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ECONOMY IN FEEDING THE FAMILY

V

Condensed Milk, Malted Milk Milk Powder

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Condensed or Evaporated Milks, Malted Milks and Milk Powders.

By John Phillips Street
Chemist in Charge of Analytical Laboratory.

Condensed Milk.

The words "condensed" and "evaporated" as applied to milk have been rather loosely used in the past. The term "evaporated" has generally been applied to milk which had been concentrated by evaporation under reduced pressure with more or less heat, but without the addition of any cane sugar. The term "evaporated cream" was always a misnomer, as the product was similar to cream only in consistency. Legal enactments and the practice of the better class of manufacturers have made this term obsolete.

"Condensed" milk, on the other hand, is popularly applied to evaporated milk to which more or less cane sugar has been added to aid in its preservation. Certain brands, however, are found on the market where the original significance of the two terms is entirely lost, and confusion has accordingly resulted. The Federal Committee on Food Definitions and Standards recognizes the terms "condensed" and "evaporated" as applied to milk as synonymous, and suggests the use of the prefixes "sweetened" or "unsweetened" as the case may be, to prevent misunderstanding.

The numerical standards now in force for these products are as follows:

Condensed milk contains not less than 25.5 per cent. of total solids and not less than 7.8 per cent. of milk fat.

Sweetened condensed milk contains not less than 28.0 per cent. of total milk solids and not less than 8.0 per cent. of milk fat.

Condensed skimmed milk contains not less than 20.0 per cent. of milk solids.

Sweetened condensed skimmed milk contains not less than 28.0 per cent. of milk solids.

It is obvious that the quality of a condensed milk depends upon the quality of the original milk, upon the degree of concentration, and upon the skill with which this concentration is ef-

fected. If skimmed or partially skimmed milk is condensed the product will necessarily be deficient in milk fat; a highly concentrated milk of course will be richer than one of less concentration made from the same original milk; excessive heat will give the product an unpleasant cooked taste; and poor methods of manufacture will produce granulation, grittiness and other undesirable features. The quality of the raw material and the skill of the manufacturer therefore greatly influence the quality of the manufactured product.

Unsweetened milk is quite apt to spoil after the can has been opened. It should therefore be kept in a cold place pending use, and the same precautions taken for its preservation as for raw milk. Indeed, it has been suggested that manufacturers should pack such milk in cans holding only enough for a day's supply. While this would increase the cost, it would offer obvious advantages. The sweetened condensed milks keep much better, but even these should be kept in a cold place after opening.

The tables contain our analyses of 43 samples of unsweetened, 84 sweetened and 6 sweetened skimmed condensed milks. These were examined chiefly in 1904, 1906, 1909, 1916, and 1919, the later analyses probably more accurately representing the product as now sold.

It will be noted that while the sweetened milks on the average contain somewhat more fat than the unsweetened, the large amount of cane sugar added necessitates a considerable dilution before use. The dilution necessary to minimize this excessive sweetness reduces the proportion of protein and fat far below that found in normal milk. The labels of most brands of condensed milk give directions for its use as a drink, alone or with tea or coffee, as a cooking adjunct, or as a food for infants.

In our 1909 inspection attention was called to the very misleading directions for dilution given on many of the labels which, if followed, would yield a very dilute product quite unfit for the purposes indicated. From our tables it is apparent that none of the brands can be diluted with much more than 1.5 parts of water to one of milk and still yield a product equalling standard milk in fat content.

In the inspections of 1916 and 1919 a gratifying change for the better was noted on many of the labels. A very common claim then made was as follows: "By adding one part of water to one

part of the contents of this can a resulting milk product will be obtained which will not be below the legal standard for whole milk." This claim is correct as applied to all but one of the brands of unsweetened milks listed in the table. Such a diluted product will closely resemble market milk in composition. However, the same claim is often made for the sweetened milks, and with these it is less tenable. The average composition of a sweetened milk thus diluted would show 36.83 solids, 20.15 cane sugar, 0.91 ash, 4.19 protein, 7.05 milk sugar and 4.53 per cent. fat, a product very different from normal milk.

It is in connection with the directions for infant feeding, however, that the severest criticism must be made as to the manufacturers' claims. This subject was discussed at length in our Reports for 1909 and 1916, and will not be elaborated here. Suffice it to say that the resultant mixtures made by following the manufacturers' directions do not even approximate the composition of human milk, the deficiencies in protein and fat being especially striking. In the sweetened milks cane sugar makes up from 30 to 60 per cent. of the solids in the child's diet. The seriousness of the matter lies in the fact that many ignorant mothers, trusting to the manufacturers' directions, offer to their babies diets which by no possibility can maintain them or secure adequate growth.

Condensed milks have a distinct use in the home and in the sick room. When properly prepared they are more digestible than fresh cow's milk,[1] a strong point in their favor. While they cannot be regarded as absolutely sterile, as the heat to which they are subjected is not necessarily high enough to kill all disease germs, they are probably more nearly sterile than most raw milk, and if properly kept after opening are less liable to spoilage and decomposition. As an exclusive diet for young children they cannot be recommended, because of their deficiency in fat. An unsweetened condensed milk properly diluted with water, and with cream and milk sugar added, would offer a very satisfactory substitute for human milk. The sweetened condensed milks are entirely unsuited for infants' use, no matter how they are manipulated.

[1] Hutchinson's Food & the Principles of Dietetics, 1906, p. 458.

TABLE I—CONDENSED MILK (UNSWEETENED).

Date of analysis.	Brand and Manufacturer.	Water.	Ash.	Protein (N x 6.38).	Milk Sugar.	Fat.	Calories per 100 grms.
1916	Armour & Co. Veribest	74.57	1.58	6.38	9.80	7.67	134
1919	" " " "	74.94	1.58	6.67	8.55	8.26	135
1905	Borden's Cond. Milk Co. Peerless	70.97	.....	.....	.....	7.55	...
1906	" " " " "	73.68	1.52	6.95	10.25	7.60	137
1909	" " " " "	69.21	1.71	8.36	11.45	9.27	163
1916	" " " " "	73.72	1.39	6.64	9.82	8.43	142
1919	Carnation Milk Prod. Co. Carnation	74.29	1.34	6.70	8.10	9.57	145
1916	Delavan Cond. Milk Co. Beauty	74.04	1.53	6.83	9.49	8.11	138
1909	Federal Packing Co. Hylac	70.13	1.70	8.17	9.80	10.20	164
1909	Gt. Atl. & Pac. Tea Co. A. & P.	71.54	1.43	7.66	10.80	8.57	151
1916	" " " "	74.07	1.50	6.57	9.85	8.01	138
1906	Helvetia Milk Cond. Co. Highland	69.70	1.85	8.31	11.46	8.68	157
1909	Helvetia Milk Cond. Co. Highland	70.60	1.60	7.85	10.95	9.00	156
1906	Helvetia Milk Cond. Co. Our Pet	73.66	1.58	6.86	10.43	7.47	136
1909	" " " " "	71.62	1.63	7.08	10.71	8.96	152
1916	" " " " "	71.82	1.69	7.53	10.63	8.33	148
1916	Highland Milk Cond. Co. Honor	71.29	1.48	7.08	11.39	8.76	153
1916	" " " "	71.95	1.53	7.08	10.54	8.90	151
1906	Hires Cond. Milk Co. Gold	75.19	1.49	7.22	10.49	5.61	121
1916	" " " " ...	73.72	1.52	7.27	9.59	7.90	139
1909	Indiana Cond. Milk Co. Wilson's	75.27	1.53	6.70	8.75	7.75	132
1916	" " " "	73.45	1.51	7.91	8.55	8.58	143
1909	Libby, McNeil & Libby. Libby's	74.08	1.50	7.15	9.39	7.88	137
1916	Mohawk Cond. Milk Co. Gold Cross	72.72	1.75	7.91	9.58	8.04	142
1916	Morris & Co. Supreme	73.05	1.60	6.51	10.73	8.11	142
1916	National Cond. Milk Co. Globe	72.60	1.57	7.02	10.84	7.97	143
1916	Pacific Coast Cond. Milk Co. Carnation	73.75	1.49	6.76	9.89	8.11	140
1906	Scranton Cond. Milk Co. Gilt Edge	70.11	1.70	8.60	11.99	7.60	151
1916	Seminole Cond. Milk Co. Belle Brook	72.94	1.62	6.57	10.83	8.04	142
1916	Seminole Cond. Milk Co. Lake View	73.83	1.60	6.44	10.08	8.05	139
1906	St. Charles Cond. Co. Silver Cow	70.09	1.81	8.31	11.31	8.48	155
1909	" " " " "	70.86	1.72	8.17	10.63	8.62	153
1906	" " " St. Charles	68.93	1.80	8.75	11.86	8.66	160
1909	" " " " "	71.58	1.34	7.66	10.55	8.87	153
1905	Van Camp Pack. Co. Top Notch	71.37	.....	.....	.....	7.10	...
1906	" " " " "	73.49	1.53	7.05	10.45	7.48	137
1909	" " " Van Camp's	74.85	1.29	6.89	9.77	7.20	131
1910	" " " " "	.....	.....	.....	.....	8.41	...
1911	" " " " "	71.23	.....	.....	.....	9.35	...
1916	" " " " "	72.90	1.69	6.76	10.65	8.00	142
1909	Wayne Co. Cond. Milk Co. Blue Label	70.98	1.57	7.53	10.93	8.99	155
1916	Wisconsin Cond. Milk Co. Lion	74.48	1.45	6.70	9.38	7.99	136
1916	" " " Mohican	73.89	1.37	6.57	10.24	7.93	139
	Average	**72.78**	**1.57**	**7.26**	**10.26**	**8.24**	**145**
	Maximum	**75.27**	**1.85**	**8.75**	**11.99**	**10.20**	**164**
	Minimum	**68.93**	**1.29**	**6.38**	**8.10**	**5.61**	**121**

TABLE II—CONDENSED MILK (SWEETENED.)

Date of analysis.	Brand and Manufacturer.	Water.	Cane sugar.	Ash.	Protein (N x 6.38).	Milk sugar.	Fat.	Calories per 100 gms.
1904	Allen-Ditchett Co. The Best.....	28.03	38.57	1.90	9.12	15.48	6.90	315
1904	Amer. Cond. Milk Co. Anchor.....	26.97	37.88	1.97	9.28	14.44	9.46	332
1904	" " " Blue Bell....	26.50	37.94	1.95	9.50	14.80	9.31	333
1904	C. Andresen & Co. Andresen's Best..	24.69	41.62	2.10	9.81	14.43	7.35	330
1916	Aylwer Cond. Milk Co. Canada First	28.93	39.62	1.56	7.53	13.30	9.06	323
1919	Aurora Cond. Milk Co. Aurora.....	25.39	42.10	1.75	7.85	12.91	10.00	341
1904	Bennett, Sloan & Co. Valley Farm..	24.86	42.13	1.91	9.12	13.28	8.70	336
1916	Berna Milk Co. Swiss Milk Berna...	25.01	37.52	2.02	8.36	*17.12	9.97	342
1916	Bernese Alps Milk Co. Swiss Milk..	23.72	41.73	1.86	8.17	14.91	9.61	346
1904	Borden's Cond. Milk Co. Baby.....	25.00	39.97	1.87	8.71	14.42	10.03	343
1909	" " " "	27.62	40.61	1.73	7.91	12.53	9.60	331
1916	" " " "	27.55	40.84	1.72	8.17	12.96	8.76	327
1904	" " " Challenge..	24.84	43.42	1.92	8.57	13.02	8.23	334
1909	" " " " ...	31.32	29.22	1.82	8.10	*20.24	9.30	314
1916	" " " " ...	25.02	39.88	1.88	7.98	15.45	9.79	341
1909	" " " Dairy.....	25.22	43.42	1.60	8.10	12.08	9.58	341
1904	" " " Daisy.....	29.32	40.47	1.75	7.82	12.13	8.51	318
1909	" " " "	26.28	43.45	1.50	8.17	11.50	9.10	334
1916	" " " "	26.08	41.80	1.79	7.52	14.24	8.57	331
1919	" " " Darling....	26.95	43.43	1.70	7.85	10.42	9.65	334
1904	" " " Defiance..	26.75	39.81	1.93	8.99	13.09	9.43	331
1909	" " " " ..	26.13	40.91	1.73	8.47	13.13	9.63	337
1916	" " " " ..	23.97	42.22	2.00	7.72	15.03	9.06	341
1916	" " " Dime.....	27.85	39.44	1.77	7.77	14.26	8.91	326
1919	" " " "	27.21	37.49	1.79	7.65	17.42	8.44	326
1904	" " " Dirigo.....	24.91	41.22	1.90	9.03	13.06	9.88	342
1916	" " " Dixie.....	26.06	38.41	1.81	8.04	*16.51	9.17	334
1904	" " " Eagle.....	25.99	42.93	1.86	8.15	12.35	8.72	332
1909	" " " " ...	24.87	44.03	1.86	8.04	11.95	9.25	339
1916	" " " " ...	26.26	39.90	1.70	7.59	15.76	8.79	333
1909	" " " Full Weight	23.85	41.00	1.95	8.80	14.95	9.45	344
1919	" " " Leader....	28.82	41.35	1.74	7.87	11.53	8.69	321
1904	" " " Magnolia..	27.17	42.24	1.78	7.95	12.52	8.34	326
1909	" " " " ..	23.81	42.11	1.76	8.80	13.66	9.86	347
1916	" " " " ..	26.66	42.16	1.75	7.85	13.09	8.49	329
1904	" " " O. K.....	25.78	36.56	1.89	8.72	*17.30	9.75	338
1909	" " " Pine Tree..	29.89	32.97	1.64	7.98	*18.50	9.02	319
1904	" " " Stag.....	23.67	43.70	1.97	9.16	12.54	8.96	342
1919	" " " Star.....	31.72	38.52	1.66	8.20	10.80	9.10	312
1909	" " " Thistle....	25.16	41.12	1.86	8.10	13.70	10.06	342
1904	" " " Tip Top...	21.67	41.76	2.15	9.35	15.00	10.07	355
1909	" " " " " ..	25.08	39.94	1.88	8.29	15.24	9.57	340
1904	" " " Winner....	25.26	42.34	1.81	8.87	12.06	9.66	340
1919	Bridgeton Cond. Milk Co. Epicure.	29.38	30.14	1.66	7.31	*23.18	8.33	317
1909	Champlain Cond. Milk Co. Champlain.....	29.30	39.11	1.71	7.85	12.43	9.60	324
1904	Clark's Summit D. & C. Co. Apple Blossom.....	27.65	32.01	1.88	8.46	*20.60	9.40	329

*Results probably too high due to a partial inversion of cane sugar.

TABLE II—CONDENSED MILK (SWEETENED)—*Continued.*

Date of analysis.	Brand and Manufacturer.	Water.	Cane sugar.	Ash.	Protein (N x 6.38).	Milk sugar.	Fat.	Calories per 100 gms.
1919	Diamond Creamery Co. Honeysuckle	28.52	40.28	1.69	7.88	12.03	9.60	327
1916	Direct Impt. Co. Benefit	29.57	40.60	1.65	7.91	12.01	8.26	316
1909	Emery Food Co. Emery	28.89	39.23	1.54	8.61	12.84	8.89	323
1904	Gt. Atl. & Pac. Tea Co. Grandmother's A. & P	27.27	40.09	1.87	8.88	13.53	8.36	325
1909	Gt. Atl. & Pac. Tea Co. Grandmother's A. & P	28.84	29.64	1.75	7.91	*22.85	9.01	323
1916	Gt. Atl. & Pac. Tea Co. Grandmother's A. & P	26.15	43.22	1.64	7.52	12.63	8.84	333
1904	Dr. Hand Cond. Milk Co. Dr. Hand's	26.97	38.63	2.16	9.36	14.07	8.81	328
1909	" " " " " "	29.75	35.34	1.99	8.43	*16.55	7.94	313
1916	Holland Food Corp. Milkman	25.67	39.44	2.08	8.68	14.98	9.15	335
1909	M. B. & F. S. Hubbell. Gilead	30.21	36.75	1.62	8.10	14.14	9.18	327
1916	Hudson Cond. Milk Co. Kitten	27.68	26.99	1.99	8.49	*24.68	10.17	332
1919	International Milk Prod. Co. Dairy Queen	27.32	43.90	1.68	7.44	10.66	9.00	329
1916	Libby, McNeil & Libby. Libby's	23.61	43.90	1.79	8.36	13.02	9.32	349
1919	" " " " ...	26.09	43.99	1.81	7.37	12.40	8.34	330
1919	" " " " ...	25.76	45.21	1.61	7.98	10.98	8.46	333
1904	Michigan Cond. Milk Co. Peninsular	26.38	41.72	1.86	8.60	13.20	8.24	328
1909	" " " Star	25.79	42.36	1.78	8.49	12.59	8.99	335
1916	Mohawk Cond. Milk Co. Gold Medal	27.46	43.30	1.66	6.95	12.22	8.41	326
1904	" " " Sweet Clover	24.07	43.09	1.87	8.71	12.95	9.31	343
1909	" " " " "	24.29	42.97	1.79	8.74	12.26	9.95	345
1909	" " " " "	24.73	44.05	1.59	8.42	11.82	9.39	342
1916	" " " " "	26.52	41.20	1.67	8.42	13.21	8.98	332
1904	Henri Nestlé. Nestlé's	25.76	38.70	1.90	8.70	15.37	9.57	337
1904	Scranton Cond. Milk Co. Gilt Edge	25.48	41.13	1.85	8.72	13.86	8.96	336
1904	" " " Red Line	27.45	39.60	1.93	8.98	14.80	7.24	319
1916	Seminole Cond. Milk Co. Butler's	25.28	43.81	1.76	7.78	12.45	8.92	336
1916	" " " Essie	23.61	46.02	1.92	7.27	12.95	8.23	339
1904	U. S. Cond. Milk Co. Empire State	26.09	40.80	1.83	8.14	14.11	9.03	333
1904	" " " Regal	27.02	40.33	1.85	7.96	13.91	8.93	329
1904	" " " Upper Ten	27.88	38.47	1.85	8.34	14.66	8.80	325
1909	Vermont Cond. Milk Co. Ruby	26.58	40.68	1.65	8.23	12.82	10.04	337
1909	" " " Silver Chord	25.46	42.33	1.91	8.49	12.30	9.51	338
1909	" " " Vermont	25.90	40.97	1.71	8.36	13.80	9.26	336
1909	" " " "	25.41	43.56	1.62	8.23	11.57	9.61	340
1909	" " " "	28.17	40.54	1.70	8.43	11.28	9.88	330
1909	Wayne Co. Cond. Milk Co. Pride of Wayne	24.52	44.83	1.63	8.36	12.29	8.37	337
1904	Wisconsin Cond. Milk Co. Arrow	26.83	42.02	1.79	8.49	12.87	8.00	326
1916	" " " Lion	29.53	39.93	1.70	7.91	12.21	8.72	319
	Average (84 analyses)	**26.62**	**40.34**	**1.80**	**8.29**	**14.00**	**8.95**	**332**
	Maximum	**31.72**	**45.21**	**2.16**	**9.81**	**24.68**	**10.17**	**355**
	Minimum	**21.67**	**26.99**	**1.50**	**6.95**	**10.42**	**6.90**	**312**

*Results probably too high due to a partial inversion of cane sugar.

CONDENSED SKIMMED MILK (SWEETENED).

Date of analysis.	Brand and Manufacturer.	Water.	Cane sugar.	Ash.	Protein (N x 6.38).	Milk sugar.	Fat.	Calories per 100 gms.
1916	M. Darlington's Sons. Marvel.....	28.60	48.22	1.86	8.29	12.36	0.67	282
1916	Foster Packing Co. Target.....	26.32	38.63	1.90	8.74	23.37	1.04	292
1919	Merton Dairy Prod. Co. Value.....	29.27	30.42	2.33	9.80	27.02	1.16	279
1916	Hires Cond. Milk Co. Square.....	28.34	47.45	1.71	8.36	13.28	0.86	284
1919	Northville Milk Cond. Co. Domestic	30.16	42.72	2.34	10.05	13.06	1.67	278
1916	South Holland Milk Corp. Van Troup	29.80	37.83	2.19	9.57	20.00	0.61	276
	Average.....	**28.74**	**40.88**	**2.05**	**9.14**	**18.18**	**1.01**	**282**

MALTED MILKS.

Seven samples, representing four brands, have been analyzed. These are mixtures of dried milk and malted cereals. They contain practically no unaltered starch and accordingly are of value to persons with impaired digestion.

TABLE III—MALTED MILK.

Date of analysis.	Brand and Manufacturer.	Water.	Fat.	Fiber.	Ash.	Protein (N x 6.25).	Nitrogen-free extract.	Calories per 100 gms.
1915	A. D. S.....	5.93	6.75	0.13	3.08	14.06	70.05	397
1908	Borden's.....	5.42	6.14	0.23	3.17	13.38	71.66	395
1915	"	5.18	7.15	0.05	3.45	15.38	68.79	401
1908	Horlick's.....	3.63	8.36	0.00	3.70	12.94	71.37	412
1915	"	2.03	8.10	0.15	4.00	15.00	70.72	416
1908	Meadow's.....	4.04	4.11	0.26	3.22	13.88	74.49	390
1915	"	3.20	5.20	0.30	3.28	14.50	73.52	399

DRIED MILKS, OR MILK POWDERS.

Analyses of seven brands are shown in Table IV. As a rule these represent milks from which more or less of the original fat has been removed. This has been done with no fraudulent intent, but rather because a skimmed milk is more easily dried than a whole milk and the resultant product has superior keeping qualities.

TABLE IV—DRIED MILK.

Date of analysis.	Brand and Manufacturer.	Water.	Ash.	Protein (N x 6.38).	Fat.	Lactose.	Calories per 100 grms.
1913	Klim. Merrell-Soule Co.....	2.56	8.10	37.07	2.23	50.04	369
1918	Krystalak. Dry Milk Co.....	5.05	8.37	35.41	3.20	47.97	363
1918	Lactora. Dry Milk Co.....	8.39	7.74	32.47	2.60	48.80	348
1914	Mammala. Mammala Corp....	5.15	5.50	25.58	10.95	52.82	412
1918	" " "	4.05	5.75	25.78	14.52	49.90	433
1916	Randel's Sol. Dry Milk. W. A. Randel & Co.....	3.37	8.10	34.45	1.46	52.62	361
1916	Skimilkris. Borden's Cond. Milk Co.....	2.90	8.30	35.73	1.93	51.14	365
1909	Trumilk. Merrell-Soule Co.....	3.78	6.00	25.65	47.36	37.21	498

The legal restrictions as to the sale of skimmed milk as such doubtless also contributed to the development of this method of marketing this valuable, and too often neglected, food.

Trumilk, essentially a dried whole milk, we believe is no longer on the market. *Klim*, manufactured by the same firm, *Krystalak*, *Lactora*, *Randel's Soluble Dry Milk* and *Skimilkris*, are all skimmed milk powders of quite similar composition.

Mammala is a dried milk from which about one-half of the milk fat has been removed and a corresponding percentage of milk sugar added. It is offered especially for the feeding of babies, invalids and convalescents.

In these days of high prices there is every reason to recommend such foods as these milk powders, especially as their production represents a distinct conservation of our food resources. Too often fat is considered the only valuable constituent of milk, the value of its protein being almost entirely overlooked. At the present time skimmed milk is one of our cheapest sources of protein.

HEBE.

This is an evaporated skimmed milk to which about 6 per cent. of cocoanut oil has been added. Cocoanut fat is not an adequate substitute for milk fat in a food for children or invalids, and no such claim is made or implied for this preparation. It should be a satisfactory food for the purposes stated on the label, namely:

"for coffee and cereals, baking and cooking." Our analysis, made in 1918, follows:

Water	74.51
Ash	1.58
Protein (N x 6.38)	6.38
Fat	8.18
Lactose	9.35
Calories per 100 gms	137

SUGAR-FREE MILKS.

These preparations have a distinct value in diets where carbohydrates are restricted, as in the case of those suffering from diabetes. We have examined two brands, *Dr. Bouma's*, sold by Gustav Muller & Co., New York, and *Whiting's*, sold by D. Whiting and Sons, Boston. Our analyses follow:

	Bouma	*Whiting.*	
	1913	1913	1919
Water	91.8	86.4	83.3
Ash	0.5	0.7	0.8
Protein (N x 6.38)	2.4	5.7	6.4
Nitrogen-free extract	0.0	Tr.	0.2
Fat	5.3	7.2	9.3
Calories per 100 gms	57	88	110

These products are both true to name and contain mere traces of carbohydrates. The *Whiting* brand, however, is the more concentrated of the two, and our analysis of this brand just completed shows considerably more nutriment than was shown by the same brand in 1913.