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Variations in Cream and Milk Tests

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South Dakota Agricultural College

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DAIRY DEPARTMENT.

VARIATIONS IN CREAM AND MILK TESTS

BY A. H. WHEATON.

BROOKINGS, SOUTH DAKOTA.

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VARIATIONS OF CREAM AND MILK BY BABCOCK AND LACTOMETER TESTS.

A. H. WHEATON.

Much trouble and annoyance have been experienced by both buttermakers and creamery patrons on account of the variation of different individual tests of milk for butter fat, and the variation of milk from the same herd at different times, the test going up and down, sometimes with no apparent cause. These variations have sometimes caused the patrons of a creamery to suspect that the buttermaker was engaged in manipulating the test in a discriminating way to further his own ends, while on the other hand the buttermaker may have had strong suspicions that the patron whose test varied greatly might be guilty of adding water or cream, or both, to his milk at one time, and at another taking cream from the milk and retaining it at home. All of these surmises may and may not have been true, as the following results will show. The fact that the same herd of dairy cows will show a variation in richness of milk, both as to butter fat and other solids, under varying conditions, has been often demonstrated by scientific, as well as some practical dairymen, but is as yet very imperfectly understood by the average dairy farmer, and by many buttermakers is looked upon as a condition easily avoided.

For the purpose of aiding all who are seeking knowledge along these lines, this department bas undertaken the task of ascertaining as nearly as possible the actual conditions and results as they appear daily and weekly at some of our near by creameries, and presenting them in the tables of this bulletin.

CAUSES OF VARIATION OF MILK TESTS.

The causes are many and varied, but a few of which can be profitably and definitely stated here. Dairying is a comparatively new industry in this locality, attended with all the disadvantages incident to a radical change from the raising of wheat and other cereal crops to a system of diversified farming. The stables and pastures as a rule are poor; the cows are those which happened to be on the farm or in the immediate vicinity when the change was first contemplated; or those purchased with no definite understanding as to what a dairy herd should consist of, or as to what the preparation for their care and management should be. The result seems to be that most newly converted dairy farmers rapidly acquire the idea that every cow is a dairy cow from which he should receive the same results as those he reads about in the dairy and farm journals.

The quality and quantity of milk which a cow will produce are first most dependent on the cow herself; her breeding, training, selection, in fact her individuality controls largely both the quality and quantity. If she as an individual is a typical dairy cow (no matter what breed), then the rest of the story remains to be told or explained by the owner and not by the cow.

A cow gives her poorest milk when she becomes fresh for the first time, and if properly cared for her milk will increase both in quality and quantity every succeeding period of lactation until she reaches her limit, or until she begins to decline on account of old age. A sudden change from very poor to very good pasturage will often cause, for the first few days, a feverish condition and an abnormal condition of the milk which may be a shrinkage of both milk and butter fat contents at the same time. Any sudden change from normal to abnormal conditions affects the amount and quality of the butter fat more than it does any or all the other solids in milk. A sudden chill, exposure to excessive heat without shade; no water one day and an abundance the next; milking at 4 o'clock in the morning and 9 o'clock at night one day, the

reverse the next; no salt for a week, then a bucket full at once; all these extremes, seemingly exaggerated, are conditions which, I have observed, do exist, and methods which are practiced, more or less, on nearly all newly established dairy farms with many additions which might be truthfully enumerated in regard to care and feeding, or the lack of it, in winter especially.

For the purpose of showing some of the variations which appear in milk as received at the creameries in practical every day work, some of the creameries were visited, the milk taken from the spout as it was dumped from the weigh can, the temperature, Lactometer reading and butter fat contents noted and recorded as in Table 1. A Quevenne Lactometer was used and the reading corrected to 60 degrees temperature:

Table No. 1 was made up from milk taken at a creamery in the extreme northern part of the state:

No. Sample	Temperature Taken	Lactometer Reading	Corrected Lactometer Reading at 60°	Butter fat, Babcock test	Solids, not fat	Total Solids	Price per 100 lbs. at 15c per lb. of butter fat
1	80	1.30	1.32●	3.90	9.15	13.05	58c
2	76	1.31	1.326	3.80	9.29	13.09	57c
3	74	1.30	1.314	3.80	8.97	12.77	57c
4	76	1.31	1.326	3.90	9.31	13.21	58c
5	78	1.30	1.318	3.30	8.97	12.27	49c
6	70	1.32	1.334	4.00	9.53	13.53	60c
7	74	1.31	1.324	3.60	9.26	12.86	54c
8	76	1.32	1.336	3.60	9.51	13.11	54c
9	78	1.29	1.308	4.20	8.9●	13.10	63c
10	76	1.3●	1.316	3.60	8.98	12.58	54c
11	78	1.30	1.318	4.00	9.12	13.12	60c
12	76	1.31	1.326	4.20	9.33	13.53	63c
13	76	1.31	1.326	4.00	9.33	13.33	60c
14	72	1.32	1.332	3.80	9.44	13.13	57c
15	74	1.31	1.324	3.40	9.14	12.54	51c
16	72	1.32	1.332	4.00	9.48	13.48	60c
17	72	1.31	1.322	3.80	9.18	12.98	57c
18	78	1.30	1.318	3.90	9.10	13.00	58c
19	76	1.31	1.326	4.00	9.33	13.33	60c
20	70	1.31	1.320	3.80	9.13	12.93	57c
21	74	1.30	1.314	3.80	8.97	12.77	57c
Av...	.....	.....	1.323	3.84	9.21	13.03	50.25

It will be seen that the average corrected Lactometer reading is 1.323, showing about average normal conditions so far as specific gravity is concerned, but if we assume that 1.033 is normal Lactometer reading for milk, then we have 17 samples which read below and 4 above, with 8 samples reading between 32.5 and 33.5. The butter fat ranges from 4.20 to 3.30, and yet the average (3.84) cannot be considered very low for this time of year (June). Solids, not fat, and average total solids seem to be about normal, yet there are wide variations in individual samples.

From this same creamery composite samples were taken, covering a period of two weeks, viz: A sample of each patron's milk was *taken* every morning, of nights' and mornings' milk (being thoroughly mixed); these samples were preserved in a milk jar by the use of corrosive sublimate tablets, as is customary in regular creamery practice, and tested with a Babcock steam turbine tester, running 900 revolutions per minute. In every case the butter fat column appeared very clear, proving the test to be as nearly correct as possible. Table No. 2 shows the result:

Number	Butter fat	Price of milk per 100 lbs. Fat 15c per lb.	Number	Butter fat	Price of milk per 100 lbs. Fat 15c per lb.	Number	Butter fat	Price of milk per 100 lbs. Fat 15c per lb.	Number	Butter fat	Price of milk per 100 lbs. Fat 15c per lb.
.....	.....	.....	20	3.4	51c	39	3.8	57c	58	3.4	51c
2	4.0	60c	21	3.8	56	40	4.4*	66 *	59	4.0	60
3	3.5	52	22	3.7	55	41	4.0	60	60	4.5*	67 *
4	4.4*	66 *	23	5.0*	75 *	42	4.6*	69 *	61	3.8	57
5	3.8	56	24	3.0	45	43	3.7	55	62	5.4*	81 *
6	3.8	56	25	3.8	56	44	4.3	64	63	3.3	49
7	3.8	56	26	4.0	60	45	3.8	57	64	5.0*	75 *
8	3.6	53	27	3.7	54	46	3.2	48	65	3.6	54
9	3.8	56	28	5.0*	75 *	47	3.8	57	66	3.7	55
10	3.8	56	29	3.6	53	48	3.2	48	67	3.4	51
11	3.7	54	30	3.9	58	49	3.3	49	68	4.0	60
12	3.2	48	31	5.2*	78 *	50	3.5	52	69	3.5	52
13	3.4	51	32	4.0	60	51	.....	.....	70	4.8*	72 *
14	4.0	60	33	3.3	49	52	3.8	57	71	4.0	60
15	3.7	55	34	3.8	57	53	4.0	60	72	3.3	49
16	3.6	53	35	3.6	54	54	3.8	57	73	4.2	63
17	3.4	51	36	4.0	60	55	4.0	60			
18	3.7	55	37	3.8	57	56	4.0	60			
19	3.2	48	38	3.6	54	57	3.7	55	Av	3.80	57 46

*—It was ascertained that cream was added to the milk before delivery to the creamery.

The cows were all on native prairie grass with no other feed, as no other feed is to be had in the section where these tests were made, viz., near the Missouri river. This region was suffering at the same time from a slight drought which accounts for the average butter fat per cent being higher, but the variations seem to have about the same range as in other sections farther east in the state, and where dairying is more generally carried on. Table No. 3 shows tests taken from the weigh can spout in a creamery near the east line of the state on two different days, together with two weeks composite sample from the same patrons. In this case the cows are more varied as to breed, while some probably had tame grass and others native prairie grass.

Table No. 3.

Number	Temperature	Lactometer Reading	Corrected to 60° temperature	Per ct of butter fat	Price of 100 lbs. milk butter fat at 15c per lb.	Number	Temperature	Lactometer Reading	Corrected to 60° temperature	Per cent. of fat	Price of milk	Number	Per cent of fat in composite sample kept 2 w'ks	Price of milk
1	63	33	33.3	3.4	51	1	62	32	32.2	4 •	60	1	3.6	54
2	60	31	31	3.6	54	2	64	31	31.4	3.5	52	2	3.6	54
3	60	31	31	3.8	57	3	65	31	31.5	3.6	54	3	3.6	54
4	60	32	32	3.6	54	4	62	32	32.2	3.6	54	4	3.6	54
5	52	29	28.2	4.0*	60	5	62	32	32.2	3.8*	57	5	3.4	51
6	68	30	31.8	—†	.....	6	66	31	31.6	4.6†	69	6	.....	.....
7	60	33	33	3.2	48	7	66	31	31.6	3.8	57	7	3.6	54
8	60	32	32	3.8	57	8	66	32	32.6	3.8	57	8	3.6	54
9	62	33	33.2	3.8	57	9	70	31	32.	4.0	60	9	3.6	54
10	80	29	31	3.8	57	10	72	30	31.2	4.2	63	10	3.6	54
11	70	31	32	3.8	57	11	70	31	32.	3.6	54	11	3.6	54
12	68	31	31.8	3.8	57	12	70	31	32.	3.8	57	12	3.7	55
13	58	32	31.8	3.7	55	13	64	31	31.4	3.6	54	13	3.4	51
14	58	33	32.8	3.7	55	14	62	31	31.2	3.6	54	14	3.6	54
15	54	34	33 4	2.8	57	15	60	32	32.	3.5	52	15	3.2	48
16	54	33	32.4	3 3	49	16	62	32	32.2	3.6	54	16	3.6	54
Av.	61.6	31.68	31.92	3.38	51.50	Av.	65	31.31	31.83	3.787	56.75	Av.	3.33	49.93

*—Night's milk. †—Morning's milk.

Table No. 4 is composite samples of milk at a creamery in the central part of Eastern South Dakota, situated about equal distances from the Missouri river and the eastern line of the state. This creamery had three skim stations. Tests from which appear in Tables 5, 6, and 7.

Table No. 4.

The left hand figures in test column represents first half of month and right hand figures last half of month.

No.	Test		No.	Test		No.	Test		No.	Test		No.	Test		No.	Test		No.	Test	
1	3.8	3.8	30	3.8	4.0	59	3.8	4.0	88	4.0	3.8	117	3.8	3.8	146	3.8	3.8	175	3.8	3.8
2	4.0	3.8	31	4.0	4.0	60	4.4	4.2	89	4.0	4.0	118	3.6	3.6	147	4.0	3.8	176	3.8	*
3	3.8	3.8	32	4.0	*	61	3.8	3.8	90	3.8	3.6	119	3.8	3.8	148	3.8	3.8	177	3.8	3.8
4	3.8	4.2	33	3.8	3.8	62	4.2	4.0	91	3.8	3.8	120	4.2	4.0	149	3.8	3.8	178	3.8	3.8
5	3.8	3.8	34	3.8	3.8	63	3.8	3.8	92	3.8	3.8	121	3.8	4.0	150	4.0	3.8	179	3.8	3.8
6	3.8	4.0	35	4.0	4.0	64	4.0	4.0	93	3.8	4.2	122	3.8	3.8	151	3.8	3.6	180	3.8	4.0
7	3.8	4.0	36	3.8	4.0	65	3.6	3.8	94	3.8	3.8	123	3.8	3.8	152	4.0	4.0	181	3.8	3.8
8	3.8	4.0	37	4.0	3.8	66	3.8	3.8	95	3.6	3.8	124	4.0	4.0	153	3.8	4.0	182	3.8	3.8
9	3.8	3.8	38	3.8	3.8	67	4.0	3.8	96	3.8	*	125	4.0	4.0	154	3.8	3.8	183	3.8	3.8
10	4.0	4.0	39	3.8	3.8	68	3.8	3.8	97	3.6	3.8	126	3.8	3.8	155	3.8	3.8	184	4.2	4.2
11	3.8	3.8	40	3.8	4.2	69	3.8	4.0	98	3.8	3.8	127	3.8	3.8	156	3.6	3.8	185	3.8	4.0
12	3.8	3.8	41	3.8	3.8	70	4.0	*	99	3.8	3.8	128	4.0	3.8	157	3.6	3.8	186	3 8	3.8
13	3.8	3.8	42	4.2	4 2	71	3.8	4 0	100	3.8	4.0	129	4.0	3.8	158	3.8	4.0	187	3.8	4.0
14	3.8	3.8	43	3.8	3.8	72	3.8	3.8	101	2.8	2.8	130	3.8	3.8	159	4.0	3.8	188	4.0	3.8
15	3.8	3.8	44	4.0	4.0	73	3.8	3.8	102	4.0	3.8	131	4.0	3.8	160	3.8	3.8	189	4.0	3.8
16	3.8	3.8	45	3.8	3.8	74	4.0	3.8	103	3.8	3.8	132	3.8	4.0	161	3.8	3.8	190	4.4	4.2
17	4.0	4.0	46	3.6	3.8	75	3.8	3.8	104	3.8	3.8	133	3.8	3.8	162	3.8	4.0	191	3.8	3.8
18	3.8	3.8	47	3.8	3.8	76	3.8	4.0	105	3.8	3.6	134	4.0	3.8	163	3.8	3.8	192	4.0	3.8
19	3.8	3.8	48	3.8	3.8	77	3.8	3.8	106	4.0	3.8	135	3.8	3.8	164	3.8	3.8	193	4.0	4.0
20	3.8	3.8	49	3.6	3.8	78	3.8	3.8	107	3.8	3.8	136	4.4	3.8	165	3.8	3.8	194	3.8	4.2
21	3.8	4.0	50	3.8	4.0	79	*	*	108	3.8	3.8	137	3.8	*	166	3.8	3.8	195	3.8	3.8
22	4.0	4.2	51	4.0	3.8	80	4.0	4.0	109	3.8	3.8	138	3.8	4.4	167	3.8	3.8	196	3.8	3.8
23	3.8	3.8	52	4.2	4.0	81	4.2	4.0	110	3.8	3.8	139	4.0	3.8	168	3.8	3.8	197	4.0	3.8
24	3.8	3.8	53	4.0	4.2	82	3.8	4.0	111	3.8	4.0	140	3.8	3.8	169	3.8	4.0	198	3.8	4.0
25	3.8	3.8	54	3.8	4.0	83	3.6	3.8	112	3.8	3.8	141	3.8	3.8	170	4.6	3.8	199	3.8	3.8
26	4.0	3.8	55	3.6	3.8	84	3.8	*	113	3.8	3.8	142	3.8	3.8	171	4.2	4.4	200	4.0	4.0
27	3.8	3.8	56	3.8	3.8	85	4.0	3.8	114	3.8	3.8	143	3.8	3.8	172	4.0	4.0	201	*	3.8
28	3.8	3.8	57	3.8	4.4	86	3.8	4.0	115	3.8	3.8	144	3.8	3.8	173	3.8	4.0	202	*	4.0
29	3.8	4.0	58	4.0	3.8	87	3.8	3.8	116	3.8	3.8	145	5.4	5.2	174	4.0	3.8	....	....	....

*—No test made.

Table No. 5.

Skim Station No. 1. Figures arranged same as in Table 4.

No.	Test		No.	Test		No.	Test		No.	Test	
1	4.0	3.8	22	3.8	4.0	43	4.0	4.2	64	*	3.8
2	3.8	3.8	23	3.8	3.8	44	4.2	4.4	65	3.6	3.6
3	3.8	4 0	24	4.0	4.0	45	3.8	3.8	66	3.8	4.0
4	3.8	3.8	25	3.8	4.0	46	3.8	3.8	67	3.8	3.8
5	3.8	3.6	26	4.0	3.8	47	4.0	3.8	68	4.2	4.4
6	3.8	3.8	27	3.8	3.8	48	4.0	3.8	69	4.2	*
7	3.8	3.8	28	3.8	3.8	49	4.0	4.2	70	*	3.8
8	4.0	4 0	29	4.0	3.8	50	3.8	3.8	71	4.0	3.8
9	3.8	3.8	30	3.8	3.8	51	3.8	3.8	72	3.8	3.8
10	3.8	3.8	31	3.6	3.6	52	3.8	3.8	73	4.0	3.8
11	4 0	4.0	32	3.8	3.8	53	3 8	3.8	74	3.8	3.8
12	3.8	3.8	33	3.8	3.8	54	3.8	3.8	75	3.8	3.8
13	3.8	3.6	34	3.6	3.8	55	3.6	3.8	76	3.8	4.0
14	4.2	4.0	35	3.6	3 8	56	3.8	3.8	77	3.8	3.8
15	4.0	3.8	36	3.8	3.8	57	4.0	4.2	78	3.8	3.8
16	3.8	3 8	37	3 8	3.8	58	3.8	4.0	79	3.8	3.6
17	3.8	3.8	38	3.8	3.8	59	3.8	4.0	80	3.8	4.0
18	3.8	3.8	39	3.8	4.0	60	4.0	4.2	81	3.8	3.8
19	4 0	3.8	40	3.6	3.8	61	3.8	3.8	82	3.8	3.8
20	3.6	3.8	41	3.6	3.8	62	4.0	3.8	83	3.8	3.8
21	3.8	3 8	42	3.8	4.0	63	3.8	3.8	84	.....	.....

*—No test made.

Table No. 6.

Skim Station No. 2. Figures arranged same as in Tables 4 and 5.

No.	Test		No.	Test		No.	Test		No.	Test	
1	3.8	3.8	22	3.8	3.8	43	3.8	3.8	64	4.0	4.0
2	3.8	3.8	23	3.8	4.0	44	3.8	3.8	65	3.8	*
3	3.8	3.6	24	3.8	3.8	45	*	4.0	66	3.8	3.8
4	4.0	4.0	25	3.8	3.8	46	3.6	3.8	67	4.0	4.0
5	3.8	3.8	26	4.0	*	47	4.0	3.8	68	*	*
6	4.0	3.8	27	3.8	4.0	48	3.8	4.0	69	*	*
7	3.8	4.0	28	3.8	3.8	49	3.8	3.8	70	*	*
8	3.8	3.8	29	*	*	50	*	*	71	*	*
9	4.0	4.0	30	4.2	4.0	51	4.0	3.8	72	3.8	3.8
10	3.6	3.8	31	3.8	*	52	*	*	73	3.8	3.6
11	3.8	4.0	32	*	*	53	4.0	3.8	74	3.8	3.8
12	3.8	3.8	33	*	*	54	*	*	75	*	*
13	3.8	3.8	34	*	*	55	*	*	76	*	*
14	3.6	3.6	35	3.8	4.0	56	3.8	*	77	3.8	3.8
15	3.8	3.8	36	4.0	3.8	57	4.0	*	78	*	*
16	3.8	3.8	37	3.8	3.8	58	3.8	3.8	79	*	*
17	4.0	4.0	38	3.8	3.6	59	3.8	3.8	80	4.2	4.0
18	3.8	3.8	39	3.8	3.8	60	3.8	*	81	*	*
19	3.8	4.2	40	3.8	3.8	61	4.0	3.8	82	3.8	3.8
20	3.8	3.8	41	4.0	4.0	62	3.8	3.8	83	3.8	3.8
21	3.8	3.8	42	*	3.8	63	3.8	*	84	3.8	3.8

*—No test made.

Table No. 7.

Skim Station No. 3. Figures arranged same as in Tables 4, 5 and 6.

No.	Test		No.	Test		No.	Test		No.	Test	
1	3.8	3.8	17	3.8	3.8	33	3.8	3.8	49	3.8	3.8
2	3.8	4.0	18	4.0	4.0	34	3.8	3.8	50	3.8	3.8
3	3.8	3.8	19	3.8	3.8	35	3.8	3.8	51	4.0	4.0
4	4.0	4.0	20	3.8	3.8	36	3.8	3.8	52	3.8	3.8
5	4.0	3.8	21	3.8	3.8	37	*	3.6	53	3.8	3.8
6	3.8	4.0	22	3.8	3.6	38	3.8	3.8	54	3.8	3.8
7	3.8	3.8	23	3.8	3.8	39	3.8	3.8	55	3.8	3.8
8	3.8	3.8	24	3.8	3.8	40	3.8	3.8	56	3.8	3.8
9	4.0	3.8	25	4.0	3.8	41	3.8	4.2	57	3.8	4.0
10	3.6	3.8	26	3.8	3.6	42	3.8	3.8	58	3.8	3.8
11	*	3.8	27	3.8	3.8	43	4.0	3.8	59	3.6	3.8
12	3.8	4.0	28	4.0	4.0	44	4.0	3.8	60	3.8	4.0
13	3.8	3.8	29	4.0	3.8	45	3.8	3.8	61	3.8	3.8
14	3.8	3.8	30	3.8	3.8	46	3.8	3.8	62	*	3.8
15	4.0	3.8	31	3.8	3.8	47	3.8	4.0	.....	.....	.....
16	3.8	3.8	32	3.8	3.8	48	4.0	4.0	.....	.....	.....

*—No test made.

Tables Nos. 1, 2 and 3 show greater variations than 4, 5, 6 and 7, which is probably due to the fact that the factories represented by 1, 2 and 3 are new plants just established, while those represented by tables Nos. 4, 5, 6 and 7, have been running several years, and the patrons have been well instructed in the care of cows, milk and utensils. There seems to be a disposition on the part of patrons of a new plant to experiment more or less in the different ways recom-

mended to them in the care and handling of milk, whereas in the older plants they settle down to well established rules, causing more uniformity in the quality of the milk.

DILUTION OF MILK WITH WATER TO FACILITATE THE RAISING OF CREAM.

The old saying that the American people love to be humbugged, and that the more expensive the humbug the more greedily the public take the bait, was never more aptly illustrated than in the sale of so great a number of so-called Hydraulic, or Cold Water Separators within the past three years. The fraud consists of a tin can about twenty inches in diameter and forty inches deep, with a cover and a tin spout with a funnel shaped top fastening to, and extending down one side of the can and under the bottom to the center, with an opening upwards into the can. It is claimed by the agents of these devices for raising cream that by diluting the milk with from 30 to 100 per cent. of water, and by pouring the water through this tin spout that all the cream can be forced to the top in from one to twelve hours. These cans are made after various patterns, all embodying the same principle, namely, "the raising of cream by diluting the milk with water." All claim a patent or "patent applied for," and sell them from $7.00 to $11.00 each. Believing that it is the province of the Experiment Station to expose fraud wherever found, and at the same time to enlighten the farmers as to the real merits or demerits of any (to them) new devices, I have to say that there is no advantage gained by the use of these (so-called) separators over the use of any ordinary tin can of nearly the same shape and by pouring the same quantity of water into the milk from the top. Bulletins No. 20—29, 1890, Cornell University, N. Y., and No. 151, 1898, I think will thoroughly bear out this statement, together with all the experiments conducted along these lines by many other experimenters. In the last named bulletin (which by-the-way is by one of the most eminent dairy experimenters,

Dr. H. H. Wing) we find that he compared the efficiency of the Wheeler's Gravity Cream Separator and Hunts' Improved Ventilated Cream Separators with the shallow pan, the Cooley can, and the centrifugal separator. Wheeler's separator left an average of .94 per cent of butter fat in the skimmed milk; Hunt's left an average of 1.01; the Cooley can 1.01. I have not space to reprint the tables showing the complete results obtained, but will quote what Mr. Wing has to say in conclusion of the very exhaustive trials covering varied conditions from fresh cows over the whole period down to the drying up of the college herd, together with conditions as found on the average farm.

In the summer of 1892, seventy farms were visited and the fat determined of the skimmed milk at each place. On forty of these farms shallow pans were used, and in thirty a deep setting system, in most cases the Cooley was in operation. The average results were as follows.

	Per cent. of fat in milk.		
	Lowest.	Highest.	Av.
Forty farms using shallow pans.....	.15	1.63	.39
Thirty farms using deep setting.....	.14	.60	.30

We are now able to judge of the efficiency of these gravity cans. It will be seen that in no case do they approach anywhere near the efficiency of the centrifugal separators, and in most cases the percentage of fat in the skimmed milk is decidedly more than would be called good creaming by either the shallow pan or deep setting process. In Table No. 1, where "strippers'" milk is used, they show an average efficiency about equal to the Cooley, but where the milk of fresher cows was used (Table 2) the Cooley gave distinctly better results. The tests made at the various farms show rather higher percentages of fat in skimmed milk than were obtained here and give a fair idea of the results likely to be obtained under ordinary farm conditions.

CONCLUSIONS.

Gravity or Dilution Separators are merely tin cans in which the separation of cream by gravity process is claimed to be aided by dilution with water. Under ordinary conditions the dilution is of no benefit. It may be of some use when the milk is all "stripper" cows', or when the temperature of melting ice cannot be secured.

These cans are not "separators" in the universally accepted sense of that term and cannot rank in efficiency with them. They are even less efficient than the best forms of deep setting systems, such as the Cooley Creamer. They are no more efficient than the old fashioned shallow pan, but perhaps require rather less labor, but spoil the skimmed milk for feeding. In all probability they would give better results if used without dilution and were immersed in as cold water as possible, preferably ice water.

Because of the fact that the fallacy of the claims of these people has been well established for many years, it was thought to be entirely unnecessary to waste valuable time and expense in recapitulating the many experiments already made on this subject.

TESTING CREAM.

A new source of annoyance to creamery men, has come up during the past three years, caused by the introduction of hand separators and the incomplete knowledge of testing cream by the Babcock tester. Every tester sent out is provided with the necessary milk test bottles, a 17.6 cc pipette, a 17.5 cc acid measure, and frequently some skim milk bottles showing graduated neck with .05 of one per cent marked on the butter fat tube. These appliances seem to be all sufficient for testing whole milk, skim milk, and buttermilk, but will not give accurate results when testing cream. Some manufacturers have tried to overcome the difficulty by making cream bottles with a graduated neck showing 30, 35 and 40 per cent butter fat and pipettes calibrated to hold 18, 20 and 22 cc of cream.

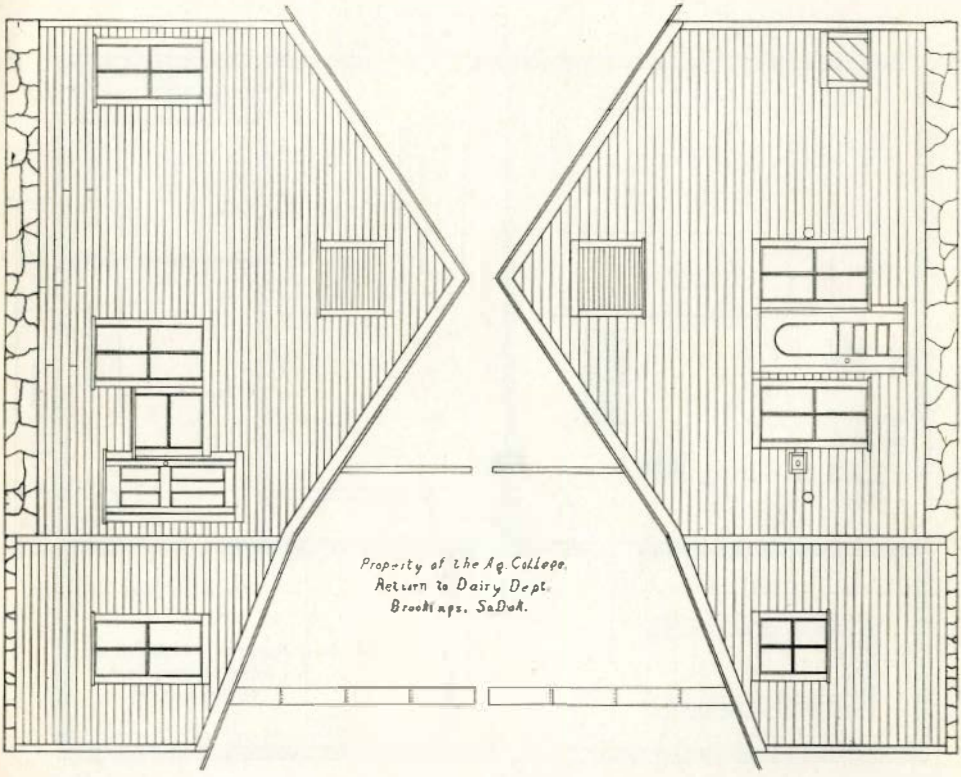
I recently examined a cream bottle for a dealer, by request, on the neck of which the graduations showed .50 more fat than was in the cream when measured by weight.

That is to say; when the actual reading was 20 per cent this bottle would show 30 per cent of butter fat. Investigations at this Station go to show that there can scarcely be any accurate cream tests made for butter fat content, where measurement alone of the cream for the test is depended on. The reasons are that cream being of a more viscous nature and thicker than the milk, (the consistency varying greatly) while the butter fat content also varies from 16 to 40 and sometimes 50 per cent, the number and size of the air bubbles incorporated in the mass vary accordingly. These air bubbles help to make bulk, but contain no fat. Therefore, it seems that the only way to get an accurate test of fat from cream is to weigh the cream into the test bottle, using 18 grams of cream and 17.5 cc of 1.82 or 1.83 specific gravity sulphuric acid for each test. Where the cream is found to be very rich, 9 grams of cream may be weighed into a test bottle and half the ordinary amount of acid used, multiplying the result by 2. This of course necessitates the purchase of a fine balance, and none of the kinds offered by the trade, so far as the writer has been able to discover,* seem to fully meet the requirements. They are either too high in price or the weights are not adapted to quick work which is necessary in creamery practice. A scale with a bar long enough or a weight heavy enough to balance the test bottle and that will weigh from *one-fourth* to *ten grams* each, and a scale which would not cost to exceed $5, would be a great help to the buttermakers in testing cream.

*—Since writing the above a scale has been produced which exactly meets the requirements. The scale is made by Henry Troemner, 710 Market street, Philadelphia, Pa.

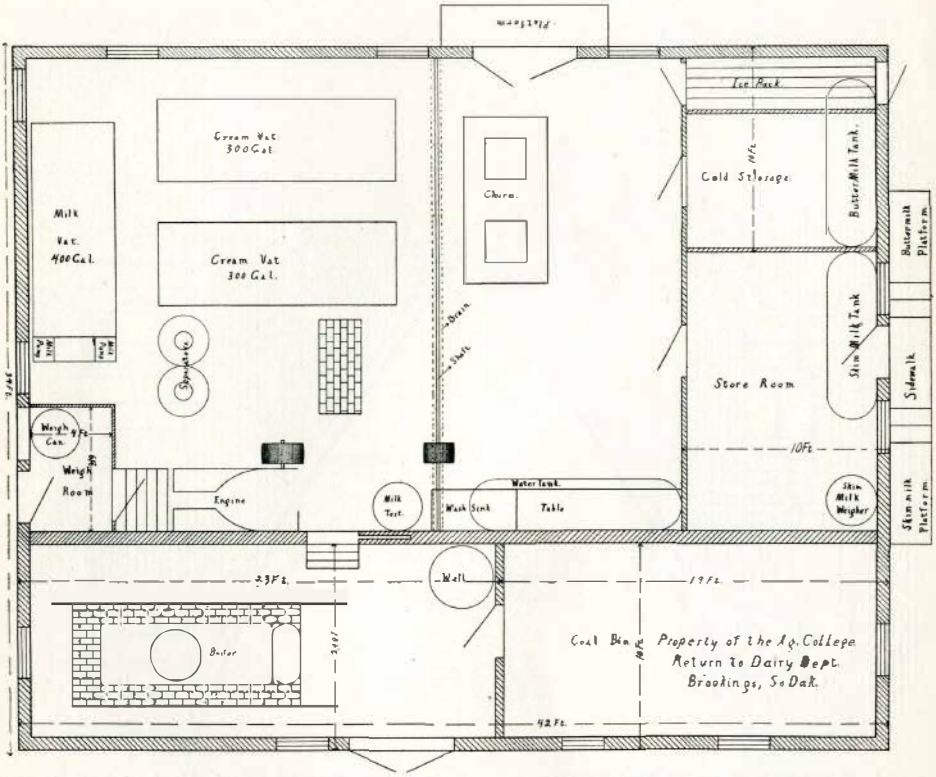
CREAMERIES.

This department is constantly receiving letters of inquiry in regard to the cost of creameries and cheese factories; how to organize co-operative companies; how to get started; where plans and specifications can be obtained for lumber, machinery, etc. To supply this demand, I have caused to be prepared by the Mechanical Department, under Prof. Solberg, some plans which are shown in the following cuts. Specifications for lumber bill has been prepared by Prof. Solberg and myself. Specifications for machinery, by-laws, incorporation papers and other information will be furnished free to those desiring to build creameries on application, provided they will safely preserve and return the same to this office after they have served the purpose intended.

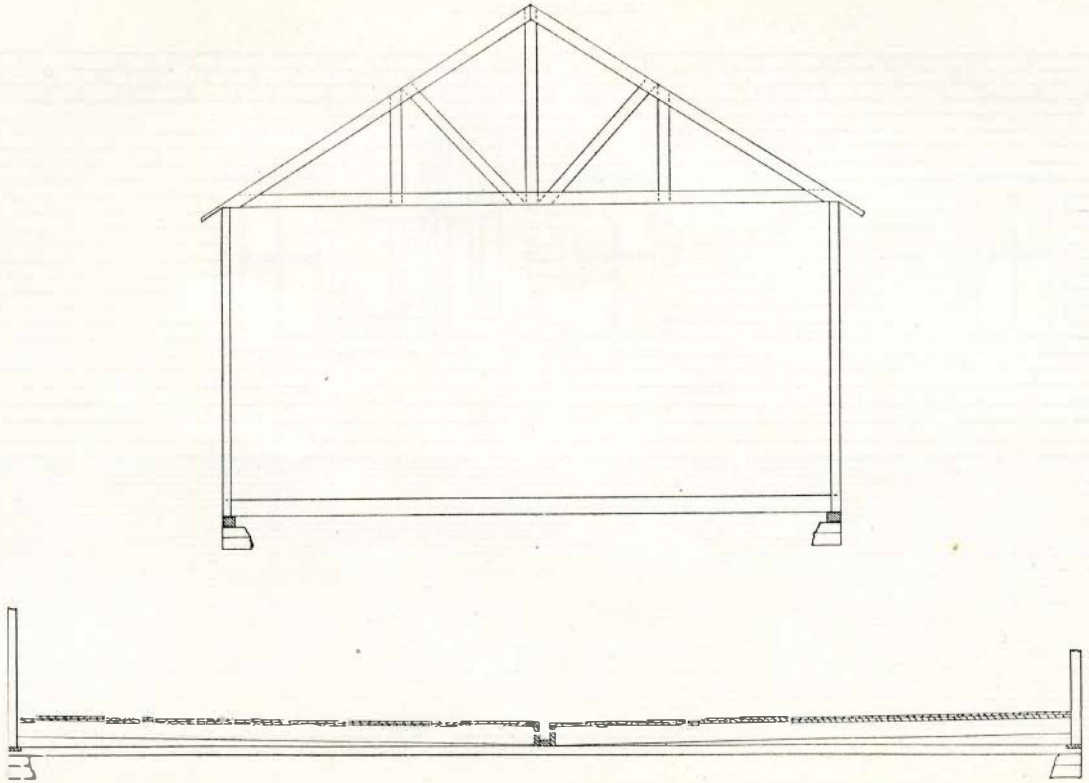


END VIEW WHERE MILK IS RECEIVED.

END VIEW WHERE SKIM MILK IS DELIVERED.

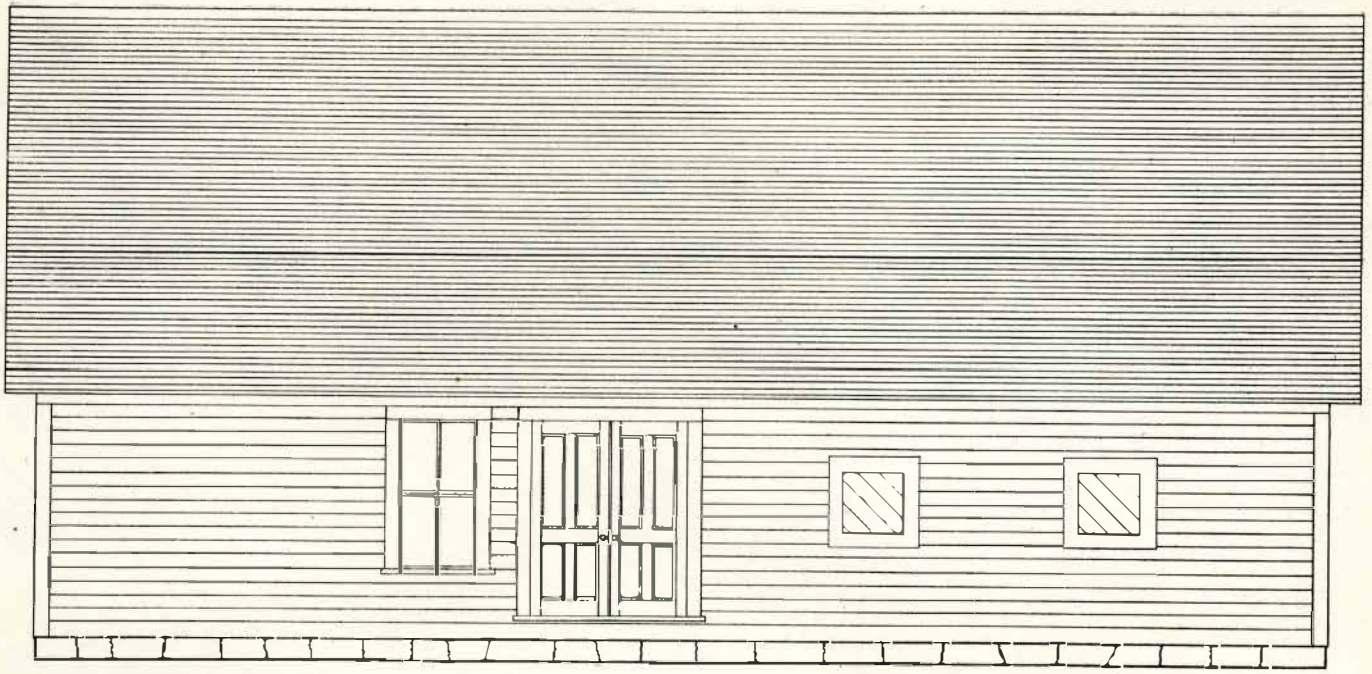

Platform
Ice Pack
Cream Vat
300 Gal.
Churn.
Cold Storage
Butter Milk Tank
Butter milk Platform
Milk
Vat.
400 Gal.
Cream Vat
300 Gal.
Steam
Shaft
Skim Milk Tank
Store Room
Sidewalk
Weigh Can
Weigh Room
Engine
Milk Test.
Water Tank.
Wash Sink
Table
10Ft
Skim Milk Weigher
Skim milk Platform
23Ft.
Well
19Ft.
Boiler
Coal Bin
Property of the Ag. College
Return to Dairy Dept.
Brookings, So Dak.
42Ft.

GROUND PLAN.



FRAME SHOWING RAFTERS, TRUSS SUB-STRUCTURE AND SLANT OF FLOORS.

FRONT SIDE VIEW.



REAR SIDE VIEW.