.



In Motion.

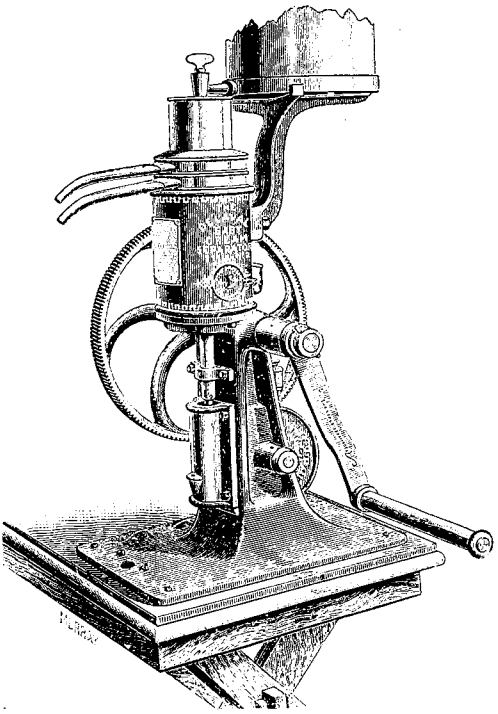
The Cochran and Shorts apparatus can be procured at any dairy headquarters at prices not varying much from those at which the Babcock is sold. Though requiring more care in manipulation, we consider the Cochran method the second best for determining fat, because of greater speed, together with the accuracy. It can be procured at $10.00, for a four-bottle test. We herewith give a cut representing this apparatus:



THE COCHRAN MILK TEST.

THE DE LAVAL SEPARATOR.

The skim milk for the foregoing analyses was separated from the cream by means of the De Laval "Baby" Cream Separator, which, from this experience, and other trials made and observed with this machine, and from observations at the trials of other separators, we believe to be the best on the market. Farmers who have enough cows to justify the expenditure, and dairymen who make sweet cream butter, and all who patronize creameries, can illy afford to be without this valuable separator. We append a cut of the machine:



II.

The Influence of Food Upon the Pure Fat Present in Milk.

WALTER J. QUICK.

It is quite generally understood that the quantity of food consumed influences the yield of milk. There is not very much conclusive and authentic evidence regarding the *quality* of food as materially modifying the richness of the milk. It will be acknowledged that certain foods and grasses influence the color of butter. Numerous experiments exhibit results to prove that an increase of the same ration will increase a cow's milk yield, but *not* the quality of that yield. By a few it is believed that the quality of milk can be changed very perceptibly by changing rations. Not enough has been accomplished to settle the question conclusively. Eminent men remain on both sides, many among the most prominent stoutly maintaining that the quality of the milk depends solely, or almost so, on the individual animal, some being producers of rich milk, and others of the poorer article.

It was not with the belief that we, by this experiment, would settle this mooted question, that we undertook it. If we can throw some light upon the subject, or inspire investigation among those interested in Colorado, we will be satisfied.

Much has been said, and many the belief expressed, by men of the West, where such abundant oat crops are always produced, that "oat chop" fed with alfalfa is better than wheat bran for producing rich milk. This question has been the source of much argument at farmers' institutes, and various meetings of dairymen and farmers. The statement has been made, and not successfully contradicted, that with oats worth $1.00 per hundred ($20.00 per ton), and wheat bran at $15.00 per ton, the oats, ground, and alfalfa hay is worth enough more as a dairy feed and butter producer to justify its use. This question we have been asked to test in connection with this experiment.

This feeding experiment was determined upon early in February, 1892. It was desirable to have cows representing at least two breeds. The College being in possession of a fine herd of Shorthorns, two cows were selected from it suitable for the trial. The loan of two Jerseys was secured, through the kindness of Mr. John Nelson, a Jersey breeder near Fort Collins. The feeding commenced February 18, Mr. A. Campbell, the College herdsman, in charge, and Mr. F. A. Huntley, Assistant Agriculturist, helping with the milk analyses.

With the above objects in view, the four cows were placed upon a ration of 2 pounds of oat chop—that is, ground or rolled oats—and the first crop of lucerne, or better known as alfalfa hay. They were given the ration morning, noon and evening; more hay was fed than they would eat, the residue always being weighed, and deducted from the original weight of the feed. Every forenoon, between 10 and 11 o'clock, each cow was weighed. They were given exercise in a lot, but not allowed access to anything they might eat, and were given all the water they desired.

At the close of the first feeding period, clear wheat bran was substituted for oat chop; this was, as stated, *clear bran*, specially ordered for this experiment, containing no shorts. All may not know that the so-called bran received from the mills contains all the shorts produced, run together from the mill into the bran bin. This is what the farmer gets when he buys bran. The clear bran costs us at Fort Collins $14.00 per ton; oats was worth $20.00.

From daily analyses and close observation, we ascertain it to be a fact that a longer time is necessary for securing an even yield of butter fat from some cows than others. While with some the per cent. may be influenced by a change in the ration in forty-eight hours, and such cows become regular in that length of time, with others we find the per cent. influenced, for better or worse, according to the quality of the ration, and grow regular in sixty-four to seventy-two hours, and still others (exceptions), requiring even more time. As should be expected, this is governed to a great extent by the appetite of the cow. Those animals that might be termed good feeders, and that will eat one ration with about the same relish as another, exhibit in the quality of the milk the results of a change in feed sooner, and in every case under our observation, a steadier flow, with more uniform per cent. of butter fat. Naturally, then, we would expect, and do find, that the shy or dainty feeder shows a greater variation in both quantity and quality.

We have consulted men of experience in the feeding of dairy stock, and several eminent experimenters located in other stations, and we are informed that while a longer period is usually taken for each ration, yet with care it is not absolutely necessary. The results of these experiments give indorsement to these statements, and while we would not recommend less than ten days for a feeding period, we believe that quite sufficient.

Having found, then, that the fluctuations in the per cent. of butter fat are reduced to a minimum in most cases after a change in a ration has been instituted seventy-two hours, we add twenty-four hours for safety, and include in our averages only analyses after ninety-six hours, or after twelve feeds have been consumed by the cows, except in starting the experiments. As some cows were moved, they were given from twenty-four to forty-eight hours still more, to become familiar with their new surroundings and feed before the analyses of their milk were taken into the averages. Analyses, however, were made from which to observe changes. Occasionally one has been thrown out, when by accident or other cause it is known to be wrong.

METHOD OF ANALYSIS EMPLOYED.

The most careful records of milk yield, feed, water, and animal weight, have been kept throughout the experiment, and the milk of each cow has been tested daily for its fat per cent. by the Babcock method. This tester was adopted, as we consider it the most accurate and speedy, and less subject to errors.

The analyses with the Babcock tester were nearly all duplicated by the Station Chemist with the gravimetric method. The difference in the results of these two methods is greater than was expected, but can be accounted for in the fact that the samples for the gravimetric examination of each day's milking (combined morning and evening) were drawn off the morning after, while those for the Babcock were pipetted from the combined milk as soon as the evening's milking was over, and were placed in the test bottles ready for analysis.

The variation being so great, not only in comparison with the Babcock, but frequently as compared with the same cow's milk the day before, by the same method,

caused us to investigate. With the Babcock we found the duplicate samples in the evening run very close, never varying over .4 of 1 per cent., while those taken the next morning varied from ½ to 2 per cent. The explanation is that the cream rises, sometimes dries on top, and frequently is sour, when it is impossible to mix and secure a fair sample. At times, without the knowledge of the operator, his pipette will draw in a clot of cream, while again from the same vessel its mouth is surrounded by the poorest of milk, containing almost no butter fat. We find, from repeated analyses with the Babcock, that after sampling, the milk may stand in the test bottles until it is sour and coagulated, without the results being changed.

From a study of the tabulation we learn that the quality of milk was quite perceptibly influenced by the change of food given these cows. It will be also observed that in every case by the Babcock analysis, the wheat bran produced the best results, and that the gravimetric analysis exhibited two cases as good or better, with the other two but slightly lower. It must be remembered that in the two cases which showed a lower per cent. when the cows were on bran, the samples were from the two longest in milk; and, further, that if there is any advantage from this fact, it was given the oat chop ration, which was fed first. Three of the cows lost in yield of milk, which might be due to some extent to the same cause, but more likely to natural fluctuations or the condition of the weather at that time. This is the more likely, since there is sufficient evidence extant, that bran causes a better flow of milk than oats. While they gained in weight on the oat chop, each lost a few pounds on the bran ration. The difference in either case could have been caused by the difference in water drank, at a single time. With these suggestions, we leave the con-

clusions to be drawn by the reader, asking his attention to the almost constant difference existing in the values of the foods in question, and that in this experiment clear bran was employed, instead of the usual mixed mill feed.

1st period, ration oat chop and alfalfa; 2d period, bran and alfalfa.

Period.	NAME.	BREED.	Age.	Calved.	Hay Eaten.	Per Ct. Fat.		Weight of Animal.		
						Bab.	Grav.	Begin.	Close.	Gain or Loss.
1	Bonnie Louan	Shorthorn	7	April, 1891	24.8	3.81	4.08	1315	1320	5
2	" "	"			25.0	3.95	4.10	1320	1315	—5
1	Orchard Lark	"	3½	Oct., 1891	28.3	3.43	3.75	1230	1270	40
2	" "	"			26.8	3.50	3.62	1270	1264	—6
1	Matilda	Jersey	4	Dec., 1891	23.0	2.55	3.00	910	955	45
2	"	"			23.1	2.95	3.00	955	942	—13
1	Pride of the Rockies	"	4	Sept., 1891	22.5	4.00	3.93	865	895	30
2	" " "	"			20.1	4.26	4.28	895	880	15

FEEDING EXPERIMENT CONTINUED.

Apparently, we secured a glimpse into the darkness with the oat and bran feeding. Our idea in this experimenting in the same line was, if possible, to learn more of the influence of different foods upon the butter fat.

Cows.—More cows were added. We employed in this work the same Shorthorns, secured from Messrs. Cornforth & Styles, of Loveland, two pure-bred Holsteins, retained one of the Jerseys and exchanged the other for an older cow; each breed was then represented by an aged and a young animal. These six cows received the same treatment and quarters as had the four, and were under the charge of the same herdsman until April 1, when he was succeeded by Mr. B. Roseberry, who gave them the same careful attention to the close of the experiment.

Feeds Selected.—A change was deemed advisable in feeding stuffs. Very dissimilar foods were selected, believing that it is better to compare two or three such than to try more, for the reason that it is difficult and requires most careful attention to details, to be certain from one trial as to the results of even two different rations. The selections consisted of linseed oil meal, corn meal, and wheat bran, with the first cutting of alfalfa and bright oat straw. Each kind of concentrated food was fed alone with one kind of rough stuff, except when the ration was changed to oil meal, at which time some bran had to be added as an appetizer. It is seldom that more than 4 pounds of oil meal can be fed a cow daily without salivating her, but we succeeded in feeding in this case 4.5 pounds, with alfalfa, without bad results. Since the question of the amount of food fed is conceded not to be of special importance as bearing upon or influencing the composition of the milk, the animals were given all they would consume without impairing their appetites. They were watched most carefully, fed according to their demands, and record kept.

FEEDING PERIODS.

The length of a period determined upon was ten days.

1. The six animals were fed alfalfa and bran for ten days, for the purpose of testing the milk, and making comparison on the same ration as a basis.

2. Beginning with the eleventh day, we fed one lot of three cows (one of each breed) with oil meal and alfalfa, and the other three with wheat bran and alfalfa.

3. Straw was substituted for alfalfa for ten days, other feed continued the same.

4. The conditions of the two lots of cows were reversed, giving the first lot wheat bran, and the second oil meal.

5. All were feed wheat bran and alfalfa.

6. The first lot of three cows were now changed to Indian corn meal, and the second to wheat bran, all receiving alfalfa.

7. Reversed the conditions of the two lots of cows.

8. All fed corn meal and alfalfa.

The object in the last three periods, and others similar, is the noting of variations in the quality of the milk, and to see if they correspond to the variation and quality of the foods employed.

During all of this work we took samples of each cow's milk, combining that of morning and evening, and analyzed them, as in the case of the four cows, by the Babcock method. Gravimetric analyses were frequently made by the Station Chemist, which do not correspond as well as we would wish with the other method employed, for the reasons heretofore stated. A careful record of the food eaten and water drank has been kept, and the cattle weighed daily between 10 and 11 o'clock. A great deal of attention and labor is connected with such an experiment. Analyses to the number of 706 have been made, recorded and averaged for this bulletin. It is believed that the experiment is not wholly without merit, and that the tables on the following pages are that interesting and comprehensive as to enable the reader, by careful study, to deduce from them information of much value.

No. 1.—Bonnie Louan, Shorthorn, age 7 yrs; last calf April, 1891.

FEEDING PERIOD.	Food Consumed. Daily Average, lbs.			Milk Yield, Daily Average.		Per Ct. Fat.		Weight of Animal.		
	Feed.	Hay or Straw.	Water.	lbs.	ozs.	Babcock.	Gravimetric.	Beginning	Closing.	Gain or Loss.
1. Wheat bran and lucerne.....	6	23.3	107.1	13	1	3.84	4.16	1232	1344	112
2. Linseed oil meal, some bran and lucerne.....	Bran, 1.9 O. Meal 1.8	22.8	106.3	12	5	4.53	4.16	1344	1342	—2
3. Lin. oil meal and oat straw..	4.3	7	60.7	9	7	5.22	5.15	1342	1312	—30
4. Wheat bran and oat straw....	6	14.6	75.8	10	3	3.99	3.77	1312	1304	—8
5. Wheat bran and lucerne.....	8.7	20.1	105.9	12	12	3.90	3.50	1304	1342	38
6. Indian corn meal and lucerne	6.4	20.8	95.2	13	4	3.92	3.48	1342	1326	—16
7. Wheat bran and lucerne.....	10.5	19.7	119.7	14	6	3.67	3.75	1326	1338	12
8. Indian corn meal and lucerne	9	20.4	107.3	13	12	3.38	3.55	1328	1356	18

No. 2—Orchard Lark, B. 2d, Shorthorn, age 3½ years; last calf, October, 1891.

1. Wheat bran and lucerne.....	6	24.1	123.6	13	13	3.45	3.81	1180	1285	105
2. Wheat bran and lucerne.....	6	24.2	126.4	13	4	3.18	3.22	1285	1294	9
3. Wheat bran and oat straw....	6	12.5	79.9	10	10	3.68	4.53	1294	1270	—24
4. Lin. oil meal and oat straw..	4.3	17.4	84.6	10	9	3.97	3.72	1270	1210	—60
5. Wheat bran and lucerne.....	8.7	22	120.2	12	5	3.66	3.73	1210	1234	24
6. Wheat bran and lucerne.....	10.5	24.5	122.7	13	1	3.52	3.54	1234	1298	64
7. Indian corn meal and lucerne	7.3	26.1	133	12	10	3.22	3.35	1298	1296	—2
8. Indian corn meal and lucerne	9	26.7	127.5	12	13	3.38	2.95	1296	1322	26

No. 3—May Lincoln, Holstein, age 8 yrs; last calf, October, 1891.

1. Wheat bran and lucerne.....	6	22.3	110	21	12	3.14	3.35	1005	1115	110
2. Linseed oil meal, some bran and lucerne.....	O. Meal 2.1 Bran 1.2	24.8	118.2	20	10	3.42	3.12	1115	1132	17
3. Lin. oil meal and oat straw...	4.4	8.3	67.5	15	9	3.38	3.53	1132	1070	—62
4. Wheat bran and oat straw....	6	12.8	73.1	14	0	2.74	3.23	1070	1076	6
5. Wheat bran and lucerne.....	8.7	18.4	106.3	16	6	2.78	2.95	1076	1128	52
6. Indian corn meal and lucerne	6.4	21.3	97.5	18	1	2.53	2.82	1128	1132	4
7. Wheat bran and lucerne.....	10.5	20.8	129.6	18	8	2 60	3.10	1132	1138	6

No. 4—Queen Sontag, Holstein, age 4 years; last calf, July, 1891.

FEEDING PERIOD.	Food Consumed. Daily Average, lbs.			Milk Yield. Daily Average.		Per Ct. Fat.		Weight of Animal.		
	Feed.	Hay or Straw.	Water.	lbs.	ozs.	Babcock.	Gravimetric.	Beginning.	Closing.	Gain or Loss.
1. Wheat bran and lucerne.....	6	27.9	129	21	1	3.34	3.50	1002	1145	143
2. Wheat bran and lucerne.....	6	29.3	139.7	21	7	3.42	3.44	1145	1170	25
3. Wheat bran and oat straw....	6	12	84.7	15	6	3.53	3.93	1170	1164	—6
4. Lin. oil meal and oat straw ..	4	19.1	104.7	10	12	3.73	4.18	1164	1160	—4
5. Wheat bran and lucerne.....	8.7	23.4	150	12	2	3.20	3.27	1160	1178	18
6. Wheat bran and lucerne.....	10.3	27.1	160	16	3	3.18	3.40	1178	1214	36
7. Indian corn meal and lucerne	7.3	29.2	138.7	18	4	3.02	3.50	1214	1206	—8

No. 5—Lalite, Jersey, age 9 years; last calf, January, 1892.

1. Wheat bran and lucerne.....	6	21.1	99.3	21	8	4.00	4.73	750	857	107
2. Linseed oil meal, some bran and lucerne	Bran 1.4 Oil m. 2.1	20.8	94.2	20	4	4.62	4.86	857	848	—9
3. Lin. oil meal and oat straw..	4.4	7.1	52.1	15	3	5.12	5.20	848	800	—48
4. Wheat bran and oat straw....	6	11.3	62.6	14	9	4.47	5.20	800	792	—8
5. Wheat bran and lucerne.....	8.1	14.1	76.4	15	10	4.38	4.83	792	848	50
6. Indian corn meal and lucerne	6.4	19.6	75.6	17	15	4.27	4.36	848	826	—22
7. Wheat bran and lucerne.....	10.5	15.4	102.3	18	5	4.42	4.85	826	830	4
8. Indian corn meal and lucerne	9	18.6	84.7	19	15	4.32	4.20	830	838	8

No. 6—Pride of the Rockies, Jersey, age 4 years; last calf, September, 1891.

1. Wheat bran and lucerne.....	6	20.8	98.6	14	13	4.14	4.43	815	899	84
2. Wheat bran and lucerne.....	6	20.1	96.6	15	1	4.45	4.86	899	892	—7
3. Wheat bran and oat straw....	6	8.6	62.7	13	2	4.68	4.80	892	886	—6
4. Lin. oil meal and oat straw..	3.9	14.6	81.9	12	11	4.70	4.90	886	862	—24
5. Wheat bran and lucerne.....	8.7	19.4	92	13	13	4.46	4.43	862	910	48
6. Wheat bran and lucerne.....	10.5	16.5	94.6	15	1	4.40	4.78	910	888	—22
7. Indian corn meal and lucerne	7.3	16.5	85.8	15	5	4.03	3.85	888	886	—2
8. Indian corn meal and lucerne	9	17.2	87.3	15	14	4.02	3.60	886	898	12