New York Agricultural Experiment Station.

PETER COLLIER, DIRECTOR.

BULLETIN No. 34—NEW SERIES.

AUGUST, 1891.

COMPARISON OF DAIRY BREEDS OF CATTLE, WITH REFERENCE TO PRODUCTION OF BUTTER.

GENEVA, N. Y.

BOARD OF CONTROL.

GOVERNOR HILL, Albany.
N. M. CURTIS, Ogdensburg, St. Lawrence Co.
JAMES MCCANN, Elmira, Chemung Co.
DANIEL BACHELOR, Utica, Oneida Co.
CHAS. JONES, Geneseo, Livingston Co.
G. S. MILLER, Peterboro, Madison Co.
GEO. F. MILLS, Fonda, Montgomery Co.
WILLIAM C. BARRY, Rochester, Monroe Co.
PHILIP N. NICHOLAS, Geneva, Ontario Co.
ADRIAN TUTTLE, Watkins, Schuyler Co.

OFFICERS OF THE BOARD.

W. C. BARRY,	President.
W. O'HANLON,	Secretary and Treasurer.
JAMES MCCANN, CHAS. JONES, G. S. MILLER, PHILIP N. NICHOLAS,	Executive Committee.

STATION STAFF.

DR. PETER COLLIER,	Director.
WM. P. WHEELER,	First Assistant.
L. L. VAN SLYKE, PH. D.,	Chemist,
*W. I. TIBBALS, PH. C.,	Assistant Chemist.
*P. H. SEYMOUR,	Assistant Chemist.
W. H. WHALEN, PH. B.,	Assistant Chemist.
R. B. ARMSTRONG, PH. C.,	Assistant Chemist.
R. D. YOUNG, PH. C.,	Assistant Chemist.
C. E. HUNN,	Acting Horticulturist.
GEO. W. CHURCHILL,	Acting Pomologist.
FRANK E. NEWTON,	Clerk and Stenographer.

The Bulletins published by the Station will be sent free to any farmer applying for them.

*Connected with Fertilizer Control.

BULLETIN NO. 34—NEW SERIES.

It is the purpose of this Bulletin to present and discuss briefly the data that have accumulated up to June 1st, 1891, in connection with the making of butter from the milk of the various individuals and breeds undergoing experiment. Since only a few individual cows have completed one full period of lactation, it is possible to make a comparison of breeds for only the first six months of lactation ; and, in no case, are we yet able to present, even for six months, the complete record of four individuals of any one breed, as we shall be able to do later. Special caution must, therefore, be given in regard to drawing any general conclusions from the results presented; for, until we have more complete results than we have at present, we cannot establish any conclusions that may be regarded as definite and reliable. However, it will be seen that very much interest attaches to the results thus far obtained, fragmentary though they are.

For a description of the organization of the chemical work connected with the analysis of the milks, and for a full statement of the methods employed in creaming, churning, etc., the reader is referred to the Chemist's Report for 1890. (See Ninth Annual Report of this Station, pages 173 to 242.)

The data will be presented and considered under the following heads:

I. Yield from 100 pounds of milk of

1. Pounds of fat in milk.
2. Pounds of fat in skim-milk.
3. Pounds of fat in cream.
4. Pounds of fat in butter-milk.
5. Pounds of fat in butter.
6. Pounds of butter.

II. Percentages of fat recovered and lost.

1. Fat recovered in cream.
2. Fat lost in skim-milk.
3. Fat lost in butter-milk.
4. Fat recovered in butter.

III. Relations of milk, cream and butter.

1. Pounds of milk required to make one pound of butter.
2. Pounds of milk required to make one pound of cream.
3. Pounds of cream required to make one pound of butter.
4. Per cent. of fat in cream.

IV. Daily yields of milk and butter.

V. Monthly yields of dairy products.

1. Pounds of milk.
2. Pounds of skim-milk.
3. Pounds of cream.
4. Pounds of butter-milk.
5. Pounds of fat in milk.
6. Pounds of fat in butter.
7. Pounds of butter.

VI. Temperature and time of churning.

VII. Microscopic data.

1. Relative number of fat globules.
2 Relative size of fat globules.

No attempt is made in this Bulletin to calculate either the relative or actual cost of producing butter, cream, etc. It is thought best to defer this line of consideration until we are able to present one full period of lactation for, at least, two individuals of each breed.

I. YIELD FROM ONE HUNDRED POUNDS OF MILK.

In Tables I to VI, there are presented data giving (1st) the number of pounds of fat in one hundred pounds of milk ; (2d) how many pounds of this fat are lost in the skim-milk, and (3d) how many pounds are obtained in the cream ; (4th) how many pounds of fat are lost in the butter-milk ; (5th) how many pounds of fat are finally recovered in the butter , and (6th) how many

pounds of butter (containing 85 per cent. of butter fat) are obtained from the one hundred pounds of milk.

This method of presentation enables us to follow the course of the fat from the milk to the butter, and gives us the absolute amounts of fat that are lost and recovered in the various operations of butter-making.

In every case, the butter is calculated as butter containing 85 per cent. of butter-fat, since this is a convenient and desirable standard. It was shown in the Chemist's Report for 1890, page 204, how unsatisfactory would be the results if the butter, as it comes from the dairy, were used for comparison. By making analyses of all the butters and then calculating them to one common standard, we have a just and reasonable basis for comparison.

Tabulating the averages obtained in Tables I to VI, we have the following :

TABLE SHOWING POUNDS OF FAT IN MILK, SKIM-MILK, ETC., FROM ONE HUNDRED POUNDS OF MILK FOR FIRST SIX MONTHS OF LACTATION.

From one hundred pounds of milk.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
Pounds of fat in milk..	3.50	5.07	3.69	3.71	5.62
Pounds of fat in skim-milk.....	0.38	0.23	0.44	0.85	0.38
Pounds of fat in cream	3.12	4.84	3.25	2.86	5.24
Pounds of fat in butter-milk....	0.09	0.05	0.06	0.16	0.08
Pounds of fat in butter...	2.96	4.70	3.09	2.36	4.92
Pounds of butter.....	3.47	5.54	3.64	2.78	5.78

OBSERVATIONS.—While, in the foregoing table, the largest amount of fat in the milk produces the largest amount of butter, it does not hold good that the amount of butter is, in every case, proportional to the amount of fat in the milk. While the amount of fat in the milk of the Holsteins stands third, the amount of butter stands fifth. The amount of butter produced from one hundred pounds of milk depends upon the amount of fat lost in skim-milk and butter-milk, as well as upon the amount of fat originally in the milk.

LOSS OF FAT IN HANDLING.—It may be interesting, in this connection, to call attention to some of the results observed by us regarding the loss of fat in handling, or the mechanical loss of fat. The amount of fat in the butter-milk plus the amount of fat recovered in the butter should just equal the amount of butter in the cream. It was observed that there was a considerable difference, the average loss of fat between the cream and butter being, up to December, 1st, 1890, for all the cows, one-fourth of one pound of fat in every hundred pounds of milk. In December, we commenced to weigh the amount of cream adhering to the Cooley cans in transferring cream from cans to churns, as described on page 200 of the Chemist's Report for 1890. The correction for the loss thus determined was made in the weight of butter obtained. Averaging the losses for the same cows since December 1st, we have found, that the loss of fat was diminished, mainly as a result of the correction, to one-twelfth of one pound, for every hundred pounds of milk; and the average was the same for all the cows from December 1st on. Stating the results in another form, the percentage of fat in milk lost in handling up to December 1st averaged 5.5 per cent., while after that time, when correction was made for loss of cream, the percentage of average loss was 1.8. If we consider only the fat in the cream, we find that up to December 1st, 89.8 per cent. was recovered in the butter; while after December 1st 96.9 per cent. was recovered in the butter, this saving having been for the most part effected by correcting for loss of cream in handling. A small portion of the increase was due to less fat going into the butter-milk, in consequence of our not being able to control various conditions during the first few weeks of experimenting; but much the larger portion of loss was caused by loss of cream in handling.

I. TABLE SHOWING POUNDS OF FAT IN ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	3.53	6.14	5.04	4.18	6 10
2	3.48	5.13	3.61	3.59	5.27
3	3.40	4.61	3.37	3.86	5.18
4	3.40	4.63	3.44	3.64	5.75
5	3.68	5.00	3.33	3.41	5.68
6	3.53	4.93	3.33	3.56	5.73
7	3.83		3.35	4.18	5.72
8	3.93		3.49	3.72	5.80
9	4.10		3.59	3.70	5.76
10	4.33			3.65	

Monthly averages for the first six months of lactation:

(1) Jerseys 5.62
(2) Guernseys 5.07
(3) Holsteins 3.71
(4) Holderness' 3.69
(5) Ayrshires 3.50

II. TABLE SHOWING POUNDS OF FAT IN SKIM-MILK FROM ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holstens.	Jerseys.
1	0.35	0.16	0.63	———	0.44
2	0.29	0 18	0.42	0.58	0.40
3	0.42	0.24	0.38	0.78	0.25
4	0.38	0.21	0.42	0.74	0.25
5	0.42	0 20	0.43	1.45	0.41
6	0.40	0.37	0.36	0.50	0.52
7	1.00		0.33	0.70	0.31
8	1.17		0.44	0.51	0.29
9	0.83		0.56	0.53	0.38
10	1.19			0.83	

Monthly averages for the first six months of lactation:

(1) Guernseys 0.23
(2) Jerseys 0.38
(3) Ayrshires 0.38
(4) Holderness' 0.44
(5) Holsteins 0.85

III. TABLE SHOWING POUNDS OF FAT IN CREAM FROM ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Holsteins.	Holderness'.	Guernseys.	Jerseys.
1	3.18	5.98	4.41	——	5.66
2	3.19	4.95	3.19	3.01	4.87
3	2.98	4.37	2.99	3.08	4.93
4	3.02	4.42	3.02	2.90	5.50
5	3.26	4.80	2.90	1.96	5.27
6	3.13	4.56	2.97	2.86	5.21
7	1.83		3.02	3.68	5.41
8	2.76		3.05	3.21	5.51
9	3.27		3.03	3.17	5.37
10	3.14			2.82	

Monthly averages for the first six months of lactation:

(1) Jerseys.....5.24
(2) Guernseys.....4.84
(3) Holderness'.....3.25
(4) Ayrshires.....3.12
(5) Holsteins.....2.86

IV. TABLE SHOWING POUNDS OF FAT IN BUTTER-MILK FROM ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	0.05	0.17	0.11	——	0.15
2	0.07	0.05	0.05	0.40	0.08
3	0.11	0.03	0.07	0.17	0.06
4	0.10	0.02	0.04	0.17	0.04
5	0.13	0.02	0.02	0.13	0.04
6	0.08	0.02	0.05	0.09	0.11
7	0.14		0.04	0.04	0.04
8	0 20		0.02	0.04	0.04
9	0.08		0.03	0.02	0.02
10	0.19			0.08	

Monthly averages for the first six months of lactation:

(1) Guernseys.....0.05
(2) Holderness'.....0.06
(3) Jerseys.....0.08
(4) Ayrshires.....0.09
(5) Holsteins.....0.16

V. TABLE SHOWING POUNDS OF FAT IN BUTTER FROM ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	3.07	5.75	4 15	———	5.23
2	3.09	4.76	2.97	2.33	4.56
3	2.76	4.24	2.77	2.77	4.56
4	2.80	4.37	2.94	2.31	5.11
5	3.04	4.66	2.82	1.72	5.13
6	2.99	4 42	2.90	2.67	4.90
7	2 58		2.98	3.03	5.12
8	2.41		2.94	3.09	5.39
9	3.00		2.97	3.06	5.17
10	2.82			2.69	

Monthly averages for the first six months of lactation :

(1) Jerseys 4.92
(2) Guernseys 4.70
(3) Holderness' 3.09
(4) Ayrshires 2.96
(5) Holsteins 2.36

VI. TABLE SHOWING POUNDS OF BUTTER (CONTAIINING 85 PER CENT. BUTTER FAT FROM ONE HUNDRED POUNDS OF MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	3.60	6.76	4.88	———	6.15
2	3.60	5.59	3-51	2.74	5.36
3	3.25	5.04	3.26	3.26	5.36
4	3.29	5.14	3.45	2.71	6.01
5	3.58	5.48	3.31	2.03	6.03
6	3.52	5.20	3.42	3.14	5.77
7	3.03		3.56	3.55	6.01
8	2.84		3.45	3.63	6.35
9	3.53		3.50	3 59	6.08
10	3.36			3.17	

Monthly averages for the first six months of lactation :

(1) Jerseys 5.78
(2) Guernseys 5.54
(3) Holderness' 3 64
(4) Ayrshires 3.47
(5) Holsteins 2.78

II. PERCENTAGES OF FAT RECOVERED AND LOST.

In Tables VII to X, there are presented data giving (1st) the per cent. of the fat in the milk recovered in the cream; (2d) the per cent. of the fat in the milk lost in the skim-milk; (3d) the per cent. of the fat in the milk lost in the butter-milk; and, (4th) the per cent. of the fat in the milk recovered in the butter.

The numbers in these tables have no reference to absolute amounts of fat in cream, etc., but serve to show simply what proportion of the fat in the milk is recovered and lost in the different processes of butter-making. Table VII, which states what per cent. of the fat in the milk goes into the cream, indicates the *creaming efficiency* or what might be called the "*creamability*" of the milk or fat in the milk. The figures in Table X, which show how much of the fat in the milk goes into the butter, indicate the *churning efficiency* or "*churnability*" of the fat in the milk or, more properly, of the fat in the cream.

Tabulating the averages obtained in Tables VII to X, we have the following:

TABLE SHOWING PERCENTAGES OF FAT IN MILK RECOVERED AND LOST.

	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
Per cent. of fat in milk recovered in cream	89.4	95.5	88	75.7	93.4
Per ct of fat in milk lost in skim-milk	10.6	4 5	12	24.3	6.6
Per cent. of fat in milk lost in butter-milk	2.4	0.7	1.5	5.3	1.5
Per cent. of fat in milk recovered in butter	84.8	92.5	84	64.3	87.6

OBSERVATIONS. — While the Jersey milk contains a larger amount of fat and makes a larger amount of butter than the milk of the Guernseys, we see from this table that the Guernseys lost a smaller proportion of fat in both skim-milk and butter-milk than did the Jerseys; that is, the creaming and churning efficiency is greater in the case of Guernseys, or, we may say, that the Guernseys make relatively more of the fat in their milk, in so far as the results at hand indicate. The amount of fat in the milk of the Ayrshires was lowest, while in creaming and churning efficiency, the Ayrshires stand third. Thus, while the rich milks lose less fat in creaming and churning, it does not necessarily follow that all milks will show a creaming and churning efficiency proportional to their richness, even when treated in the same manner.

As regards the influence of time of lactation-period upon the creaming and churning efficiency of the fat, we have not data enough to warrant any broad statement. By a careful inspection of data of individuals and of averages of breeds, the indications would seem to point to something like the following: As the period of lactation advances, the creaming and churning efficiency seems to diminish; that is, a larger proportion of fat is lost in skim-milk and butter-milk. It remains to be seen how fully our future data will confirm this.

VII. TABLE SHOWING PER CENT. OF FAT IN MILK RECOVERED IN CREAM.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	90.9	97.3	87.8	——	92.7
2	92.1	96 5	88.2	83.8	92.4
3	87.9	94.7	88.5	79.9	95.1
4	88.7	95.9	87.2	78.5	95.8
5	88.5	96.1	87.2	56.4	92.9
6	88.4	92.6	88.9	79.7	91.2
7	74.8		90.2	88	94.6
8	73 1		87.4	86.3	95.2
9	80.8		84.5	85.3	93.5
10	75.3			77.7	

Monthly averages for the first six months of lactation:

(1) Guernseys 95.5
(2) Jerseys 93.4
(3) Ayrshires 89.4
(4) Holderness'. 88.0
(5) Holsteins 75.7

VIII. TABLE SHOWING PER CENT. OF FAT IN MILK LOST IN SKIM-MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	9 1	2.7	12.2	———	7.3
2	7.9	3.5	11.8	16.2	7.6
3	12.1	5.3	11.5	20.1	4.9
4	11.3	4.1	12.8	21.5	4.2
5	11.5	3.9	12.8	43.6	7.1
6	11.6	7.4	11.1	20.3	8.8
7	25.2		9.8	12.0	5.4
8	26.9		12.6	13.7	4.8
9	19.3		15.5	14.7	6.5
10	24.7			22.3	

Monthly averages for the first six months of lactation :

(1) Guernseys 4.5
(2) Jerseys 6.6
(3) Ayrshires 10.6
(4) Holderness' 12.0
(5) Holsteins 24 3

IX. TABLE SHOWING PER CENT. OF FAT IN MILK LOST IN BUTTER-MILK.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	1.4	1.3	2.2	———	2.5
2	1.9	0.8	1.3	11.2	1.8
3	3.2	0.6	2.2	3.2	1.5
4	2.7	0 5	1.0	5.5	0.7
5	3.2	0.4	0.7	3.8	0.7
6	2.2	0.4	1.5	2.8	1.9
7	3.4		1.1	5.2	0.5
8	4.7		0.4	0.8	0.6
9	1.9		0.8	1.8	0.3
10	4.0			1.5	

Monthly averages for the first six months of lactation :

(1) Guernseys 0.7
(2) Jerseys 1.5
(3) Holderness' 1.5
(4) Ayrshires 2.4
(5) Holsteins 5.3

X. TABLE SHOWING PER CENT. OF FAT IN MILK RECOVERED IN BUTTER.

Month of Lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	87.6	93.0	82.4	———	85.7
2	88.7	93.0	82.3	64.8	86.7
3	82.1	92.3	82.1	71.7	88.1
4	82.8	94.4	85.4	62.2	88.6
5	82.7	93.0	84.7	48 7	90.5
6	84.8	89.6	87.1	74 1	86.0
7	68.7		87.6	74.0	89.5
8	65.2		84.2	83 1	93.2
9	74.3		82.9	82.3	88.8
10	69.2			74.4	

Monthly averages for the first six months of lactation :

(1) Guernseys 92.5
(2) Jerseys. 87.6
(3) Ayrshires 84 8
(4) Holderness' 84.0
(5) Holsteins.....64.3

III. THE RELATIONS OF MILK, CREAM AND BUTTER.

In Tables XI to XIV, there are presented data giving (1st) the number of pounds of milk required to make one pound of butter ; (2d) the number of pounds of milk required to make one pound of cream ; (3d) the number of pounds of cream required to make one pound of butter ; (4th) the per cent. of fat in the cream. The methods used in creaming have been practically uniform, and are described fully in the Chemist's Report for 1890, pages 198 and 199.

Tabulating the averages obtained in Tables XI to XIV, we have the following :

TABLE SHOWING RELATIONS OF MILK, CREAM AND BUTTER

	Ayrshires.	Guernseys	Holderness'.	Holsteins.	Jerseys.
Pounds of milk required to make one pound of butter	29.4	18.4	28.2	40	17.5
Pounds of milk required to make one pound of cream	5.28	3.73	5.57	7.89	4.01
Pounds of cream required to make one pound of butter	4.73	4.96	5.81	5 05	4.45
Per cent. of fat in cream....	19.50	18.08	18.05	20.47	21.05

OBSERVATIONS.—So far as the data in hand indicate anything, we are unable to see that the time of the period of lactation makes much difference as to the amount of milk required to make one pound of butter. As the period of lactation advances, some cows remain practically constant in this respect, others appear to require more milk for a pound of butter, and others less. Similarly, we can not at present make any general statement regarding the number of pounds of milk required to make a pound of cream, or regarding the number of pounds of cream required to make one pound of butter. The per cent. of fat in the cream does not appear to be uniformly influenced by advance in period of lactation.

One curious result, which does not seem to agree with the observations of others and which may be changed by more extended observations, is that the amount of fat in the cream does not seem to be, in most cases, related to the amount of fat in the milk. Thus in richness of milk, the order is (1) Jerseys, (2) Guernseys, (3) Holsteins, (4) Holderness', (5) Ayrshires, while, in richness of cream, the order is (1) Jerseys, (2) Holsteins, (3) Ayrshires, (4) Guernseys, (5) Holderness'.

XI. TABLE SHOWING POUNDS OF MILK REQUIRED TO MAKE ONE POUND OF BUTTER.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	28.2	15.5	20.6	——	16.3
2	28.5	18.0	29.0	36.6	18.9
3	31.8	19.8	30.9	30.8	18.7
.	31.0	19.5	29.2	41.1	16.9
5	28.1	18.3	30.2	59.9	16.6
6	28.6	19.3	29.4	33.9	17.5
7	35.4		28.3	28.1	16.8
8	37.0		29.0	27.5	15.8
9	30.2		28.7	28.2	16.5
10	31.6			31.7	

Monthly averages for the first six months of lactation:

(1) Jerseys, ... 17.5
(2) Guernseys, ... 18.4
(3) Holderness' 28.2
(4) Ayrshires 29.4
(5) Holsteins, ... 40.0

XII. TABLE SHOWING POUNDS OF MILK REQUIRED TO MAKE ONE POUND OF CREAM.

Month of lactation.	Ayrshires.	Guernseys	Holderness'.	Holsteins.	Jerseys.
1	5.66	3.64	5.29	—	4.19
2	6.30	3.65	6.49	7.36	4.17
3	6.52	3 76	6.35	6.47	4.22
4	6.56	3.34	5.38	7.72	3.93
5	6.63	3.88	5.26	11.08	3.94
6	5.83	4.13	4.63	6 77	3.59
7	7.09		5.07	5.48	3.63
8	7.25		6.06	5.47	3.77
9	6.39		5.84	5.16	3.93
10	6.60			4.85	

Monthly averages for the first six months of lactation:

(1) Guernseys, ... 3.73
(2) Jerseys, ... 4.01
(3) Ayrshires, ... 5.28
(4) Holderness', ... 5.57
(5) Holsteins, ... 7.89

XIII. TABLE SHOWING POUNDS OF CREAM REQUIRED TO MAKE ONE POUND OF BUTTER.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	5.00	4.24	3.90	—	3.89
2	4.63	4.93	4.48	4.97	4.53
3	4.85	5.29	4.86	4.76	4.44
4	4.72	5.87	5.44	5.35	4.29
5	4.26	4.71	5.76	5.20	4.35
6	4 92	4.71	6.44	5.00	5.19
7	5.08		5.58	5.25	4.65
8	5.27		4.83	5.11	4.28
9	4.80		4.91	5.64	4.26
10	4.73			8.00	

Monthly averages for the first six months of lactation.

(1) Jerseys, ... 4.45
(2) Ayrshires, ... 4.73
(3) Guernseys, ... 4.96
(4) Holsteins, ... 5.05
(5) Holderness', ... 5.81

XIV. TABLE SHOWING PER CENT. OF FAT IN CREAM.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	18.00	21.42	23.23	——	24.17
2	20.55	18.14	20.79	22.14	20.06
3	19.20	16.61	18.99	20.02	21.20
4	19.68	14.85	16.29	21.79	21.52
5	21.38	18.72	15.21	19.61	20.84
6	18.20	18.74	13.79	18.80	18.50
7	19.23		15.30	19.67	19.70
8	19.41		18.52	17.70	20.83
9	20.40		17.65	16.48	21.04
10	20.49			13.50	

Monthly averages for the first six months of lactation:

(1) Jerseys, ...21.05
(2) Holsteins, ...20 47
(3) Ayrshires, ...19.50
(4) Guernseys, ...18.[illegible]8
(5) Holderness', ...18.05

IV. DAILY YIELDS OF MILK AND BUTTER.

TABLE SHOWING POUNDS OF MILK AND BUTTER YIELDS PER DAY.

	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
Lbs. of milk per day	19.7	16.5	15.7	27.1	16.4
Lbs. of butter per day	0.71	0.90	0.56	0.70	0.91

The results in Tables XV and XVI show that as the period of lactation advances, the daily yield of both butter and milk diminishes.

XV. TABLE SHOWING POUNDS OF MILK GIVEN PER DAY.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	15.3	13.4	11.8	26 9	16
2	2 0.5	15.9	17.5	34.4	18.3
3	2 0.1	17.6	18 6	31.8	17.5
4	2 0.3	17.3	15.8	26.2	16.1
5	2 1.5	17.4	15.6	24 6	15.6
6	2 0.4	17.4	14.9	18.9	14.9
7	2 0 9		13.7	16.8	13.6
8	1 9.1		13.0	16.7	13.0
9	1 8.3		13.2	14.1	13.3
10	1 6.7				

Monthly averages for the first six months of lactation.

(1) Holsteins,.....27.1
(2) Ayrshires,.....19.7
(3) Guernseys.....16.5
(4) Jerseys,.....16,4
(5) Holderness',.....15.7

XVI. TABLE SHOWING POUNDS OF BUTTER PER DAY.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	0.58	0.88	0.57	——	0.99
2	0.75	0.88	0.60	0.78	0.93
3	0.67	0.89	0.60	0.97	0.85
4	0 68	0.88	0.55	0.65	0.88
5	0.81	0.94	0.52	0 50	0 94
6	0.78	0.90	0.51	0.62	0.86
7	0.66		0.49	0.59	0.81
8	0.57		0.45	0 62	0.82
9	0 67		0.46	0.53	0.81
10	0.60			0.33	

Monthly averages for the first six months of lactation :

(1) Jerseys,.....0.91
(2) Guernseys, ...0.90
(3) Ayrshires,.....0.71
(4) Holsteins, ...0.70
(5) Holderness',.....0.56

V. MONTHLY YIELDS OF DAIRY PRODUCTS.

The following table presents data which are made up from averages contained in Tables XXII to XVIII :

TABLE SHOWING MONTHLY YIELDS OF DAIRY PRODUCTS.

	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
Lbs of milk ..	617.9	494.7	477.8	783.1	480.6
" " skim-milk	518.4	360.7	392.2	675 1	358.7
" " cream	99 5	134.0	85.6	108.0	121.9
" " butter-milk	77.9	106.9	68.7	86.5	94.3
" " fat in milk	21.7	24.8	17.4	28 4	26 7
" " fat in butter	18.4	23.1	14 4	18.3	23 5
" " butter	21.6	27.1	16.9	21 5	27.6

XVII. TABLE SHOWING POUNDS OF SKIM-MILK PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	215.0	178.6	123.2	——	259.7
2	535.6	357.3	457.4	764.0	400.2
3	503.0	381.8	470.7	756 7	372.0
4	543.5	356.3	398.4	704.0	338.3
5	571.1	392.9	392.3	665.7	360.2
6	565.5	399.6	326.0	490.0	310.6
7	541.9		341.1	427.9	296 3
8	455.5		326.1	397 3	288.3
9	463.6		337.8	356.5	299.7
10	417.7			258.9	

Monthly averages for the first six months of lactation:

(1) Holsteins.....676.1
(2) Ayrshires,.....518.4
(3) Holderness',.....392.2
(4) Guernseys, ...360 7
(5) Jerseys,.....358.7

XVIII. TABLE SHOWING POUNDS OF MILK GIVEN PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	260.7	250.4	150 8	——	341 1
2	636.3	491.7	541.2	884.	527.3
3	596.4	520	558.6	895.	487 8
4	642.7	509.3	489.2	811.2	452.5
5	673.3	529.6	483.9	738 9	484.3
6	684 2	530.	416.6	586.4	443.6
7	649.4		425.	516.	408.7
8	544.3		390.7	482.8	395.7
9	566 9		407.8	437.7	407.9
10	498.2			312.7	

Monthly averages for the first six months of lactation:

(1) Holsteins,.....783.1
(2) Ayrshires,.....617.9
(3) Guernseys,.....494.7
(3) Jerseys, ...480.6
(5) Holderness',.....477.8

XIX. TABLE SHOWING POUNDS OF CREAM PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys,
1	45.7	71.8	27.6	——	81.4
2	100.7	134.4	83.8	120.0	127.1
3	93.4	138.2	87.9	138.3	115.8
4	99.2	153.0	90.8	107.2	115.2
5	102.2	136.7	91.6	73.2	124.1
6	118.7	130.4	90.6	96.4	133.
7	107.5		83.9	88.1	112.4
8	88.8		64.6	85.5	107.4
9	103.3		70.0	81.2	105.0
10	80.5			53.8	

Monthly averages for the first six months of lactation:

(1) Guernseys, ... 134.
(2) Jerseys, ... 121.9
(3) Holsteins, ... 108.
(4) Ayrshires 99.5
(5) Holderness', ... 85.6

XX. TABLE SHOWING POUNDS OF BUTTER-MILK PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	36.2	54.7	20.6	——	60.5
2	77.5	107.0	65.1	95.8	98.9
3	73.9	112.0	69.8	109.3	89.7
4	78.1	126.9	73.9	87.2	88.4
5	78.1	107.6	75.6	58.3	95.0
6	94.6	102.9	76.3	77.2	107.5
7	87.1		68.8	70.1	88.0
8	72.6		51.1	68.0	82.3
9	82.3		56.7	64.8	80.2
10	62.7			44.2	

Monthly averages for the first six months of lactation:

(1) Guernseys, ... 106.9
(2) Jerseys, ... 94.3
(3) Holsteins, ... 86.5
(4) Ayrshires, ... 77.9
(5) Holderness', ... 68.7

XXI. TABLE SHOWING POUNDS OF FAT IN MILK PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins	Jerseys.
1	9.20	15.37	7.60	——	20.81
2	22.14	25.22	19.54	31.73	27.79
3	20.27	23.97	18 82	34.55	25.27
4	21.85	23.58	16.82	29.53	26.02
5	24.78	26.48	16.11	25.20	27.51
6	24.15	26.13	13.87	20.78	25.42
7	24.87		14.24	21.57	23.38
8	21.39		13.64	17.96	22.95
9	23.24		14.64	16.19	23.50
10	21.57			11.41	

Monthly averages for the first six months of lactation:

(1) Holsteins, ... 28.40
(2) Jerseys, ... 26.66
(3) Guernseys, ... 24.84
(4) Ayrshires, ... 21.66
(5) Holderness', ... 17.36

XXII. TABLE SHOWING POUNDS OF FAT IN BUTTER PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	8 0	14.6	6.0	——	17 8
2	19.7	23.3	15.9	20.6	24.0
3	16 6	22.3	15.5	24.7	22.2
4	18.0	22.2	14 4	17.0	22.8
5	20.5	24.7	13.6	12.7	24.7
6	20.5	23.4	12.1	16.3	21.6
7	17.3		12.8	15.4	20·8
8	13.8		11.5	14.9	21.4
9	17.8		12 2	13 9	21.1
10	15.1			8.2	

Monthly averages for the first six months of lactation:

(1) Jerseys, ... 23 5
(2) Guernseys, ... 23.1
(3) Ayrshires, ... 18.4
(4) Holsteins, ... 18.3
(5) Holderness', ... 14.4

XXIII. TABLE SHOWING POUNDS OF BUTTER PER MONTH.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	9 5	17 1	7.0	——	20.9
2	23.2	27.3	18 7	24.2	28.2
3	19 5	26.2	18.1	29.0	26.1
4	21.1	26.1	16·9	20.0	26.8
5	24 1	28 9	16 0	14.9	29.1
6	24 1	27.5	14.3	19.2	25.5
7	20 4		15.1	18.0	24.4
8	16.2		13.5	17 5	25.1
9	21.0		14 3	16.4	24.8
10	17 8			9.6	

Monthly averages for the first six months of lactation:

(1) Jerseys, ...27.6
(2) Guernseys, ...27.1
(4) Ayrshires, ...21.6
(4) Holsteins.....21.5
(5) Holderness',.....16.9

VI. TEMPERATURE AND TIME OF CHURNING.

Averages made up from Tables XXIV and XXV give us the following :

TABLE SHOWING TEMPERATURE AND TIME OF CHURNING.

	Ayrshires.	Guernseys	Holderness'.	Holsteins.	Jerseys.
Temperature of churning (degrees F)	62°	61.5°	62°	61°	61°
Time of churning (minutes)	33	30	67	65	51

OBSESVATIONS.—While the average temperature of churning does not vary greatly for the different breeds, the time of churning varies from 30 to 67 minutes.

The advance of the period of lactation appears, from the data at hand, to be accompanied by a higher degree of temperature of churning. Taking an average of all the cows, we have the following for the first nine months of lactation :

Month of lactation.	Temperature.	Time. (minutes.)
1	61°	36
2	61°	38
3	61.5°	34
4	62°	52
5	62°	55
6	63°	67
7	63°	77
8	63°	63
9	64°	73

XXIV. TABLE SHOWING TEMPERATURE (IN DEGREES FAHRENHEIT) OF CHURNING.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	62°	61°	60°	——	61°
2	61°	61°	61°	60°	61°
3	62°	62°	60°	61°	62°
4	63°	63°	62°	61°	60°
5	62°	62°	65°	60°	61°
6	64°	62°	66°	62°	62°
7	61°		65°	62°	64°
8	61°		63°	63°	64°
9	62°		66°	66°	63°
10	64°			68°	

Monthly averages for the first six months of lactation :

(1) Holsteins ..... 61°
(2) Jerseys ..... 61.1°
(3) Guernseys ..... 61.8°
(4) Ayrshires ..... 62.3°
(5) Holderness' ..... 62.3°

XXV. TABLE SHOWING LENGTH OF TIME (IN MINUTES) OF CHURNING.

Mouth of Lactatioh.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	28	17	66	——	33
2	30	19	53	40	46
3	34	32	49	67	38
4	35	36	76	64	53
5	33	34	85	60	63
6	39	44	85	97	71
7	47		103	66	92
8	48		72	75	57
9	62		56	120	55
10	45				

Monthly averages for the first six months of lactation :

(1) Guernseys 30
(2) Ayrshires 33
(3) Jerseys 51
(4) Holsteins 65
(5) Holderness' 67

VII. MICROSCOPIC DATA.

Tables XXVI and XXVII include data pertaining to (1st) relative number of fat globules and (2d) relative size of fat globules. The methods employed in determining these data are those devised by Dr. S. M. Babcock and described in the Fourth Annual Report of this Station.

The *relative number* of fat globules is ascertained directly by counting the globules by means of a microscope in a known amount of milk. For the sake of comparison, it is desirable to know how many globules there are in some particular volume. The volume of milk adopted as a standard for the sake of comparing the number of fat globules is one-ten-thousandth of a cubic millimeter, one cubic millimeter occupying about the volume of an ordinary pin-head. By using so small an amount of milk, we get numbers which are not too large to comprehend, and which answer satisfactorily for the purposes of comparison. The *relative number* of fat globules means, therefore, the number in one ten-thousandth (.0001) of one cubic millimeter of milk.

If we know the volume of fat and the number of globules in that volume, we can readily ascertain the average volume or size of one globule by dividing the volume of fat by the number of globules. Since we desire only relative numbers for the sake of comparison, it answers the purpose to take the per cent. of fat in the milk, obtained by analysis, as representing the volume of fat. If, then, we divide the per cent. of fat in the milk by the number of globules in .0001 c. mm. of milk, we shall obtain the average relative volume or size of one globule. As the number thus obtained is too small for convenient use, it is multiplied by 10,000, and the number obtained is used to represent the *relative size* of the fat globules. The numbers representing the relative size of the fat globules do not, therefore, represent any actual size or volume, nor can they be referred to one standard of size ; but, by

proceeding in the manner described with different milks, we get numbers which can be compared and which represent, relatively to one another, the average size or volume of the fat globules in the different milks. As pointed out by Dr. Babcock, the average diameter of globules would not serve well for comparison, unless the globules were uniform in size or nearly so. "But as the volumes of spheres vary, not directly as their diameters, but as the cubes of their diameters, and as the average of a series of numbers does not determine what the average of their cubes will be, it follows, with bodies varying to the extent, often occurring in the fat globules of milk, that their average diameter conveys no definite idea of their volume, which is really in most cases what is sought. The average volume of milk globules, owing to their variable size, is always greater than the volume indicated by their average diameter, the difference between two volumes being greatest when the globules vary most in size. It is, therefore, evident that if we wish to study the influence of the size of globules upon the character of milk, their volume rather than their average diameter should be considered." (Fourth Annual Report of this Station, pape 297).

TABLE SHOWING RELATIVE NUMBER AND RELATIVE SIZE OF FAT GLOBULES

	Ayrshires.	Guernseys	Holderness'.	Holsteins.	Jerseys.
Relative number of fat globules	77	61	81	74	61
Relative size of fat globules	536	863	498	523	1087

OBSERVATIONS.—There appears to be a general relation between the relative number of fat globules and the creaming and churning efficiency, the milk containing the fewer number being more efficient for butter-making. In regard to the relative size of the fat globules, the larger the size, the more efficient the creaming and churning, which we see is borne out in a general way by the foregoing numbers, though modified in some cases by other factors.

So far as we can judge from the data now on hand, advance of the period of lactation seems to be accompanied by an increase

in the number and diminution in the size of the fat globules, according to the following table :

Month of lactation.	Relative number of fat globules.	Relative size of fat globules.
1	58	907
2	57	808
3	60	798
4	89	594
5	74	659
6	80	598
7	75	516
8	100	458
9	104	436

XXVI. TABLE SHOWING RELATIVE NUMBER OF FAT GLOBULES.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	64	61	—	—	49
2	66	46	68	53	53
3	70	52	68	67	45
4	85	76	87	113	86
5	98	63	79	73	56
6	81	70	104	66	76
7	131		110	97	62
8	102		94	118	80
9	98		115	118	83
10	158			175	

Monthly averages for the first six months of lactation :

(1) Jerseys, 61
(2) Guernseys, 61
(3) Holsteins, 74
(4) Ayrshires, 77
(5) Holderness', 81

XXVII. TABLE SHOWING RELATIVE SIZE OF FAT GLOBULES.

Month of lactation.	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
1	687	928	—	—	1104
2	579	1063	661	640	1098
3	624	954	607	576	1228
4	426	659	501	285	1097
5	394	838	397	520	1149
6	486	737	334	595	846
7	293		329	425	1017
8	392		379	327	732
9	378		315	337	715
10	278			217	

Monthly averages for the first six months of lactation:

(1) Jerseys, ... 1087
(2) Guernseys, ... 863
(3) Ayrshires, ... 536
(4) Holsteins, ... 523
(5) Holderness', ... 498

SUMMARY.

In the following table, the more important results embodied in the foregoing tables are presented. As previously pointed out, *these results must not be regarded as conclusive*, since they are only provisional and may be considerably modified when we come to present results for complete periods of lactation and for a full herd of each breed.

TABULATED SUMMARY OF RESULTS FOR FIRST SIX MONTHS OF LACTATION.

	Ayrshires.	Guernseys.	Holderness'.	Holsteins.	Jerseys.
Pounds of fat in 100 pounds of milk	3.50	5.07	3.69	3.71	5.61
Pounds of fat in skim-milk from 100 pounds of milk	0.38	0.23	0.44	0.85	0.38
Pounds of fat in cream from 100 pounds of milk	3.12	4.84	3.25	2.86	5.24
Pounds of fat in butter-milk from 100 pounds of milk	0.09	0.05	0.06	0.16	0.08
Pounds of butter from 100 pounds of milk	3.47	5.54	3.64	2.78	5.78
Per cent. of fat in milk recovered in cream	89.4	95.5	88	75.7	93.4
Per cent. of fat in milk lost in skim-milk	10.6	4.5	12	24.3	6.6
Per cent. of fat in milk lost in butter-milk	2.4	0.7	1.5	5.3	1.5
Per cent. of fat in milk recovered in butter	84.8	92.5	84	64.3	87.6
Pounds of milk required to make one pound of butter	29.4	18.4	28.2	40	17.5
Pounds of milk required to make one pound of cream	5.28	3.73	5.57	7.89	4.01
Pounds of cream required to make one pound of butter	4.73	4.96	5.81	5.05	4.45
Per cent. of fat in cream	19.50	18.08	18.05	20.47	21.05
Pounds of milk per day	19.7	16.5	15.7	27.1	16.4
Pounds of butter per day	0.71	0.90	0.56	0.70	0.91
Time of churning (in minutes)	33	30	67	65	51
Relative size of fat globules	536	863	498	523	1087

In the pages following, are presented tabulated data for each individual of each breed. This will enable any one interested in doing so to make a comparison of individuals.

AYRSHIRE BUTTER RECORD—MONTHLY AVERAGES OF QUEEN DUCHESS.

		Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
Month of Lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
2	Aug. 1890	48°	59°	30	28.26	4.37	0.51	3.86	0.13	3.62	4.26	56	808
3	Sept. "	47°	61°	34	22.28	4.48	0.65	3.83	0.16	3.42	4.02	34	1185
4	Oct. "	49°	61°	34	21.83	3.93	0.37	3.56	0.27	2.94	3.46	87	490
5	Nov. "	47°	61°	36	21.52	3.95	0.34	3.61	0.24	3.28	3 86	105	380
6	Dec. "	42°	62°	50	18.34	3.78	0.38	3.40	0.14	3.17	3.73	64	618
7	Jan. 1891	39°	62°	43	15.71	3.60	0.29	3.31	0.03	3 23	3.80	—	——
8	Feb. "	39°	62°	36	15.09	3.31	0.28	3.03	0.10	2.90	3.44	108	308
9	Mar. "	37°	63°	58	17.43	3.86	0.16	3.70	0.02	3.56	4.31	98	378
10	Apr. "	44°	64°	33	19.87	3.71	0.23	3.48	0.02	3 40	4.08	130	287
11	May "	48°	64°	25	19.69	3.67	0.48	3.19	0.03	3.08	3.63	98	388

AYRSHIRE BUTTER RECORD—MONTHLY AVERAGES OF QUEEN DUCHESS (*Concluded.*)

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter milk.	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
2	2[illegible].73	7.32	3 24	1.10	805.7	695 7	110	76.1	28.8	33.9	88.1	11.9	2 8	82.5
3	24 97	5.75	4 34	0.90	671 1	554.4	116 7	89.8	22.9	26.9	85.4	14.6	3.6	76.4
4	29.12	6 13	4.75	0 78	701.6	587 2	114 4	90.3	20.5	24.1	90.6	9 4	6 8	75.0
5	25 90	5.95	4 35	0 85	657.8	547 8	110	84 6	21 6	25.4	91 4	8.6	6.0	82.9
6	26 85	5.32	5.04	0.85	703 9	571 6	132.3	106.1	22.3	26 2	89.7	10.3	3.8	84.0
7	26 33	4 72	5.58	0 91	747.1	588.8	158.3	130 0	24.7	28.3	92.1	7 9	0.8	89.9
8	29 11	4.98	5.84	0.80	649	518.7	130.3	108	19	22.3	91.5	8.5	3.0	88.2
9	23 23	4.57	5 08	0.97	702 2	548 6	153 6	123.4	25.7	30.2	95.9	4.1	0.4	95.1
10	24.51	5 68	4.31	0.90	662.4	545.8	116 6	89 6	23	27	94.0	6.0	0.5	93.2
11	27.61	5.81	4 75	0.81	690.6	571.8	118 8	86 9	21.3	25	86.7	13.3	0.8	83.9

AYRSHIRE BUTTER RECORD—MONTHLY AVERAGES OF MISS FLOW 5TH.

		Creaming and churning.					From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs.	Time of churning. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
7	Aug. 1896	51°	60°		50	22.74	4.05	1.72	2.33	0.24	1.92	2.26	131	293
8	Sept. "	51°	60°	1	00	23.72	4 54	2.06	2.48	0.29	1.91	2 24	95	476
9	Oct. "	49°	60°	1	5	23.36	4 34	1 50	2.84	0 14	2 33	2 74	—	—
10	Nov. "	48°	63°		57	21.11	4.95	2.14	2.81	0.36	2.24	2 63	1185	268
11	Dec. "	42°	62°	1	10	13.31	4.80	2.01	2.79	0.23	2 44	2.87	1125	402

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter milk.	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
7	44.53	9.75	4.57	0.40	551.7	495.1	56.6	44.2	12 4	10.5	57.5	42 5	5.9	47.4
8	44 79	9 52	4.70	0 34	449 5	402.3	47.2	37 2	10.0	8.5	54.7	45 3	6.4	42.2
9	37.08	8.20	4 52	0.37	431.5	378.5	53	41 3	11.7	9.9	65 6	34.4	3.3	53.5
10	38 73	7 52	5.15	0.29	333 9	289.5	44.4	35 8	8.6	7.3	56.7	43.3	7.4	45.2
11	35 00	4.94	7.08	0.16	173.9	138.7	35.2	30.2	5 0	4.3	58.3	41 7	4.9	50.8

AYRSHIRE BUTTER RECORD—MONTHLY AVERAGES OF MANTON BELLE.

		Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Lbs. of fat in milk.	Lbs. of fat in skim-milk.	Lbs. of fat in cream.	Lbs. of fat in butter-milk.	Lbs. of fat in butter.	Lbs. of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1.....	Dec. '90	41°	60°	19	20.12	4.00	0.56	3.44	0.03	3 28	3.86	41	995
2.....	Jan. '91	41°	62°	19	16.34	3.10	0.20	2.90	0 06	2.79	3.28	58	539
3.....	Feb. "	38°	62°	23	16 47	2.82	0.31	2.51	0.13	2.37	2.79	90	316
4.....	Mar. "	38°	64°	28	19.47	3.42	0.39	3 03	0.01	3 01	3.53	83	453
5.....	Apr. "	44°	63°	30	21.24	3.40	0.50	2.90	0.01	2.80	3.30	90	409
6	May "	44°	65°	28	18.06	3.27	0.42	2.85	0 02	2.80	3.30	97	354

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Lbs. of milk to one lb. of butter.	Lbs. of milk to one lb. of cream.	Lbs. of cream to one lb. of butter.	Lbs. of butter per day.	Lbs. of whole milk.	Lbs. of skim milk.	Lbs. of cream.	Lbs. of butter milk.	Lbs. of fat in butter.	Lbs. of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent of fat in butter-milk.	Per cent of fat recovered in butter.
1*	26.52	5.85	4.53	0.65	327.8	271.8	56.0	43.6	10.5	12.4	86.0	14.0	0.8	81.8
2	30.64	5.56	5.51	0 69	649.6	532.8	116 8	95 6	18 0	21.2	93.7	6.3	2.2	90.1
3	36.05	6.58	5.48	0.65	655 4	555 8	99.6	81 4	15.5	18.2	88.9	11.1	4 9	83.9
4	29.12	6 41	4.54	0.79	714.2	602.8	111.4	86.9	20.8	24.5	88.9	11.1	0.3	88 2
5	30.35	7.30	4 16	0 76	688.8	594 5	94 3	71.6	19 3	22.7	85.5	14.5	0.3	82.4
6	30 37	6 33	4.80	0.70	664 5	559 5	10.5	83.1	18 6	21.9	87.1	12.9	0.6	85 6

*First month of lactation contains 20 days.

AYRSHIRE BUTTER RECORD—MONTHLY AVERAGES OF JUNIETTA PEERLESS.*

Month of lactation.	Date.	Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
		Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number fat globules.	Relative size of fat globules.
1	Feb. '91	38°	64°	37	15 87	3.05	0.13	2 92	0.06	2.85	3.35	87	379
2	Mar. "	37°	63°	41	17.06	2 97	0 16	2.81	0.02	2.77	3.26	84	392
3	Apr. "	44°	64°	46	18.83	2.90	0.31	2.59	0.03	2.50	2.94	87	370
4	May "	47°	64°	42	17.74	2.86	0.38	2.48	0.03	2.44	2.87	86	336

*Junietta Peerless dropped calf at eighth month of pregnancy and her condition has not been entirely normal.

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter-milk	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. fat lost in butter-milk.	Per cent. of fat recovered in butter.
1*	29.85	5.43	5.50	0.50	193 5	157.9	35.0	29 1	5.5	1.5	95.7	4.3	1 9	93.4
2	30.99	6.02	5.15	0.47	453 5	378.2	7 .3	60.7	12 4	14.6	94.5	5 5	0 8	93.4
3	34.23	7 24	4.73	0.45	462.6	398 7	63.9	50.4	11.5	13.5	89.3	10.7	1.2	86.0
4	34.85	7.14	4.88	0.47	512.4	440.6	75.8	57.1	12.5	14.7	86.5	13.5	1.0	85.3

*First month of lactation contains 13 days.

GUERNSEY BUTTER RECORD—MONTHLY AVERAGES OF ROSETTE FORD.

Month of lactation.	Date.	Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
		Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of fat containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1	Nov. '90	47°	61°	14	21.32	5.40	0 19	5.21	0.26	4.92	5.80	61	928
2	Dec. "	41°	60°	20	19.45	5 32	0.26	5.06	0 06	4 82	5.67	46	1147
3	Jan. '91	42°	62°	46	17.81	4 74	0.33	4.41	0 03	4.22	4.96	39	1193
4	Feb. "	38°	65°	25	15.82	4.90	0.28	4.62	0.02	4.52	5.32	72	722
5	Mar. "	37°	61°	42	19.01	5 12	0.22	4.90	0.02	4.86	5.72	66	870
6	Apr "	43°	61°	47	20.06	5.02	0.50	4.52	0.02	4.40	5.18	75	714
7	May "	44°	64°	38	25	4 81	0.65	4.16	0.02	3.98	4.68	152	338

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter-milk	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
1*	17.85	4.10	4.35	0.73	195.4	147.8	47.6	36.7	9.3	10.9	96.3	3.7	1.4	90.6
2	17.72	3.81	4.65	0.98	543.4	400.4	143	112 3	26.1	30.7	95.2	4.8	1.0	90.8
3	20.13	4.00	5.03	0.90	561.5	421.1	140 4	112.5	23.7	27.9	93.0	7.0	0.5	89.0
4	18.80	3.42	5.50	0.91	482.3	341.3	141	115.3	21 8	25 7	94.3	5.7	0.4	92.2
5	17.41	3.85	4.52	0.91	501.9	371.5	130 4	101.5	24.6	28.9	95.8	4.2	0.4	94.9
6	19.31	4.46	4.33	0.83	478.8	371.4	107.4	82.6	21.1	24.8	90.0	10.0	0.3	87.6
7	21.39	3.90	5.48	0.78	515.9	383.6	132.3	108 2	20 5	24.1	86.5	13.5	0.4	82.9

*First month of lactation contains 15 days.

GUERNSEY BUTTER RECORD.—MONTHLY AVERAGES OF ORIOLE.

		Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Lbs. of fat in milk.	Lbs. of fat in skim-milk.	Lbs. of fat in cream.	Lbs. of fat in buttermilk.	Lbs. of fat in butter.	Lbs. of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1	Dec. 1890	41°	60°	20	21.51	6.87	0 12	6 75	0.08	6.57	7.72	—	—
2	Jan. 1891	39°	61°	17	16 82	4.94	0.11	4.83	0 03	4.69	5.52	45	980
3	Feb "	39°	62°	18	15.41	4.49	0.16	4 33	0.03	4 25	5.13	64	715
4	Mar. "	37°	61°	47	13.88	4.36	0.11	4 25	0.02	4 21	4 96	79	596
5	Apr. "	44°	63°	25	18 43	4 89	0 18	4.71	0.02	4 46	5 24	61	805
6	May "	48°	63°	41	17.42	4.83	0.23	4.60	0.02	4.43	5.21	65	760

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Lbs. of milk to one lb. of butter.	Lbs. of milk to one lb. of cream.	Lbs. of cream to one lb. of butter.	Lbs. of butter per day.	Lbs. of whole milk.	Lbs. of skim-milk.	Lbs. of cream.	Lbs. of buttermilk.	Lbs. of fat in butter.	Lbs. of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat in buttermilk.	Per cent. of fat recovered in butter.
1*	13.09	3.18	4.12	1.05	305.4	209.4	96.	72 7	19.8	23.3	98.3	1.7	1.2	95.4
2	18 24	3.50	5.21	0.78	440.	314.3	125.7	101.6	20.5	24.1	97.8	2.2	0.6	95.1
3	19.50	3.52	5.54	0.88	478.4	342.5	135.9	111.4	20 8	24 5	96.3	3.7	0.6	95.5
4	20 21	3.25	6.22	0 86	536.3	371.3	165.	138.5	22.5	26.5	97.4	2.6	0.5	96.5
5	19 08	3.90	4.89	0.97	557.3	414.3	143.	113 8	24 8	29.2	96.3	3.7	0.4	91.1
6	19.27	3.79	5 08	0.98	581.3	427.9	153.4	123.2	25.7	30.2	95.2	4.8	0.4	91.5

*First month of lactation contains 24 days.

AMERICAN HOLDERNESS BUTTER RECORD—MONTHLY AVERAGES OF MAGGIE 6TH.

		Creaming and churning.					From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs.	Time of churning. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1	Sep. '90	42°	59°	1	25	23.31	5.30	0.59	4.71	0.09	4.51	5.31	—	—
2	Oct. "	48°	60°		51	20.61	3.68	0.37	3.31	0.05	3.09	3.64	55	713
3	Nov. "	48°	60°		47	19.54	3.38	0.33	3.05	0.08	2.87	3.38	68	607
4	Dec. "	42°	59°	1	13	17.63	3.63	0.49	3.14	0.03	3.06	3.60	65	594
5	Jan. '91	44°	64°	1	42	14.60	3.36	0.41	2.95	0.02	2.87	3.37	75	514
6	Feb. "	38°	64°	1	51	11.83	3.18	0.40	2.78	0.06	2.70	3.17	104	308
7	Mar. "	38	66°	1	14	15.54	3.41	0.38	3.03	0.06	2.98	3.51	107	376
8	Apr. "	44	64°	1	8	20.66	3.46	0.33	3.13	0.02	3.00	3.53	89	376
9	May "	45	66°		50	17.63	3.62	0.49	3.13	0.04	3.07	3.61	112	344

AMERICAN HOLDERNESS BUTTER RECORD—MONTHLY AVERAGES OF MAGGIE 6TH (*concluded.*)

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Lbs. of milk to one lb. of butter.	Lbs. of milk to one lb. of cream.	Lbs. of cream to one lb. of butter.	Lbs. of butter per day.	Lbs. of whole milk.	Lbs. of skim-milk.	Lbs. of cream.	Lbs. of butter-milk.	Lbs. of fat in butter.	Lbs. of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter milk.	Per cent. of fat recovered in butter.
1*	18.83	4.95	3 80	0.54	61.2	48 8	12 4	9 1	2 8	3.3	88.9	11.1	1.7	85.1
2	27 97	6 21	4 50	0.65	568.5	477 0	91.5	71 2	17.3	20.3	89.8	10.2	1.4	83.9
3	29.76	6.41	4.64	0.65	585 3	494.	91.3	71.7	16.8	19 6	90 0	10.0	2.5	84.9
4	27 91	5 58	5.00	0 61	522.9	429.3	93 7	75.	15.6	18.7	85.5	13 5	0 9	84 3
5	29.75	4.98	5 97	0 53	493.2	394 2	99.	82 4	14.1	16.6	87 8	12 2	0.5	85.5
6	31 55	4.25	7.42	0.47	413 0	315 9	97.1	84.	11.1	13.1	87 3	12.7	1.9	84 9
7	28.49	5 13	5 38	0 53	449 4	361.8	87.6	71.3	13.9	16 3	88.9	11.1	1.6	87.4
8	28.33	6.62	4 28	0 49	417.1	354 1	63 0	48 3	12.5	14.7	90.6	9 4	0.4	86 7
9	27.71	5 65	4 90	0 50	428.1	352 3	75.8	60.3	13 2	15 5	86 5	13 5	1.1	85.0

*First month of lactation contains six days.

AMERICAN HOLDERNESS BUTTER RECORD—MONTHLY AVERAGES OF NELLIE 6TH.

		Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Lbs. of fat in milk.	Lbs. of fat in skim-milk.	Lbs. of fat in cream.	Lbs. of fat in butter-milk.	Lbs. of fat in butter.	Lbs. of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1	Sept. 1890	45°	61°	47	23.14	4.78	0.67	4.11	0.12	3.78	4.44	----	——
2	Oct. "	48°	61°	55	20.96	3.54	0.48	3.06	0.04	2.85	3.38	79	609
3	Nov. "	49°	60°	51	18.44	3.36	0.44	2 92	0.05	2.67	3.14	——	——
4	Dec. "	41°	64°	1 19	14.94	3 25	0 36	2.89	0.04	2.81	3 30	109	407
5	Jan. 1891	38°	66°	1 7	15.82	3.30	0.44	2.85	0.02	2.76	3.25	83	279
6	Feb. "	38°	67°	1 0	15 75	3 48	0.33	3.15	0.04	3.10	3.66	103	339
7	Mar. "	38°	66°	2 11	15.05	3.28	0.28	3.00	0.02	2.95	3 47	114	282
8	Apr. "	43°	61°	1 15	16.39	3 52	0 55	2.97	0.01	2.88	3.38	99	381
9	May "	45°	65°	1 2	17.68	3 56	0.63	2.93	0.02	2 87	3 38	119	285

AMERICAN HOLDERNESS BUTTER RECORD—MONTHLY AVERAGES OF NELLIE 6TH (*concluded.*)

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter-milk.	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	per eent. of fat recovered in butter.
1*	22.44	5.62	4.00	0.59	240.3	197.6	42.8	32.1	9.1	10.7	86.6	13.4	2.6	79.7
2	30.07	6.76	4.45	0 55	513.9	437.9	76.0	59	14.5	17	86.5	13.5	1.1	80.7
3	31.96	6.29	5.08	0.55	531.9	447.4	84.5	67.9	14.1	16.6	87.0	13.0	1.6	79.3
4	30 42	5.18	5.87	0 48	455.4	367.5	87.9	72.9	12.8	15	88.9	11.2	1.1	86.5
5	30.72	5.53	5.55	0 50	474.6	390.3	84.2	68.8	13.1	15.4	89.6	13.4	0.8	83.9
6	27.32	5.00	5 46	0.55	420.1	336.1	84.0	68.6	13.1	15.4	90.5	9.5	1.1	89.3
7	28.90	5 00	5.78	0.45	400.6	320.5	80.1	66.3	11.7	13.8	91.5	8.5	0.7	89.9
8	29 64	5 50	5.39	0.41	364.2	298.0	66.2	53.9	10.5	12.3	84.2	15.8	0.4	81.7
9	29.62	6.02	4.92	0.42	387.4	323.1	64.3	51.2	11.1	13.1	82.5	17.5	0.4	80.7

*First month of lactation contains 18 days.

HOLSTEIN-FRIESIAN BUTTER RECORD—MONTHLY AVERAGES OF TOLSMA ARTIS.*

		Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning	Time of churning. hrs.	Time of churning. min	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. of butter fat.	Relative number of fat globules.	Relative size of fat globules.
4	Aug '90	51°	60°		31	23 59	3.63	0 90	2.73	0.13	2.18	2 56	93	314
5	Sep. "	51°	60°		44	18.82	3 15	1.83	1.32	0.14	1.01	1.19	50	644
6	Oct. "	49°	60°		57	19.85	3 19	0 87	2 32	0 11	2.07	2.43	—	—
7	Nov. "	48°	61°		32	19 86	4 80	0 46	4.34	0.04	3.14	3.69	100	509
8	Dec. "	42°	62°	1	2	15 88	3 71	0 43	3.28	0.04	3.11	3.65	112	344
9	Jan. '91	39°	67°	1	44	12.49	3.50	0.65	2 85	0.02	2.76	3.24	104	289
10	Feb. "	38°	65°	2	15	7.78	3.35	0.46	2.89	0.10	2.78	3.27	182	186

*Tolsma Artis has not been in an entirely normal condition all the time, and this is especially noticeable in the results presented for the fourth, fifth and sixth months of lactation.

HOLSTEIN-FRIESIAN BUTTER RECORD—MONTHLY AVERAGES OF TOLMA ARTIS (*concluded*).

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds af skim-milk.	Pounds of cream.	Pounds of butter-milk	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
	46.39	8.95	5.18	0.59	841.8	747.8	9.4	75.9	15.4	18.1	72.5	27.5	3.9	57.5
4	84.41	14.3	5.90	0.29	727.3	676.4	50.9	42.3	7.3	8.6	41.7	58.3	4.5	31.2
5	41.81	8.33	50.2	0.34	447.7	394	53.7	43	9.1	10.7	72.6	27.4	3.6	64.6
6	27.06	4.56	5.93	0.30	241.8	188.8	53	44	7.7	9.0	90.5	9.5	9.5	65.5
7	27.38	4.74	5.77	0.36	309.7	244.4	65.3	54	9.6	11.3	88.5	11.5	1.2	83.8
8	30.82	4 46	6.91	0.25	237.2	184	53.2	45.5	6.5	7.7	81.4	11.6	0.61	78.9
9	30.58	2.70	11 3	0.10	80.7	50.8	19.0	27.3	2.2	2.6	86.3	13.7	2.98	83.0
10														

HOLSTEIN-FRIESIAN BUTTER RECORD.—MONTHLY AVERAGES OF ESEL 2D.

		Creaming and churning.					From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs.	Time of churning. min.	Per cent. of fat in cream.	Lbs. of fat in milk.	Lbs. of fat in skim milk.	Lbs. of fat in cream.	Lbs. of fat in butter-milk.	Lbs. of fat in butter.	Lbs. of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
2	Aug. 1890	48°	60°		40	22.14	3.59	0.58	3.01	0.40	2.33	2.74	53	640
3	Sept. "	47°	61°	1	7	20.02	3 86	0.78	3.08	0.17	2.77	3 26	67	576
4	Oct. "	49°	62°	1	31	19.99	3.64	0.57	3.07	0.21	2.43	2 86	132	256
5	Nov. "	48°	60°	1	15	20.40	3.66	1.06	2.60	0.11	2 43	2 86	95	396
6	Dec. "	42°	63°	2	17	17.74	3.92	0.52	3.40	0.07	3.27	3.85	66	595
7	Jan. 1891	39°	63°	1	40	19.48	3.55	0.53	3.02	0.03	2.91	3.42	94	340
8	Feb. "	38°	64°	1	27	19.49	3.73	0.60	3.13	0.03	3.07	3.62	123	310
9	Mar. "	37°	65°	2	14	20.47	3.90	0.41	3.49	0.01	3.35	3.94	132	384
10	Apr. "	44°	72°	5	58	19.13	3.95	1.22	2.73	0.05	2.60	3 06	168	248
11	May "	48°	67°	3	11	17.00	3.72	0.96	2.76	0.03	2.62	3.09	166	239

HOLSTEIN-FRIESIAN BUTTER RECORD—MONTHLY AVERAGES OF ESEL 2D (*concluded*).

	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
Month of lactation.	Lbs. of milk to 1 lb. of butter.	Lbs. of milk to one lb. of cream.	Lbs. of cream to one lb. of butter.	Lbs. of butter per day.	Lbs. of whole milk.	Lbs. of skim-milk.	Lbs. of cream.	Lbs. of butter-milk.	Lbs. of fat in butter.	Lbs. of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
2	36.62	7.36	4.97	0 78	884.	764.	120.	9 58	20.6	24.2	83.8	16.2	11.2	64 8
3	30.84	6 47	4.76	0.97	895.	756 7	138.3	109.3	24.7	29.	79.9	20.1	3 2	71.7
4	35 77	6.49	5.51	0.71	780 6	660.3	120.3	98.5	18 5	21.8	84 4	15.6	7.0	66.9
5	35.43	7.87	4.50	0.71	750.5	655 1	95.4	74.2	18.0	21.2	71.0	29 0	3.1	66.2
6	25 95	5 21	4 98	0 90	725.1	586.	139.1	111.5	23.5	27.6	86.7	13 3	1.9	83.5
7	29.21	6 41	4.56	0.87	790 1	666.9	123.2	96.2	23.	27.	85.5	14.5	0.8	82.5
8	27.61	6.21	4.45	0.85	655.8	550.2	105.6	81.9	20.1	23.7	84.0	16.0	0.9	82.4
9	25.54	5 85	4.37	0.81	638 1	529.	109.1	84.1	21.2	25.	89.2	10.8	0 3	85 6
10	32 82	7.00	4 69	0.55	544.7	467.1	77.6	61.	14.1	16.6	69.0	31.0	3.0	65.7
11	32 36	6.10	5.30	0.56	560.6	468.7	91.9	74.6	14.7	17.3	74.3	25.7	0.8	70.7

JERSEY BUTTER RECORD—MONTHLY AVERAGES OF COUNTESS FLAVIA.

		Creaming and churning.					From one hundred pounds of milk.						Microscopic data.	
Month of lactation.	Date.	Average temperature during setting.	Average temperature during churning.	Time of churning. hrs.	Time of churning. min.	Percent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat	Relative number of fat globules.	Relative size of fat globules.
5	Aug. 1890	51°	60°	1	40	26 32	6.01	0.68	5.33	0.09	5.10	6.00	58	984
6	Sept. "	51°	62°	2	15	26.23	6.12	0.95	5.17	0 20	4.56	5 37	96	724
7	Oct. "	49°	63°	2	15	22.58	5 99	0.35	5 64	0.05	5 22	6.14	52	1273
8	Nov. "	49°	64°	1	23	24.65	6.42	0 49	5.93	0.07	5.69	6.69	85	759
9	Dec. "	42°	63°	1	17	20.88	6 18	0.51	5.67	0 02	5.45	6.42	80	780
10	Jan. 1891	39°	66°	1	11	18.23	6 45	0 52	5 93	0.02	5.84	6 86	99	703
11	Feb. "	38°	63°		50	17.99	6 35	0.40	5.95	0.03	5 89	6 93	78	757
12	Mar. "	38°	65°	1	3	20.68	6.56	0.19	6.37	0.03	5.87	6.90	63	1040
13	Apr. "	43°	65°		57	20.94	6.30	0.19	6.11	0.02	5.86	6.89	69	939
14	May "	46°	66°		51	20.86	5.87	0.49	5.38	0.04	5.27	6.20	70	908

JERSEY BUTTER RECORD—MONTHLY AVERAGES OF COUNTESS FLAVIA (*concluded*).

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream.	Pounds of butter milk	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
5	16.65	4.94	3.37	1.11	574	457.8	116.2	81.8	29.2	34.4	88.7	11.3	1.49	84.9
6	18.77	5.13	3.66	0.87	492.4	396.4	96.0	69.8	22.2	26.2	84.5	15.5	3.26	74.5
7	16.43	4.00	4.11	0.93	474.1	355.6	118.5	89.7	24.5	28.8	94.1	5.9	0.83	86.9
8	14.94	4.17	3.58	0.99	442.7	336.6	106.1	76.5	25.2	29.6	92.4	7.6	1.10	88.6
9	15.64	3.68	4.25	0.93	448.9	326.9	122.	93.3	24.4	28.7	91.8	8.2	0.32	85.0
10	14.62	3.07	4.76	0.99	449.8	303.3	146.5	115.7	26.2	30.8	91.9	8.1	0.31	90.6
11	14.43	3.03	4.76	0.91	365.8	245.1	120.7	95.4	21.5	25.3	93.8	6.2	0.48	92.9
12	14.48	3.25	4.46	0.91	409.8	283.7	126.1	97.8	24.1	28.3	97.1	2.9	0.45	89.5
13	14.51	3.42	4.24	0.94	409.6	289.8	119.8	91.6	24.0	28.2	97.0	3.0	0.32	93.0
14	16.19	3.85	4.21	0.86	432.8	320.4	112.4	85.7	22.7	26.7	91.7	8.3	0.66	89.8

JERSEY BUTTER RECORD--MONTHLY AVERAGES OF BARBARA ALLEN.

Month of lactation.	Date.	Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
		Average temperature during setting.	Average temperature during churning.	Time of churning. hrs.	Time of churning. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number of fat globules	Relative size of fat globules.
2	Sept. '90	47°	61°	1	7	18.91	4 91	0.51	4.40	0 11	4.14	4.87	—	—
3	Oct. "	49°	62°		47	20.90	5.16	0.29	4.87	0.10	4.52	5.31	42	1216
4	Nov. "	48°	61°		40	21.08	5.33	0.18	5.15	0 04	4.48	5.27	123	984
5	Dec. "	41°	63°		35	18.43	5.55	0.24	5.31	0.02	5.17	6.08	61	1256
6	Jan. '91	39°	63°		27	14.42	5 70	0 31	5.39	0.05	5.18	6.09	49	1127
7	Feb. "	38°	65°		33	17 63	5.48	0.38	5.10	0.04	7.03	5.91	54	1011
8	Mar. "	37°	65°		51	16.25	5.38	0.17	5 21	0 02	5 13	6 03	85	603
9	Apr. "	43°	61°		58	23.85	5.46	0 25	5.21	0.02	5.08	5.98	80	728
10	May "	44°	64°		47	19.53	5.33	0.46	4.87	0 02	4.74	5.57	103	542

JERSEY BUTTER RECORD—MONTHLY AVERAGES OF BARBARA ALLEN (*concluded*).

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per day.	Pounds of whole milk.	Pounds of skim-milk.	Pounds of cream,	Pounds of butter-milk	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent of fat lost in butter-milk.	Per cent. of fat recovered in butter.
2	20.67	4 37	4.73	0.84	519	400	119	93.9	21.3	25.1	89.7	10.3	2.25	84.5
3	18.96	4 13	4.59	0.85	501.7	380.2	121.5	95 0	22 5	26.5	94 3	5.7	2.00	87.5
4	19 05	4.09	4 66	0.87	494.2	373.2	121	95 1	22	25.9	96.6	3.4	0.76	84.0
5	16 49	3.45	4 79	0.88	450.6	319.6	131	103.7	23.2	27.3	95 7	4.3	0.36	93.3
6	16.41	2.67	6.15	0.98	495.2	309 8	185.4	155.2	25.7	30.2	94.6	5 4	0.87	91.0
7	16.94	3.43	4 94	0.86	409.9	290.4	119.5	95.3	20 6	24 2	93 0	7.0	0.36	91.6
8	16 63	3.13	5.31	0.85	437.4	298.0	139.4	113 1	22.4	26 3	96 8	3.2	0.37	95.2
9	16.74	4.60	3 64	0.83	418.1	327.2	90 9	66.0	21.2	24.9	96.5	4.5	0.27	93.1
10	17.98	4 00	4.49	0.76	421.7	316 3	105.4	81.9	20.0	23.5	91.4	8.6	0.37	88.8

JERSEY BUTTER RECORD—MONTHLY AVERAGES OF GILDERBLOOM.

Month of lactation.	Date.	Creaming and churning.				From one hundred pounds of milk.						Microscopic data.	
		Average temperature during setting.	Average temperature during churning.	Time of churning. hrs. min.	Per cent. of fat in cream.	Pounds of fat in milk.	Pounds of fat in skim-milk.	Pounds of fat in cream.	Pounds of fat in butter-milk.	Pounds of fat in butter.	Pounds of butter containing 85 per cent. butter fat.	Relative number of fat globules.	Relative size of fat globules.
1	Sept. '90	46°	61°	33	24.17	6.10	0.44	5.66	0.15	5.23	6.15	49	1104
2	Oct "	48°	61°	25	21.21	5.62	0.28	5.34	0.08	4.99	5.87	53	1098
3	Nov. "	48°	62°	28	21.49	5.19	0.20	4.99	0.06	4.60	5.41	48	1239
4	Dec. "	42°	59°	1 5	21.96	6.16	0.31	5.85	0.04	5.74	6.75	48	1209
5	Jan. '91	44°	61°	53	17.77	5.47	0.30	5.17	0.02	5.11	6.01	48	1208
6	Feb. "	38°	62°	52	14.85	5.37	0.29	5.08	0.09	4.97	5.84	82	687
7	Mar. "	38°	65°	1 47	18.90	5.68	0.19	5.49	0.02	5.34	6.28	81	766
8	Apr. "	44°	64°	37	21.60	5.61	0.20	5.41	0.02	5.37	6.32	70	834
9	May "	45°	65°	30	18.39	5.63	0.38	5.25	0.02	4.98	5.85	88	637

JERSEY BUTTER RECORD—MONTHLY AVERAGES OF GILDERBLOOM (*concluded*).

Month of lactation.	Yield of butter.				Monthly yield of dairy products.						Percentages of fat recovered and lost.			
	Pounds of milk to one pound of butter.	Pounds of milk to one pound of cream.	Pounds of cream to one pound of butter.	Pounds of butter per per day.	Pounds of whole milk.	Pounds of skim milk.	Pounds of cream.	Pounds of butter-milk.	Pounds of fat in butter.	Pounds of butter.	Per cent. of fat recovered in cream.	Per cent. of fat lost in skim-milk.	Per cent. of fat lost in butter-milk.	Per cent. of fat recovered in butter.
1*	16 3	4.19	3.89	0.99	341.1	259 7	81.4	60.5	17 8	20 9*	92.7	7.3	2.5	85.7
2	17.1	3 96	4 32	1.01	535 6	400.4	135.2	103.9	26.6	31 3	95	5 0	1 4	88.9
3	18.5	4 31	4.29	0 85	473 8	363 9	109 9	84.3	21.8	25 6	95.9	4.1	1.1	88.8
4	14.8	3.76	3.93	0 89	410.7	301.4	109.3	79.6	23 5	27.7	94.9	5.1	0.65	93.2
5	16 7	3 42	4 88	0 83	428.4	303.1	125 3	99 8	21.7	25.5	94 4	5.6	0.36	93.3
6	17.2	2.98	5.77	0.72	343 2	225.7	117.5	97.5	17.0	20.0	94 5	5.5	1 6	92 4
7	16.0	3.45	4.90	0 73	342	242.9	99 1	78.9	17.2	20.2	96.7	3.3	0.35	94.4
8	15 8	4 00	3 95	0.65	307 1	230.3	86.8	57.4	16.5	19.4	96.5	2.5	0.36	95.8
9	17.1	3 50	4.88	0.67	356.8	254.8	10.2	81.1	27 8	20.9	93.2	6.8	0.35	88.4

*First month of lactation contains 21 days.