

## THE CONDENSED MILK MANUFACTURE.

[Condensed from the Milk Journal.]

For many years there have been upon the market preparations called "Dessicated Milk," "Milk Powders," "Milk Essence," &c. But these were articles prepared from milk rather than actual milk. They found, however, prior to the introduction of Condensed Milk proper, considerable demand for use at sea, and in the colonies, where anything that has the appearance of milk will, in the nature of the case, command more or less sale. Still they did not enter into family consumption to any extent. The desideratum was a preserved milk which should be so pure, wholesome, and palatable as to take the place of crude milk in large cities.

To Mr. Gail Borden, of New York, should be awarded the credit of producing preserved milk that filled all these conditions. Indeed, all the brands of good or even fair quality now sold are prepared substantially under the system originated by him. A man of intense energy and unyielding tenacity of purpose, and an inventor, of great ingenuity if not of marked scientific attainments, he added to all this the enthusiasm of a philanthropist who believed that preserved milk would be a boon to humanity. As long ago as 1846 he began his experiments, conducted simultaneously with others, the aim of which was the preservation of meat. It may be mentioned here that in the London Exhibition of 1851, a gold medal was awarded to Mr. Borden for his "Meat Biscuits." We believe that he did not at this time exhibit his condensed milk. It was not till about 1856 that he himself arrived at the conviction that he obtained the quality he had been seeking. Meanwhile he had expended energy, time, and quite a fortune in his experiments, for he at length saw that, to experiment to advantage, a large amount of material, involving much expense, must be used in each instance.

At an early stage of his experiments he decided that milk could not be preserved in a dry form, as "dessicated," or "powdered," or "solidified," but must be left in a semi-liquid state. That some preservative agent must be added, and that nothing but water must be eliminated, also became apparent. The result is that condensed milk, as now known to trade and consumers, consists of milk from which only water has been taken, and to which nothing but sugar has been added, the product being of the consistency of honey, and by dilution in water reconvertible to milk itself, somewhat sweetened. It may be stated in this connection that all the dry preserved milks require to be dissolved in hot water, while the condensed milk prepared under the Borden system readily dissolves in cold water.

By 1861, Mr. Borden had quite extensively introduced his article, and four or five factories were in operation, capable of producing in the aggregate, perhaps 5,000 tins of one pound each per day. During the war of the rebellion, large quantities were required for the Northern Armies, the officers and many privates purchasing it of the sutlers, while the hospitals were supplied by the Government and the various Sanitary and Christian Aid Societies. This gave an impetus to the trade, at the same time that the shipping demand steadily increased.

About this time Mr. Borden put upon the market for city use what he calls "Plain Condensed Milk." This is prepared in the same way as the other, except that no sugar is added, and it is not hermetically sealed. It will remain sound from one to two weeks, and is so pure and so convenient, as well as economical, that it is stated that now more than one third of the milk used in New York City is of this kind. With the end of the war and the dissolution of the armies, the demand for sugared condensed milk fell off, and the manufacturers, who had been stimulated to too great a production, turned their attention to this "Plain Condensed Milk." It would be well if enterprise and capital and philanthropy could be enlisted in supplying London with this form of milk to the extent that New York and other American cities are now supplied with it. We have no means of estimating the present extent of the manufacture of condensed milk in the United States. For this we must wait for the returns of the census of 1870. However, we know that the capacity of the eight or ten factories, on the Hudson, in Connecticut, Pennsylvania, and Illinois, is not less than 500 cases of four dozen pound tins per day, equal to 8,500,000 pounds per annum. It may be stated that one pound of the condensed is equivalent to four or five pounds of crudemilk.

The exports from the United States of condensed milk (combined with sugar) during the twelve months ending September 30th, 1870, amounted to a declared Custom House valuation of \$200,000. In the year 1869 it was exported to England from New York to the value of upwards of \$30,000. The bulk of the remainder exported from New York was sent to South America, Australia, India, and China, while that sent to London and Liverpool was mainly held in bond, and sent eventually to the British Colonies or disposed of as ship's stores.

We now pass to the introduction of the manufacture of the Borden kind of condensed milk in Europe, and to the development of its manufacture and sale.

In 1865 an American gentleman, who had noted the advantages of the article, in the American Army during the four years of the war, became resident in Switzerland in the capacity of United States Consul. Remarkable the cheapness and richness of Swiss milk, the cheapness of labor, and other facilities afforded in that country, he conceived the idea of preparing condensed milk in Switzerland. The ultimate success of his project has abundantly proved the soundness of the conception. He promoted the "Anglo-Swiss Condensed Milk Company," the extent of whose present business is set forth in the following extract from "The Grocer" of December 31st:

"In the canton of Zug there has of late grown up a new mode of preserving milk, which, owing to the good pasturages of that locality, is very excellent in quality. In the commune of Cham, the Anglo-Swiss Condensed Milk Company, with a capital of £12,000, employ about sixty operatives in their factory, the tall chimney of which may be seen by the railway traveller passing over the line from Lucerne to Zurich. The number of cows hired for the year is 1440, and the average amount of condensed milk prepared daily during the 365 days of the year, (as it is necessary to include the Sundays), is 110 cases of four dozen each of 1lb. tins; these equal 1,927,200 tins as produce of the year. The price of the crude milk is 17c. per mass, or about 1d. per quart, and the daily cost of the tins, made in the establishment, amounts to £16 10s. About one half of the produce is sent direct to London, where one half of this is consumed, whilst the remainder goes for ship stores, is exported to the colonies, and sent to the provincial towns of England. Entering, as it does, into the daily food of the masses, no duty should be imposed upon it; at present it is classed with confectionery, and pays accordingly, whereas it is milk; at all events only the quantum of sugar which it contains should pay duty and this quantum is uniform, and can easily be ascertained. The half of the produce not sent to England is distributed over Germany, and there is some demand from France and Russia. We have been informed that a large shipment was placed in Paris two days before the investment of the city, and balloon letters beg that a large supply may be ready to be sent in so soon as the siege shall terminate. Owing to the demands from the sutlers who supply the armies of Germany and France, and the various aid societies, for the moment this Company is only able, with great difficulty, to keep an adequate supply for the regular demands.

This Company was the first in Europe to introduce condensed milk to family use. Until its advent, the article was known only as for ships' stores and for colonial consumption. By extensive and systematic advertising, and through the boundless energy which characterizes your business Yankee, this Company has secured a large demand for ordinary family consumption, not only in England, but also in Germany and Russia. Baron Liebig and other authorities on questions of food, supported it heartily from the first, and allowed the patronage of their names for publication. Its success led naturally to the springing up of competitive companies. These have been organized at Grütters and half a dozen other places in Switzerland, in Bavaria, in Holstein, in Ireland, and in England. But failing to produce a standard quality, and wanting in *prestige*, they have nearly all ceased to manufacture.

All now known to the London trade are the Anglo-Swiss ("Milkmaid Brand"); Mr. Newnam's "Irish Condensed Milk," from Mallow, near Cork ("Harp Brand"); and the English Condensed Milk Company ("Lion Brand"), whose works are at Aylesbury, Buckinghamshire.

## Electrotypy.

This has taken a very important place among the useful arts, enabling manufacturers to produce cheaply a great many things which were otherwise expensive, and artisans to do many things which were otherwise impossible. The process is not a difficult one to comprehend. A galvanic current has the property, under certain conditions, of decomposing many chemical compounds. If the ends of two wires, connected with a battery, be inserted in a vessel of water, and a current of sufficient power made to pass from one to the other through the water, the latter is decomposed into its elements, which are the gases hydrogen and oxygen. One gas will rise in bubbles from one wire end, and the other from the other. These wire ends are called electrodes. Many other substances, if dissolved in water, will decompose much more readily; as, for example, sulphate of copper, commonly known as blue vitriol. This is a compound of sulphuric acid and copper, and it takes much less power to separate the two than to resolve water into its component parts. As the current passes through the solution of blue vitriol the sulphuric acid appears at one electrode, and the pure copper at the other. The sulphuric acid thus set free from its previous combination, will at once attack its electrode, if it be of any metal for which it has affinity. As the wires are generally copper, it, of course, produces new blue vitriol at the expense of the electrode which is thus eaten away. Meanwhile the other electrode is receiving continual accession of copper, which is deposited upon it. If now there be attached to this wire a cast of any kind, which it is desired to reproduce in copper, the metal is deposited upon it as long as the galvanic current is flowing and doing its work. A perfect copy, taking every minutest hair line, is thus obtained in pure copper; and if the surface of the cast or mould be properly protected, the copy may be readily removed after it is complete. The process might be continued until the deposit of copper should become indefinitely thick, but for economy in expense it is usually arrested when there is only a very thin layer, and into this a backing of soft metal is run, in order to give stiffness. By this simple means, anything may be copied with absolute accuracy, whether it be a seal, or a medal, or an engraved plate, or a leaf, or even a photographic negative; the one condition being that the picture or device depend on an unevenness of surface. Engraved plates, especially those of the great masters, are very costly, and yet, after a certain number of proofs have been printed, they lose, by wearing, much of their delicacy in the finest lines and touches. The first thousand impressions are far more valuable than any taken subsequently. The difficulty is now obviated by electrotypy, as the original plate coming from the hand of the artist need never be put under the printing press to lose its sharpness of outline. Copies can be taken indefinitely, and the originals

of great works preserved for all time. So, also, by some newly discovered device, a printed engraving of which the plate is lost or ruined, may be used to reproduce a new plate, as perfect as the original. Thus we have the means of restoring the best productions of the most celebrated masters at a very small cost. A much more extensive application of this art is in the reproduction of printed matter in the permanent form of copper plates. Various metals may be deposited by the same method from suitable solutions—gold, silver, nickel, and platinum, as well as copper. This gives a ready means for covering, or plating inferior metals with the noble metals, which may be done to any desired thickness, as in a multitude of articles for domestic use.

Electrotypy affords an excellent employment for boys, combining entertainment with instruction and the development of skill. They can easily learn how to do it, if they are blessed with any aptitude, and it may lead them to deeper studies in chemistry, greatly to their advantage, and to the exclusion of mischief-making.—*Mechanics' Magazine*.

## Warming Country Houses.

One of the most important items in the preservation of the general health is being comfortably warm all the time, for then we would never take cold. There should be a room in every farmer's family which should be kept at a temperature of not under 65° Fah., from daylight until bed-time, all winter, by stove or furnace heat; stoves are better, because they will bring up the heat more quickly. When the farmer comes in from his work, he is generally over-heated and tired, both conditions making him greatly more susceptible of taking cold; or, on the other hand, he is very cold from having been riding, or engaged in something which has not involved activity enough to keep him adequately warm, and then a well-heated room is exceedingly grateful, and gradually raises the temperature of the surface of the body to its natural condition.

Large stoves consume less fuel in proportion than small ones, and give out more heat hence are more economical.

It is a common error in the country to have too small stoves, so as to economize space, and under the mistaken notion that they consume less fuel in proportion. A circular stove, six feet high and about two feet in diameter, lined with fire brick two feet high, will keep a large room more equably warm, and maintain a purer atmosphere, with a very much less amount of fuel, than our common stoves. Stoves of this shape, made of porcelain, are used in Germany and Russia, where wood is grown for fuel; and, from personal observation, we think that about half the amount of wood is consumed, giving a greater, better, and more comfortable heat than we have here. In farmers' houses, an immense amount of heat is used in warming "all out doors. The longer a flue is, the stronger the draft; all flues should be built from the ground, thus securing a good draft, and also saving millions of property every year from being burned, which is the case when flues are built on floors up through the rafters and roof.

Two sitting rooms on the same floor, and one or two chambers above, may be adequately warmed by one stove thus: Let the stove stand in one room, and let a pipe of good size be sent through the partition into the adjoining room, where it should expand into a large drum; from this drum the ordinary pipe should extend, through the floor, into the chamber above, with a drum there, if needed. Only a moderate amount of heat is needed in a chamber; but that moderate amount is needed in winter time. There is no advantage in going to bed in a cold room, nor in sleeping in a cold room, nor in getting up and dressing in a cold room; persons may survive it; many have lost health by it. To have the chill taken off the air on going to bed, and when dressing, is comfortable and healthful. A room under 45° is a cold room for a sleeping apartment, and sleeping in an atmosphere, indoors, lower than that is always hurtful, is always positively pernicious, for the simple reason that such a temperature causes the carbonic acid gas of a sleeping apartment to condense and settle in the lower part of the room, where it is breathed into the lungs, with the most pernicious results. Sleeping in a room cooler than above named is especially dangerous to aged, feeble, and invalid persons, as it tends to cause inflammation of the lungs. Persons may sleep out of doors with impunity when the temperature is many degrees lower; that is because the out-door air is pure, is full of life, full of oxygen, without any admixture of indoor poisons, and hence gives a vigor of circulation, which keeps the whole body warmed to its natural point, resisting cold and all diseased conditions.—*Hall's Journal of Health*.

## A New Brass.

The difficulty of uniting iron to brass is created by the unequal rate of expansion in the two metals, which destroys the unity when the temperature is changed. A new alloy of copper is announced, and the inventor claims that its expansion by heat is so similar to that of iron and steel, that the surfaces may be regarded, when joined, as permanently united, for all practical purposes. The formula (recently published in the *Journal of Applied Chemistry*) is as follows: Tin, 3 parts; copper, 39½ parts; zinc, 7½ parts. Any of our readers who have occasion to join iron and brass, can easily try this new "metal," and we shall be glad to hear of the practical value of an idea of such high technical importance.

OPIMUM culture has been attempted in Illinois, and although the poppies did not grow to be healthy plants, some opium was obtained, by incision of the capsules, which, on treatment by Mohr's process, gave nearly nine per cent of crystals of morphia. The grower will experiment further this year.