

A COMPARATIVE TEST OF CENTRIFUGAL CREAM SEPARATORS.

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OUTLINE.

A COMPARATIVE TEST OF CENTRIFUGAL CREAM SEPARATORS.

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A COMPARATIVE TEST OF CENTRIFUGAL CREAM SEPARATORS.

During the month of March, 1900, a series of tests were made of two centrifugal cream separators in use at the dairy school of the Kansas State Agricultural College.

The object of the tests was primarily, to determine the amount of power required to operate each separator. A secondary object was to make a more general comparison of the two machines, comparing the capacities, skim-milk tests, etc.

Each machine was installed by its manufacturer. Both separators were in good order, and care was taken to test both under as nearly the same conditions as possible. The power used was measured by a Flather hydraulic transmission dynamometer, which was carefully inspected and calibrated in the College Engineering Laboratory. The constant of the dynamometer was accurately computed, which constant, multiplied by the reading of the pressure-gauge, and by the number of revolutions per minute, gave the horse-power transmitted at the instant the readings were taken. The skim-milk tests were by the Babcock test, and were made by the dairy students in charge. Owing to the fact that the students were not thoroly familiar with the work, several of the skim-milk tests were lost, and some are incorrect.

The separators tested were:--

I. The United States Number 1 Belt, manufactured by the Vermont Farm Machine Company, Bellows Falls, Vermont. This separator is driven by a flat belt, and has a rated capacity of 2500 pounds of milk per hour at a rated speed of 8000 revolutions per minute.

II. The Alpha Number 1 Belt, manufactured by the De Laral Separator Company, Chicago, Illinois. The Alpha is driven by a round rope belt, and has a rated capacity of 3000 pounds of milk per hour at a rated speed of 5600 revolutions per minute.

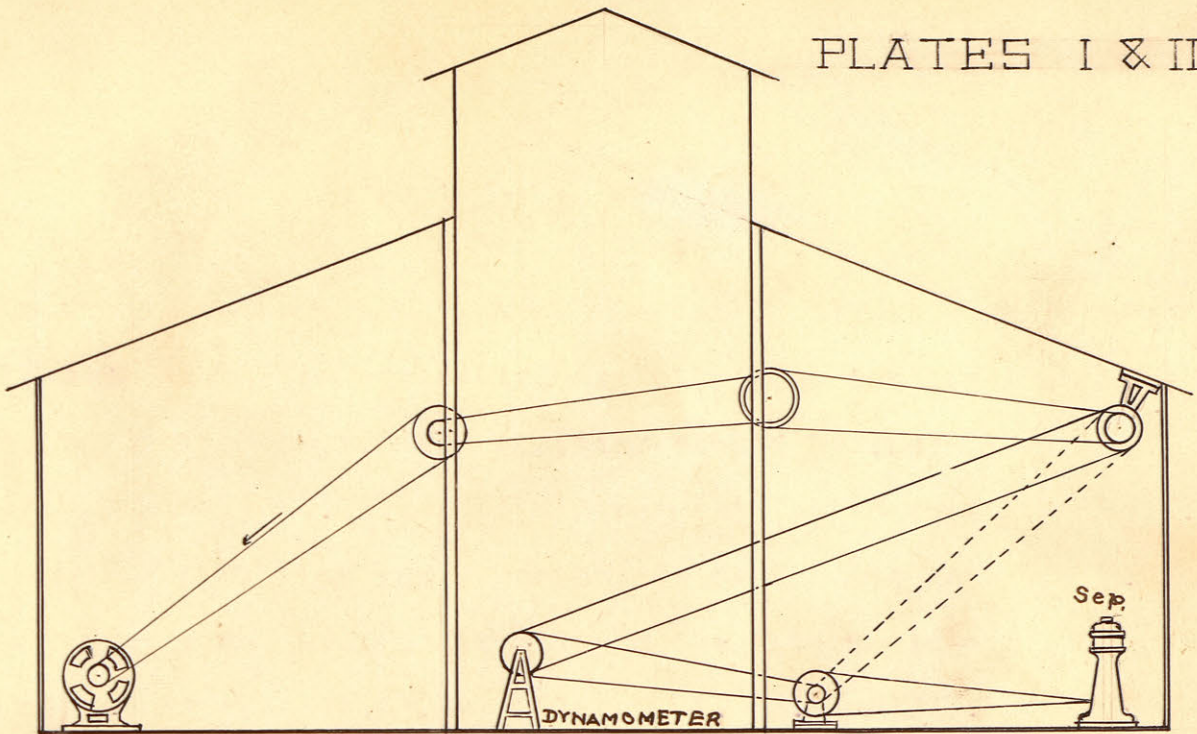
Six different tests were made of the United States Separator, and five were made of the Alpha.

The United States Separator as installed, required a counter-shaft between the line-shaft and the intermediate, while the intermediate of the Alpha as installed was belted directly from the line-shaft. Altho the power required to run the shafting should be included in making a test of a whole plant, the shafting was eliminated in these tests, since the object of the tests was a comparison of the two separators. Hence the dynamometer was belted directly to the intermediate of each separator.

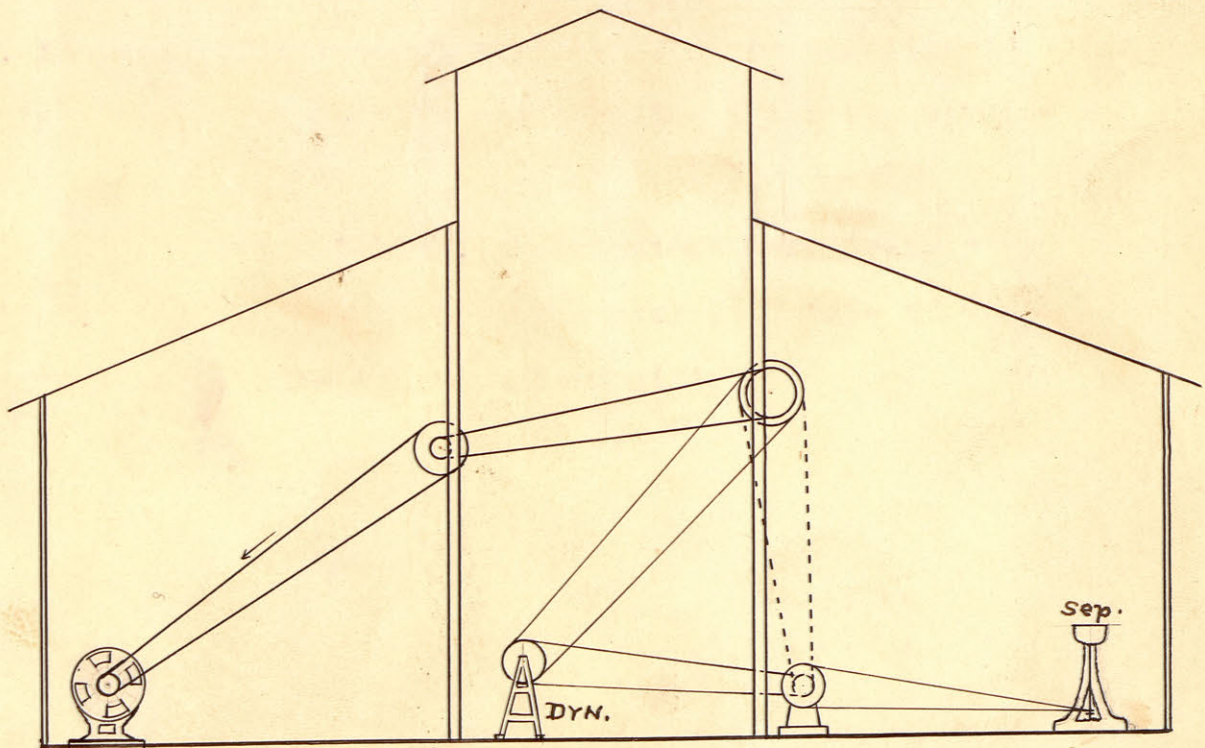
For manner of belting, see plates, I, II, and III.

Owing to the fact that the time required to bring the separators up to speed, could not be made the same in every run, it was necessary to express the power required in bringing the separators up to the required speed, in terms of horse-power minutes. This quantity is obtained by combining the power readings and the time interval according to Simpson's Rule.

In the following tables, the readings were taken every minute during the test. Oil was fed to the separator at a rate of 40 drops per minute, and 8 drops per minute to the intermediate.



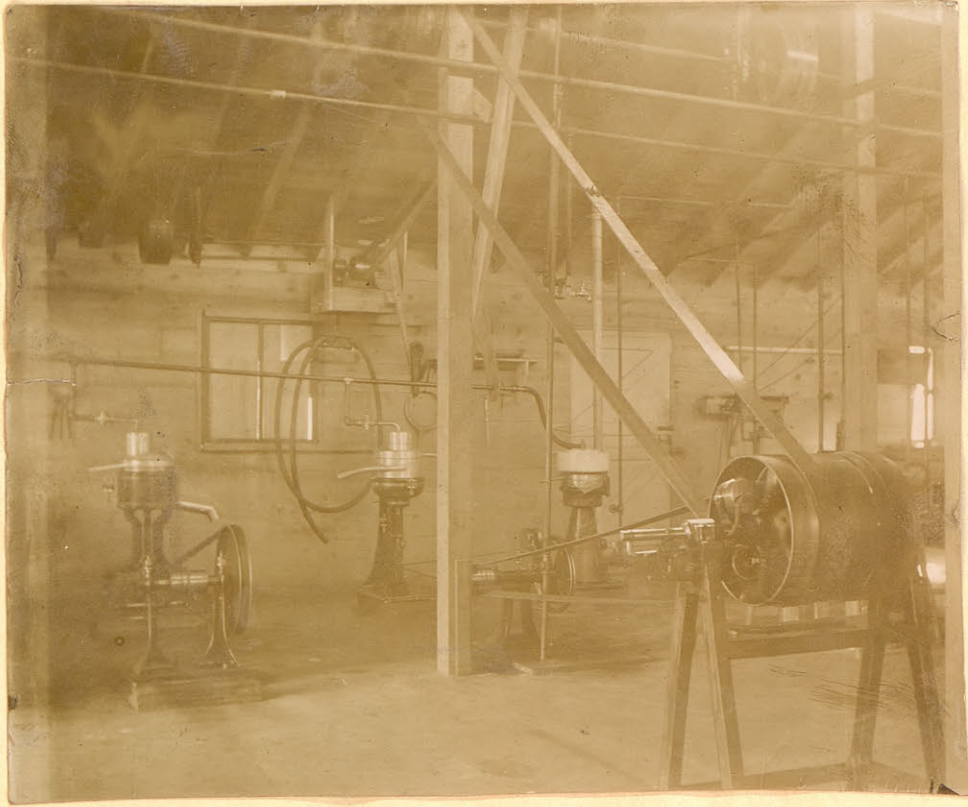
Manner of Belting United States Separator
During Tests.



Belting of Alpha Separator During Tests

Dotted Belts Shows Belting as Installed.

Plate 3.



U. S. SEPARATOR

TEST I.

Reading	Pressure	Revolutions	Rev. x Pres.	H. P.	Remarks.
1.	0#	380	0	0	
2.	6.75	360	2430	3.00	Separator started
3.	7.50	350	2625	3.241	
4.	9.50	330	3135	3.870	
5.	3.25	380	1235	1.525	
6.	3.75	370	1387.5	1.712	
7.	2.25	385	866.25	1.069	
8.	3.00	380	1140	1.407	
9.	2.75	380	1045	1.290	
10.	2.50	375	937.5	1.157	Sep. belt tightened
11.	2.75	378	1039.5	1.285	
12.	5.50	360	1980	2.444	Sep. belt tightened
13.	3.50	370	1295	1.599	
14.	3.25	375	1218.5	1.504	
15.	3.00	375	1125	1.389	
16.	3.00	380	1140	1.407	
17.	4.00	375	1500	1.852	Sep. belt tightened
18.	3.75	380	1425	1.759	Speed 8400
19.	3.75	385	1443.5	1.782	
20.	3.00	380	1140	1.407	
21.	4.00	380	1520	1.876	Milk started
22.	4.75	385	1828.5	2.257	
23.	4.25	385	1636.25	2.020	
24.	4.25	380	1615	1.994	
25.	5.25	385	2021.25	2.495	
26.	4.00	380	1520	1.876	
27.	4.50	380	1710	2.111	Speed 8200
28.	4.25	380	1615	1.994	
29.	4.25	380	1615	1.995	
30.	4.50	380	1710	2.111	
31.	4.50	380	1710	2.111	Milk stopped
32.	4.00	380	1520	1.876	
33.	3.75	380	1425	1.759	
34.	4.00	380	1520	1.876	
35.	4.25	380	1615	1.994	
36.	4.00	380	1520	1.876	
37.	3.50	385	1347.5	1.663	
38.	3.25	390	1267.5	1.565	

Horse-power minutes required in starting---36.

U. S. SEPARATOR.

4.

TEST II.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	400	0	0	
2.	10.	390	3900	2.4075	Sep. started.
3.	15.	380	5700	3.5180	
4.	14.	385	5390	3.3270	
5.	13.25	380	5700	3.5180	
6.	15.	380	5700	3.5180	
7.	14.	380	5320	3.2840	
8.	17.	370	6290	3.8830	
9.	16.	375	6000	3.7030	
10.	11.75	360	4230	2.6110	
11.	9.50	380	3610	2.2280	
12.	10.	385	3850	2.3765	Milk started.
13.	10.50	385	4042	2.4950	
14.	9.75	370	3607.5	2.2270	
15.	10.25	375	3843.	2.3730	
16.	10.50	375	4042	2.4950	Speed 8200
17.	14.	360	5040	3.1110	Sep.belt tightened
18.	12.50	375	4687.8	2.8940	
19.	11.50	375	4312.3	2.6620	
20.	11.50	375	4312.3	2.6620	
21.	11.	380	4180	2.5800	
22.	11.25	380	4275	2.6390	
23.	9.00	385	3465	2.1390	
24.	9.00	385	3465	2.139	Speed 8000
25.	9.50	385	3657	2.2575	
26.	9.00	380	3420	2.111	
27.	9.00	380	3420	2.111	
28.	9.00	380	3420	2.111	
29.	8.75	370	3237.5	1.9985	
30.	14.00	370	5180	3.1980	Sep.belt tightened
31.	11.50	365	4197	2.691	
32.	10.75	370	3977	2.455	
33.	10.75	370	3977	2.455	
34.	10.50	390	4095	2.528	
35.	10.00	380	3800	2.346	
36.	9.75	370	3607.5	2.227	
37.	9.75	365	3558.6	2.197	
38.	9.50	365	3467.3	2.1405	
39.	9.50	365	3467.3	2.1405	
40.	9.00	375	3375	2.083	Milk out
41.	7.25	385	2791	1.723	
42.	6.00	370	2220	1.3705	
43.	0	385	0	0	

Horse-power minutes required in starting---33.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H.P.	Remarks.
1.	0#	340	0	0	
2.	5.	340	1700	1.0495	Separator started
3.	13.	340	4420	2.7385	
4.	12.	325	3900	2.4075	
5.	14.	320	4480	2.7655	
6.	14.	325	4550	2.809	
7.	15.	320	4800	2.963	
8.	15.50	320	4960	3.062	
9.	11.	355	3905	2.4105	
10.	7.	350	2450	1.512	
11.	8.50	345	2932.5	1.810	Sep. belt tightened
12.	7.	345	2415	1.4905	
13.	9.	340	3060	1.889	
14.	7.	345	2415	1.4905	
15.	7.	345	2415	1.4905	
16.	9.	350	3150	1.9445	
17.	7.	355	2885	1.534	Milk started
18.	9.50	360	3419.5	2.111	
19.	11.	355	3905	2.4105	
20.	9.50	360	3419.5	2.111	
21.	9.50	350	3325	2.0525	Speed 7800
22.	9.25	360	3330	2.0555	
23.	9.25	350	3237.5	2.052	
24.	9.	355	3195	1.972	
25.	9.	345	3105	1.917	
26.	8.75	350	3150	1.8905	
27.	9.	350	3150	1.9445	
28.	9.	360	3240	2.000	
29.	8.75	355	3106	1.917	
30.	8.50	355	3017	1.8625	
31.	8.50	360	3959.5	1.8855	Milk stopped
32.	8.	360	2880	1.778	
33.	8.	365	2920	1.791	
34.	7.50	355	2662.5	1.646	
35.	4.	380	1520	.938	
36.	0	370	0	0	

Horse-power minutes required in starting---33.

Reading.	Pressure.	Revolutions	Rev. x	Pres. H. P.	Remarks.
1.	0#	360	0	0	
2.	14.	355	4970	3.068	Separator started.
3.	12.75	345	4398	2.7115	
4.	11.50	355	4082	2.520	
5.	11.75	350	4112	2.538	
6.	13.	350	4550	2.809	
7.	17.	340	5700	3.568	
8.	15.75	340	5352	3.305	
9.	15.	340	5100	3.148	
10.	10.	365	3650	2.253	
11.	6.5	365	2372	1.464	
12.	7.75	370	2868	1.770	
13.	7.75	360	2790	1.772	Milk started.
14.	8.75	360	3150	1.945	
15.	8.50	370	3145	1.942	
16.	8.75	365	3194	1.942	
17.	9.25	370	3423	2.113	
18.	10.25	370	3485	2.151	Sep. belt tightened
19.	10.	375	3750	2.315	
20.	9.25	365	3376	2.084	Sep. Speed 8200
21.	9.	365	3285	2.028	
22.	8.75	365	3194	1.927	
23.	9.25	365	3376	2.084	
24.	8.25	365	3070	1.895	
25.	8.25	360	2970	1.834	
26.	9.	365	3205	2.028	
27.	8.25	360	2870	1.834	
29.	8.	365	2920	1.803	
30.	7.75	370	2868	1.770	
31.	7.75	375	2906	1.794	Sep. Speed 7800
32.	7.75	360	2790	1.722	
33.	8.	360	2880	1.778	
34.	7.75	375	2906	1.794	
35.	7.75	375	2906	1.794	
36.	7.25	365	2646	1.633	Sep. Speed 7900
37.	7.50	365	2737	1.680	
38.	7.25	365	2646	1.633	
39.	7.	375	2625	1.620	
40.	6.75	375	2531	1.562	
41.	6.	375	2250	1.389	
42.	6.75	375	2531	1.562	
43.	14.75	350	4925	3.040	
44.	12.	360	4320	2.667	
45.	11.	355	3905	2.411	
46.	10.	375	3750	2.315	Milk stopped.
47.	9.50	375	3762	2.199	
48.	9.50	370	3515	2.170	
49.	9.50	370	3515	2.170	
50.	0	385	0	0	

Horse-power minutes required in starting---30.

U. S. SEPARATOR.

TEST V.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	375	0	0	
2.	18.	350	6300	3.472	Separator started
3.	15.	375	5622	3.472	
4.	14.5	360	5220	3.222	
5.	15.	355	5322	3.286	
6.	14.5	350	5073	3.131	Belt tightened.
7.	10.5	360	3780	2.333	
8.	8.5	360	3060	1.899	
9.	8.	360	3880	1.778	
10.	10.25	370	3792	2.341	Belt tightened.
11.	11.	365	4015	2.478	Milk started
12.	10.	360	3600	2.224	Speed 8200
13.	9.5	355	3372	2.081	
14.	9.75	355	3461	2.137	
15.	10.5	360	3780	2.333	
16.	9.50	365	3467	2.140	
17.	10.	355	3550	2.191	
18.	9.	355	3195	1.972	
19.	9.50	360	3420	2.111	
20.	10.25	355	3638	2.246	
21.	9.75	360	3510	2.167	
22.	9.75	360	3510	2.167	
23.	9.50	355	3372	2.082	
24.	9.75	360	3510	2.167	
25.	9.75	350	3413	2.107	
26.	9.25	350	3238	1.999	
27.	9.	360	3240	2.000	
28.	9.	360	3240	2.000	
29.	9.	360	3240	2.000	
30.	8.75	375	3281	2.025	
31.	8.	355	2840	1.753	Speed 7200
32.	8.50	365	3102	1.951	
33.	8.	375	3000	1.852	
34.	7.75	360	2990	1.722	
35.	8.50	365	3102	1.915	
36.	7.50	360	2700	1.667	
37.	7.25	365	2646	1.633	
38.	7.	365	2555	1.577	
39.	7.	370	2590	1.599	
40.	15.	370	5400	3.333	Belt tightened.
41.	11.	360	3960	2.445	Milk stopped.
42.	9.75	370	3607	2.226	
43.	9.	365	3285	2.028	
44.	9.5	380	3610	2.228	
45.	8.75	375	3281	2.025	
46.	0	375	0	0	

Horse-power minutes required in starting—24.58.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	390	0	0	
2.	14.5	350	5072	3.131	Separator started
3.	14.	360	5040	3.111	
4.	14.25	370	5271	3.254	
5.	17.5	365	6304	3.941	
6.	20.	340	6800	4.197	
7.	10.	350	3500	2.160	
8.	5.5	365	2008	1.239	
9.	4.	350	1400	.864	
10.	9.	345	3105	1.970	
11.	6.50	345	2242	1.384	
12.	7.75	330	2557	1.578	
13.	9.50	345	3277	2.023	
14.	10.25	370	3792	2.341	Speed 8000
15.	7.75	390	3022	1.865	Milk started.
16.	8.25	400	3300	2.037	
17.	8.	385	3080	1.901	
18.	8.	380	3040	1.876	
19.	8.	375	3000	1.852	
20.	8.5	370	3145	1.941	Speed 8000
21.	7.75	380	2945	1.818	
22.	8.	380	3040	1.876	Speed 7700
23.	7.75	375	2906	1.794	
24.	14.75	360	5310	3.278	
25.	11.5	360	4140	2.556	Speed 8200
26.	9.75	370	3607	2.226	
27.	10.	375	3750	2.315	
28.	10.	370	3700	2.284	Milk stopped.
29.	8.75	385	3368	2.079	
30.	8.75	385	3368	2.079	
31.	8.	380	3040	1.876	
32.	7.25	370	2682	1.655	
33.	0	390	0	0	

Horse-power minutes required in starting---32.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	230	0	0	
2.	5.75	225	1294	.799	Separator started.
3.	5.25	230	1207	.745	
4.	4.75	235	1116	.689	
5.	4.50	225	1012	.625	
6.	10.	235	2350	1.457	
7.	9.	225	2025	1.250	
8.	14.50	225	3262	2.014	
9.	11.25	230	2587	1.597	
10.	8	230	1840	1.136	Speed 5400
11.	8	230	1840	1.136	
12.	7.50	230	1725	1.065	
13.	9.50	225	2137	1.319	Speed 5600
14.	9.50	225	2137	1.319	Milk started
15.	9.75	225	2194	1.354	
16.	9.75	225	2194	1.354	
17.	9.75	230	2242	1.384	
18.	9.75	225	2194	1.354	
19.	9.25	225	2194	1.354	Speed 5600
20.	9.25	230	2127	1.313	
21.	9.	230	2070	1.278	
22.	9.25	230	2127	1.313	
23.	9.	225	2025	1.250	
24.	8.75	230	2012	1.242	
25.	8.50	230	1955	1.207	
26.	9.	230	2070	1.278	
27.	9.25	230	2127	1.313	
28.	9.	235	2115	1.305	
29.	9.	225	2025	1.250	
30.	8.25	235	1939	1.197	
31.	7.	230	1610	.993	Milk stopped
32.	7.25	235	1704	1.052	
33.	8.	230	1840	1.136	Milk out
34.	8.	235	1880	1.160	
35.	6.50	240	1560	.963	
36.	6.75	235	1586	.979	
37.	5.	240	1200	.741	
38.	7.25	235	1704	1.052	
39.	5.	235	1175	.725	
40.	7.50	235	1762	1.088	
41.	0	240	0	0	

Horsepower minutes = 13.1665

ALPHA SEPARATOR.

TEST II.

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	225	0	0	
2.	7.50	225	1687	1.041	Separator started
3.	6.	225	1350	.832	
4.	6.75	230	1552	.958	
5.	10.50	225	2362	1.458	
6.	14.	220	3080	1.901	
7.	12.75	225	2868	1.770	
8.	7.50	225	1687	1.041	
9.	7.	225	1575	.972	
10.	7.50	225	1687	1.041	
11.	7.50	230	1725	1.065	Speed 5600
12.	7.25	230	1667	1.029	
13.	7.50	230	1725	1.065	
14.	7.	225	1575	.972	
15.	7.	225	157z	.972	Milk started in
16.	7.75	225	1744	1.074	
17.	7.	225	1575	.972	
18.	8.	225	1800	1.111	
19.	8.	225	1800	1.111	
20.	8.	230	1840	1.136	
21.	8.	225	1800	1.111	
22.	7.75	225	1744	1.074	
23.	8.50	225	1912	1.180	
24.	8.	225	1800	1.111	
25.	8.50	225	1912	1.180	
26.	8.	225	1800	1.111	
27.	8.50	230	1955	1.207	
28.	8.	225	1800	1.111	
29.	8.25	230	1897	1.171	
30.	8.50	225	1912	1.180	
31.	7.75	225	1744	1.074	
32.	8.	225	1800	1.111	
33.	7.75	230	1782	1.100	
34.	8.	225	1800	1.111	
35.	9.	225	2025	1.250	Speed 5500
36.	8.50	225	1912	1.180	
37.	8.50	225	1912	1.180	
38.	8.50	230	1955	1.207	
39.	7.75	225	1744	1.074	
40.	7.50	225	1687	1.040	
41.	7.	225	1575	.972	
42.	6.	230	1380	.852	Milk out
43.	6.50	230	1495	.923	
44.	6.	230	1380	1.852	
45.	5.50	230	1340	.827	
46.	6.25	230	1437	.887	
47.	0	230	0	0	

Horse-power minutes = 15.631

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	230	0	0	
2.	10.	230	2300	1.420	
3.	7.	220	1540	.951	
4.	2.50	230	575	.355	
5.	9.	230	2070	1.278	
6.	13.	225	2925	1.805	
7.	5.	230	1150	.710	Speed 5600
8.	7.	230	1610	.994	Milk started
9.	5.50	230	1265	.881	
10.	7.	220	1540	.951	
11.	9.	230	2070	1.278	
12.	7.50	230	1725	1.065	
13.	8.50	235	1997	1.233	
14.	8.	230	1840	1.136	
15.	8.75	230	2012	1.242	
16.	8.	230	1840	1.136	
17.	7.50	230	1725	1.065	
18.	7.	230	1610	.994	Sep. speed 5800
19.	7.	235	1645	1.015	Milk out
20.	7.	235	1645	1.015	
21.	7.	235	1645	1.015	
22.	0	235	0	0	

Horse-power minutes = 7.016

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	230	0	0	
2.	6.75	225	1519	.937	Separator started.
3.	6.	225	1350	.833	
4.	10.	225	2250	1.389	
5.	9.	225	2025	1.250	
6.	13.	225	2925	1.806	
7.	7.50	225	1687	1.041	
8.	10.	230	2300	1.420	Belt tightened.
9.	9.50	225	2137	1.319	Milk started in
10.	8.	225	1800	1.111	
11.	8.	225	1800	1.111	
12.	7.50	225	1687	1.041	Speed 5600
13.	8.50	225	1912	1.180	
14.	11.	225	2475	1.528	
15.	8.	225	1800	1.111	
16.	7.	225	1575	.972	
17.	8.	225	1800	1.111	
18.	8.	225	1800	1.111	
19.	9.50	225	2137	1.319	
20.	8.	225	1800	1.111	
21.	10.	225	2250	1.389	
22.	8.	225	1800	1.111	
23.	8.	225	1800	1.111	
24.	7.75	230	1872	1.156	
25.	7.50	225	1687	1.041	
26.	7.75	225	1744	1.074	
27.	7.75	220	1705	1.052	
28.	8.25	230	1897	1.171	
29.	7.50	225	1687	1.041	
30.	9.	220	1980	1.222	
31.	9.	225	2025	1.250	
32.	10	225	2250	1.389	
33.	7.50	225	1687	1.041	
34.	7.75	230	1872	1.156	
35.	7.	230	1610	.994	
36.	7.	225	1575	.972	Milk stopped.
37.	7.	230	1610	.994	
38.	0	230	0	0	

Horse-power minutes = 9.3355

Reading.	Pressure.	Revolutions.	Rev. x Pres.	H. P.	Remarks.
1.	0#	225	0	0	
2.	2.	225	450	.278	Separator started.
3.	2.50	225	562	.347	
4.	5.25	225	181	.729	
5.	5.	225	1125	.694	
6.	10.	220	2200	1.358	
7.	9.	225	2025	1.250	
8.	15.	220	3300	2.037	
9.	7.	225	1575	.972	
10.	6.50	220	1430	.883	
11.	6.50	225	1462	.902	
12.	5.75	225	1249	.799	
13.	6.	225	1350	.833	Milk started.
14.	6.50	225	1462	.902	
15.	7.	225	1575	.972	
16.	7.	225	1575	.972	
17.	7.50	225	1687	1.041	
18.	7.75	230	1782	1.100	
19.	7.75	230	1782	1.100	Speed 5800
20.	7.50	225	1687	1.041	
21.	8.50	225	1912	1.180	
22.	7.	230	1610	.994	
23.	6.75	225	1519	.938	
24.	6.	225	1350	.833	Milk out
25.	6.	230	1380	.852	
26.	7.	230	1610	.994	
27.	0.	235	0	0	

Horse-power minutes = 10.6655

TESTS OF U. S. SEPARATOR.

	Test 1.	Test.2.	Test 3.	Test 4.	Test 5.	Test 6.
1. Date of Test.....	Mar. 2,	Mar. 5,	Mar. 6,	Mar. 7,	Mar. 9,	Mar. 9.
2. Temperature of milk degrees Fahrenheit.....	90°	85°	88°	92°	91°	99°
3. Total milk separated in pounds.....	561#	1265#	764#	1112#	1216#	493#
4. Capacity of separator during run in pounds per hour.....	3366	2616	3056	1962	2436	2274
5. Per cent fat in milk.....		4%	4.4%	4.2%	4%	4.2%
6. Per cent fat in skim-milk.....		8%	6%	.022%029
7. Per cent fat in cream.....		15.9%	15.3%	69.4%	62%	71%
8. Revolutions of separator bowl per minute.....	8200	8200	7800	7800	7800	8200
9. Horse-power minutes required in starting..	36	33	33	30	34.58	32
10. Horse-power minutes required in skimming.	28.45	67.37	33.20	68.25	70.30	31.93

TEST OF ALPHA SEPARATOR.

	Test 1.	Test 2.	Test 3.	Test 4.	Test 5.
1. Date of Test	Mar.12.	Mar.14.	Mar.14.	Mar.16.	Mar.16.
2. Temperature of milk degrees Fahrenheit.....	82°	80°	78°	91°	98°
3. Total milk separated in pounds.....	842	1192	470	1145	313
4. Capacity of separator during run in pounds per hour.....	2472	2760	2500	2544	2346
5. Per cent fat in milk.....	4%	4%	4.3%	4.6%	4%
6. Per cent fat in skim milk.....	.025%	.05%	.06%	.02%	.025%
7. Per cent fat in cream.....	44.9%	43.5%	42.5%	49.5%	43.5%
8. Revolutions of separator bowl per minute.....	5600	5500	5600	5700	6000
9. Horse-power minutes re- quired in starting.....	13.1665	15.631	7.016	9.3355	10.6655
10. Horse-power minutes re- quired in skimming.....	24.13	29.97	12.93	30.85	11.60

In all the tests, care was taken to keep the Separator belts just tight enough to prevent slipping. It will be noticed in the tables that when the belt was tightened the Horse-power was increased at times to nearly 100% of its former value. After a few minutes, the Horse-power fell back to near its former amount. This increase was due to the fact that the belt was tightened too quickly, which demanded that the inertia of the separator bowl and the milk in the separator, should be suddenly overcome.

It may be seen in the tables that the average Horse-power was greater for quick starts than for slow starts, but the horse-power-minutes required in starting was nearly the same in each case.

Unfortunately, the U. S. Separator was run at a greater capacity than it was rated for, while the Alpha was run at a less capacity than its rating. This deficiency was due to the neglect of the dairy students in charge; it puts the U. S. Separator at a disadvantage as far as a skimming test is concerned, but as a power test this deficiency of capacity will have but little effect. It will be noticed, moreover, that the two separators were operated at nearly the same capacity.

Following is a table giving the average results of the tests:

	U. S. No. 1.	Alpha No. 1.
Number of tests averaged.....	6	5
Rated capacity.....	2500# per hr.	3000# per hr.
Average capacity as tested....	2618# " "	2524# " "
Rated speed.....	8000 Rev. per min.	5600 Rev. per min.
Average speed during tests....	8000	5600
Average Horse-power minutes required in starting....	31.43	11.163
Average Horse-power while skimming.....	2.17	1.13
Average Horse-power per 1000# milk.....	.89	.48