Concentrated Milk in the Days of Napoleon

French Scientist Did First Milk Evaporating

By DR. A. W. BITTING

Dr. A. W. Bitting, author of this article, has for many years made a hobby of collecting old books—first editions and copies—on foods, including cook books, and it is through this source of information that he throws new light on the beginning of the evaporated and condensed milk industry.

Dr. and Mrs. Bitting together translated the original Nicolas Appert book on the preservation of foods. In this Appert work it is shown very conclusively that milk was first concentrated and preserved by that gentleman himself.

The real value of milk in furnishing some important ingredient not supplied by other foods, especially for children and for warding off certain diseases, was recognized in Europe during the last half of the eighteenth century. Early in the nineteenth century The Society for the Encouragement of National Industry in France advocated its more general use to promote better health and sought to stimulate interest in any suitable means for preserving it for use where fresh milk could not be obtained. It was wanted on vessels used in exploration, men-of-war, and the like, and on board slow sailing vessels carrying emigrants coming to America, as babies and young children became acute sufferers from the use of dried and salt-cured foods. It was also wanted in the larger cities during the winter. English and French purveyors of foods vied with each other in trying to supply the want, especially for sea-going vessels.

M. Appert was the first to sterilize milk in bottles and in order to economize in containers and also in volume, he evaporated the milk by one-third its original bulk. The reduction of necessity was done in an open kettle and one can readily understand that as a result of the necessarily prolonged heating a strong
cooked flavor resulted so that the product was not acceptable for general use, though it might be satisfactory for some cooking. He improved his work and submitted samples with other foods for tests by the navy in 1814. The description of the method followed in 1810 is as follows:

"Milk. Twelve liters of milk fresh from the cow have been taken, set in the water-bath and reduced to two-thirds of its volume, skimming it often. Afterwards it is strained through cloth; when cooled, the skin which had formed on it in cooling is removed, and the milk is put in bottles with the ordinary processes, and then in the water-bath for two hours boiling, etc. At the end of some months it was noticed that the cream had separated in flakes and was floating on the surface of the bottle. In order to avoid this objection, a second experiment was made with an equal quantity of milk which had been reduced in the water-bath by a half instead of a third, as on the first. I conceived adding to it, when it was reduced, eight fresh egg yolks diluted with the same milk. After having left the whole thus well mixed for a half hour over the fire, it was finished as in the former experiment.

"This method has succeeded perfectly. The egg yolks so thickened it all that at the end of a year, and even 18 months, the milk was preserved so that I have put it in bottles. The former was likewise preserved for two years and more; the cream which had formed in flakes disappeared on putting it on the fire, both of them tolerating the same heating. From both of them butter and whey were obtained; in the different experiments and chemical analysis to which they had been submitted it had been recognized that the latter, truly superior, could replace the best cream that is sold in Paris for coffee.

"Cream. Five liters of cream, skimmed carefully from good milk, were concentrated without skimming to four liters in the water-bath, the skim which was formed on it was removed so as to strain the whole through cloth, and put it to cool. After having again removed the skin that had formed in cooling, it was put into half-liter bottles with the ordinary process, so as to give it an hour's boiling in the water-bath. At the end of two years this cream was found as fresh as if it had been prepared that day. I have made good fresh butter from it in quantities of four to five ounces per half-liter.

"Whey. I have prepared whey by the ordinary processes in practice. When it is clarified and cooled, it is put in bottles, etc., so as to give an hour's boiling in the water-bath. However well clarified the whey may be, when put in the water-bath, the application of the heat always separates from it some particles of cheese which form a deposit; I have kept it two to three years in this way, and before making use of it have filtered it so as to have it very
clear. In case of haste, it suffices to decant it, to obtain it clear."

The foregoing description is of interest because it is the record of the first attempt to preserve milk in a hermetically sealed container by means of heat. It was the forerunner of what has since become a great industry. In 1811, Appert produced milk tablets and later devised the temporary preservation of milk by heating for only a short time. This is described in the fourth edition of his work in 1831. The principle is the same as used in pasteurization but which did not come into general use until a number of years later. His fellow countryman, Malbec, concentrated milk with sugar in 1826. Other French workers were Jules Jean Baptiste Martin de Lignae who obtained an English patent on evaporated milk preserved with sugar, October 7, 1847; Grunaud and Galais, who in 1850 reduced milk to one-fourth its volume at a temperature not exceeding 30 degrees C., and though not sterile it was kept for a time and was marketed in bottles; and Grimwade, who in 1856 prepared milk powder. De Lignae prepared both sweetened and unsweetened evaporated milk but the technique was not sufficiently perfected to make it a commercial success.

The English showed partiality for preserving milk with sugar, the first patent being issued to DeHeine in 1810, the heating in this case being done in an open vessel. The vacuum pan was invented three years later, May 20, 1813, by Edward Charles Howard, Best-bourne, Green, England (patent number 3754). This was not specifically designed for handling milk but the possibilities in this direction were soon recognized. The first English patent to utilize the vacuum pan for the preparation of milk was granted to William Newton, March 11, 1835. The following is quoted:

"Patent right No. 6787. For preparing animal milk so it may be preserved for any length of time with its nutritive properties and capable of being transported into any climate for domestic or medicinal purposes. This being effected by adding to the milk a certain amount of sugar and evaporating it by any suitable means, using only gentle warmth to quicken the operation. It may be brought to the consistency of cream, honey or soft paste, or even into dry cakes. Cocoa, coffee or tea may be evaporated with it."

English patents along the same line were granted to Thomas Shipp Grimway, May 14, 1847, and to Martin de Lignae, as already stated.

In this country, William Underwood prepared milk with sugar and bottled it in 1828 but in no sense did he establish an industry.

The period from 1800 to 1850 may be regarded as one in which there was a groping after the principles of concentration and the preservation of milk, but it remained for those of the second half century to improve upon and add to them so as
to make preserved milk a nearly universally distributed food.

To Gail Borden befell the good fortune to make condensed or sweetened evaporated milk a commercial success and in this case it brought pecuniary reward commensurate with the effort. He was a passenger on a sailing vessel enroute from England to this country in 1851 and observed the suffering among the small children because the food was unsuitable for their use. The little milk available was from seasick cows quartered and exposed upon deck which, on ceasing to give milk, were slaughtered for fresh meat. The passage ordinarily required four weeks or more and the conditions were so revolting that he determined to find some way to improve them.

He went to the Shaker community at New Lebanon, New York, presented the problem to them and began experimenting with the production of a preserved milk. These people had a small vacuum pan which they used in making extracts and medicinal preparations but which was available to him. In 1853 he applied for a patent upon milk concentrated in vacuum which was denied on the ground that it disclosed nothing new or novel, but upon reconsideration a patent was granted August 19, 1856.

Mr. Borden's success depended far more upon his appreciation of the need for absolute cleanliness in the production of milk, its quick handling from the barn to the factory, and the proper control of the temperature in evaporating and cooling than to any special apparatus. It was his system and skill which counted rather than any claims of invention so that in all the years which have elapsed there has been little deviation from the principles which he developed as they are fundamentally correct.

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**Early History of the Production of Evaporated Milk**

*By DR. A. W. BITTING*

**PRODUCTION** of sterilized unsweetened evaporated milk was not accomplished at one long stride but by cautiously feeling the way. Johannes Nevens Chawnder is credited with preparing milk in 1856 and 1857 which remained sound. An English patent was granted to Joseph House, January 1, 1857, for preserved unsweetened evaporated milk. He produced some milk on a commercial scale but the product was injured to such an extent by the heating that it did not find favor.
No other work is recorded again until 1881 to 1883, at which time experiments were made in both Switzerland and Germany to preserve milk without sugar. A paragraph from Fleischmann's work, "The Dairy," is illuminating:

"Shortly after the method introduced by Schreff for the sterilization of milk had become known, the idea was carried into effect by rendering the condensed milk capable of being kept by sterilizing it, and thus dispensing with the addition of sugar, which, by imparting to it a very pronounced sweet taste, rendered it disagreeable to many persons. For this purpose experiments were carried out during the years 1881 and 1883 in different parts of Germany and Switzerland. Sterilized condensed milk was best obtained by purifying the fresh milk by the application of centrifugal force, then boiling it in order to coagulate the albuminous pare of the nitrogenous matter. This was condensed in vacuum pans to a third or fourth of its original volume and poured into metal vessels of the same shape and size as were used in the factory at Cham. The vessels, after being filled and soldered, were placed for a short time at a temperature of about 120 degrees C., the keeping quality of the substance being tested by submitting it for a few weeks to a temperature of from 30 to 40 degrees C., and after that lapse of time seeing whether there were indications of fermentation shown by distention at the bottom or the top of the vessels.

"If it be neglected to heat up the milk before it is condensed, the albumin is coagulated during the sterilization, which renders the contents of the can lumpy.

"If the preparation of condensed milk, without addition of cane sugar, is carried on with the necessary precautions, the product obtained possesses great keeping properties, and when dissolved in a suitable quantity of pure water, yields a liquid possessing all the properties prized in fresh milk, which, indeed, leaves little to be desired."

It is at this point that John B. Meyenberg becomes an interesting figure. He served an apprenticeship with the Anglo-Swiss Condensed Milk Co. at Cham, Switzerland, and not being content to follow the routine through blind faith, during the period from 1880 to 1883, he conducted many experiments in packing unsweetened evaporated milk. When he was reasonably certain that he had found the proper method, he laid the facts before the company but received no encouragement for his pains. He therefore decided, though reluctantly, to come to this country where he believed the opportunities to be better. He arrived early in the spring of 1884 and immediately applied for a patent which was granted promptly on November 25 of the same year.
Going to Illinois he there became associated with the Helvetia Milk Condensing Co. at Highland, superintended the making of the special machinery needed for his process, operated it, and on June 25, 1885, packed the first sterilized unsweetened milk in this country. That date marks not only the birth of a new industry which has become one of great importance but also the application of a new principle in canning, the agitation of the cans while being treated and which has since been extended to many other foods. He did not claim invention of this feature but its application is the most important single step in the industry since the invention of the retort. The patent indicates that others had used the agitating principle but the writer has been unable to find such a record.

The first milk prepared by Mr. Meyenberg was not perfect and it required much time and experience to learn the limitations in handling milk under various conditions, the influence of feed, season, and other factors which affect it to a greater or less degree. But, as experience was acquired, it was found that the fundamentals were correct and the method was universally adopted and only recently has been modified to become a continuous instead of a batch process.

Others, following the precedent which he had set, developed machines which varied in mechanical details from the Meyenberg equipment, permitting greater capacity, easier loading and unloading, etc., but preserved the principle. Great secrecy was also maintained with regard to the handling of retorts, whether the cans were turned continuously or interruptedly, the speed of agitation, the rate at which the temperature was brought up, the time of holding, and the rate of cooling after the cooking period was over. It is of interest that in the development of the continuous system of sterilizing it was necessary to closely approach the treatment of the milk as accorded in the Meyenberg process.

John B. Meyenberg, incidentally, was born in the village of Zug, Switzerland, November 13, 1847, and was fortunate in receiving a much better education than most men of his time. This was largely due to his innate desire for knowledge and taking advantage of every opportunity that presented itself. His liking was especially along the line of science, which stimulated accurate observation, and he was skilful in the use of tools, both of which traits stood him in good stead when he became older and was serving an apprenticeship in a milk condensery. It was while working in the factory at Cham that he became convinced that evaporated milk could be preserved the same as other canned foods if only the right combination for the treatment be worked out. Sweetened milk was very costly on account of the sugar which it contained and furthermore was unsuitable for
many purposes. Plain evaporated milk appealed to him as having much greater possibilities and wider uses. He made many experiments in the canning of evaporated milk but needed special apparatus to carry them to a conclusion and these he could not obtain. The result was as already detailed and the credit for originating the industry rests in the United States instead of in his native land.

Mr. Meyenberg did not remain long with the Helvetia Milk Condensing Co. but became a promoter of the process at other points as Monroe, Wis.; Elgin, Ill.; Buena Park, Calif.; Seattle, Wash.; and Salinas, Calif. Some of the best and most widely known brands of milk were originated under his direction.

Mr. Meyenberg was married to Miss Josephine Boussand, Zug, Switzerland, before coming to this country. Three sons were born to them and they are active men in the communities in which they live. Mr. Meyenberg retired from business in 1911, and died at his home in San Jose, Calif., October 29, 1914. His was an active life and labor was no deterrent in reaching his ideals. He had the good fortune to live and see his dream come true. His home was marked by kindly hospitality and the end made doubly pleasant for he had given far more for the betterment of humanity than he had received in return.
Other publications relating to the historical and scientific aspects of Evaporated Milk, also booklets on infant feeding and recipe books may be obtained from

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