MERRELL-SOULE PRODUCTS

WILLIAM B. GERE

AN APPRECIATION

The fiftieth anniversary of Merrell-Soule is commemorated by this volume.

Since that autumn day in 1868, when G. L. Merrell and O. F. Soule joined their modest fortunes in the establishment of the business which has since borne their names, the story of Merrell-Soule has been one of continuous growth, expansion and progress. Canned goods constituted the sole output of the little factory of fifty years ago; to-day canned goods have been forgotten; ten Merrell-Soule Powdered Milk factories stretch across the country from Syracuse to Omaha, while the output of None Such Mince Meat amounts each year to more than ten million packages.

Among the men whose earnest thought and whole-hearted endeavor have been given to the building up of Merrell-Soule, to the establishment and growth of all that Merrell-Soule stands for, no name stands forth more notably than that of William B. Gere, and this volume is dedicated to his memory.

MERRELL-SOULE PRODUCTS

Powdered Milk
and
None Such Mince Meat

MERRELL-SOULE COMPANY
General Offices
SYRACUSE, NEW YORK

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G. L. Merrell

O. F. Soule

MERRELL-SOULE

For Fifty Years an Honored Name in Business

THE organization which stands back of the Merrell-Soule products is one which for fifty years has striven to make the Merrell-Soule brand, on every package, a badge of guaranteed quality.

The firm of Merrell & Soule was founded in 1868 by G. Lewis Merrell and Oscar F. Soule, who formed a co-partnership for the manufacture of canned goods and established a small factory at Syracuse, N. Y. A new co-partnership was formed in 1883, between G. L. Merrell, O. F. Soule and F. C. Soule, the last named being the son of O. F. Soule. This co-partnership continued until 1893, when the firm was incorporated, under the name of Merrell-Soule Company.

O. F. Soule died in 1902, and G. L. Merrell in 1909. The founders of the business were succeeded in its active management by their sons, and to-day a third generation is coming into its own in the Merrell-Soule executive offices.

F. C. Soule is now president. His sons, Oscar F. Soule and Robert G. Soule, are respectively treasurer and secretary. Irving S. Merrell and O. Edward Merrell, sons of G. L. Merrell, are respectively first and second vice-presidents of Merrell-Soule Company. Their father was an inventor and an expert in mechanical problems, and his sons have followed his bent, both being active in the mechanical department of the company.

O. F. Soule specialized in chemistry during his college years, and gives much of his time to the Powdered Milk Production Department. R. G. Soule, in addition to his duties as secretary, is sales and advertising manager.

The little factory first erected by the original partners was outgrown within a year, and a new one was built. In 1904 the present building was erected, at the foot of North Franklin Street, in Syracuse.

The canning of fruits and vegetables was during the early years of the company its only field of activity. In the course of time, labor-saving machines, invented by G. L. Merrell, were manufactured, and

sold to other canners. Both these industries, however, were eventually discontinued, giving way to the manufacture of None-Such Mince Meat and Merrell-Soule Powdered Milk.

In the year 1885, the manufacture of None Such Mince Meat was begun. This business increased rapidly from year to year, so that the sales now amount to more than 10,000,000 packages annually. The inception of the Powdered Milk business was in 1899, and its history is given elsewhere in this volume.

FRANK C. SOULE

Frank C. Soule, president of Merrell-Soule Company, was born in Syracuse in 1861, and received his education in the schools of his native city. At the age of eighteen he entered the employ of Merrell & Soule, and at twenty-one was admitted to partnership.

Thus Mr. Soule's entire business career has been devoted to developing the industry of which his father was one of the founders. He has seen its growth, from a modest beginning, to one of the largest and best-known companies engaged in the manufacture of food products.

What Is Merrell-Soule Powdered Milk?

IT is rich, pure milk, reduced to powder by a process in which no vital or nutritive quality of the milk is affected.

It is a form of milk in which bacteria cannot propagate.

It is the cleanest and purest form in which milk can be packed, shipped and stored.

It is milk whose transportation cost has been reduced seven-eighths (liquid milk is seven-eighths water).

It is the most convenient, most economical preparation of milk, for baking, candy-making, ice-cream manufacture, and all dairy and creamery purposes.

It is a veritable boon to hotels, restaurants, clubs, steamships, settlement houses, etc., needing only to be mixed with water in order to produce an instant, pure and palatable supply of milk for drinking or cooking.

It is a product which holds within itself and its development the brightest possibilities, greatest growth and most assured success of the milk industry, and every industry dependent on milk.

"The product of the Merrell and Gere process is without question superior to any milk powder manufactured by the various processes herein mentioned. It embodies the three all important characteristics of a desirable and successful milk powder; namely, it contains less than the minimum amount of moisture which permits of bacterial action, its butterfat is retained in the globular form and does therefore mix with water readily, forming a complete emulsion, and its albumen is present in its natural non-coagulated and soluble form, ensuring complete solubility of this dried milk in water."—From "Condensed Milk and Milk Powders," by O. F. Hunziker, B.S.A.,M.S.A., Professor of Dairy Husbandry, Purdue University, and Chief of the Dairy Department of the Indiana Agricultural Experiment Station, Lafayette, Ind.

Development of the Ideal Method of Milk Preservation

ONE thing above all others has been sought in the milk industry—to find a process of preservation by which milk could be put away when it was plentiful and released for consumption in the seasons when there was a shortage; a method by which milk could be transported great distances, to any climate, in any season, at minimum transportation cost, and stored without deterioration for long periods of time.

The desired process must, it was evident, be one which would not affect the active principles or the nutritive qualities of milk, nor change its chemical reactions in any way. The product when reaching the consumer must be, in every essential quality, Fresh Milk.

The methods known as condensation and evaporation, also the earlier milk powder processes, were efforts to achieve the desired result. But in none of them was the goal completely attained, as it is to-day in Merrell-Soule Powdered Milk—the product of a perfected process.

Liquid Milk is seven-eighths water. Merrell-Soule Powdered Milk contains approximately 2 per cent. of moisture. Transportation cost is thus reduced to a very small percentage of the expense of shipping liquid milk. The fact that powdered milk may be shipped by freight, while liquid milk must go by express or baggage, means an additional saving.

The expense of shipping powdered milk is also, of course, much lower than the transportation cost of the condensed product.

The Merrell-Soule process reduces the bacteria count to a remarkably low figure, and it is a demonstrated fact that the bacteria which are to be found in the fresh-made powder tend to decrease, rather than propagate, during storage.

Merrell-Soule Powdered Milk is quickly and easily dissolved in water, and the "reconstituted" liquid milk thus obtained is pure, fresh milk, with the delicate odor and unmistakable flavor of fresh milk, and with every chemical reaction and nutritive property of fresh milk retained unchanged.

Merrell-Soule Spray Process

Its History and Development

THE history of Powdered Milk dates back to the middle of the last century, when an inventor named Grimwade patented, in England, the first commercially usable process.

He added carbonate of soda to fresh milk, evaporated it in open-jacketed pans, with constant agitation, until a dough-like substance resulted; added cane sugar, pressed the mixture between rollers into ribbons, dried it still further, then pulverized it.

This process, cumbersome and unsatisfactory as it must have been, was in practice for some years. Other processes followed at intervals for half a century, but the real commercial development of the industry dates back only about twenty years.

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It was in 1899 that a machine for the drying of milk by what has since become known as the "double roll" process was invented by W. B. Gere, since deceased, then secretary of Merrell-Soule Co., and I. S. Merrell, first vice-president of the company. But the "dry milk" which resulted from this process was not satisfactory, and for that reason was not put on the market by Merrell-Soule Company.

Several other processes were then tried out, but none proved satisfactory until Lewis C. Merrell, brother of I. S. Merrell, hit upon the spraying of milk into a regulated current of heated air. This gave the quality that had been desired, and the next thing was to determine the commercial value of the process.

In January, 1905, a building owned by Merrell-Soule Company at Fayetteville, N. Y., was equipped, and powdered milk was produced, in a small way, by this spray process. Enough was marketed, and with sufficiently gratifying results, to warrant the company in going ahead with the enterprise.

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Meantime, patents had been applied for, and the patent office had referred Merrell-Soule Company to a United States patent granted

Irving S. Merrell
Vice President

Oscar F. Soule
Treasurer

Robert G. Soule
Secretary

O. Edward Merrell
2nd Vice President

in 1901 to Robert Stauf, of Posen, Germany, which seemed to cover the process. F. C. Soule, president of Merrell-Soule Company, thereupon went to Germany and bought not only the United States patent held by Stauf, but also thirteen foreign patents owned by Stauf and his associates.

The wisdom of the purchase of all the patents held by the Stauf interests has since been amply demonstrated. In 1915, patent litigation which had been in the courts for three years was decided by the Court of Appeals in favor of Merrell-Soule Company, the decision being based on this company's possession of the basic patents governing the spray process of powdered milk manufacture.

Following the success of the experiment at Fayetteville, the construction of the first Merrell-Soule Powdered Milk factory, at Arcade, N. Y., was begun in 1906. Before this factory was completed, it had been discovered that a better product could be obtained by condensing the milk in a vacuum pan before spraying. This resulted in new patents covering what was known as the Merrell-Gere process, embodying the original Stauf method and the improvement mentioned. Since then many other improvements have been made at the Merrell-Soule plants, and many other patents taken out.

The first powdered milk factory, at Arcade, was followed by a second, at Little Valley, N. Y., in 1909. Since then factories have been established at Frewsburg, N. Y., Union City, Pa., Waterford, Pa., Farmersville Station, N. Y., Warsaw, N. Y., Gainesville, N. Y., Attica, N. Y., and Omaha, Neb.

Consumption of milk has increased from 18,000 quarts per day, in 1906, at Arcade, to 400,000 quarts per day, at the present time, in the ten factories. The output of Powdered Milk has grown from 2,500 pounds per day, twelve years ago, to a present capacity of 70,000 pounds per day.

A Trip Through a Merrell-Soule Powdered Milk Factory

PICTURE to yourself a large, light, clean room, with a wide doorway at one side where cans of milk—fresh, cold and sweet—are being unloaded from big drays, in almost unending succession.

There you will have the first step in the manufacture of Merrell-Soule Powdered Milk. This first step includes more, however, than the mere collecting of the cans of milk from the farmers, and their transportation to the testing and weighing room. Every farm which sends milk to a Merrell-Soule factory is visited, as often as may be necessary, by a Merrell-Soule inspector, whose business it is to see that strictly sanitary conditions are maintained by the farmer.

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Unloaded at the factory, each can of milk passes first to a man who removes the cover and lifts it to his face, so as to catch the odor which has risen from the milk into the cover. Just a whiff is sufficient for this expert. If the odor indicates any condition which he knows should not be present in fresh, sweet milk, that can is set aside. Not only is it rejected, but an investigation is made, to ascertain the cause of its condition, and steps are at once taken to correct wrong conditions at the farm from which it came.

Not often does this occur, because of the vigilant inspection at all farms. Most of the cans, passing rapidly on an automatic conveyor before the expert tester, are accepted, the milk is weighed and emptied into receiving tanks.

Next comes the "skimming" of the milk—the removal of the butter-fat—by a separator. The cream which is removed is pasteurized and placed in cans to be marketed. The skimmed milk is also pasteurized, then it goes to a vacuum pan, where part of the water it contains is removed by condensation, at a temperature which does not coagulate the albumen nor affect any vital principle of the milk.

Now comes the operation which is both most interesting to watch and most important in making Merrell-Soule Powdered Milk absolutely

different from, and superior to, powdered milk made by any other process. This is the spraying process, covered by the Merrell-Soule patents.

In this process the partly condensed milk is sprayed through tiny holes in metal discs into a current of warm air. The moisture in the milk is instantly absorbed by the heated air, the remaining solid portion separates into minute particles and falls like the finest, drifting snow to the floor of the chamber in which this process takes place.

These tiny particles, closely massed as the finest flour, constitute the finished product—Merrell-Soule Powdered Milk.

Gathered up, after it has fallen to a depth of several inches, the milk powder is ready for packing.

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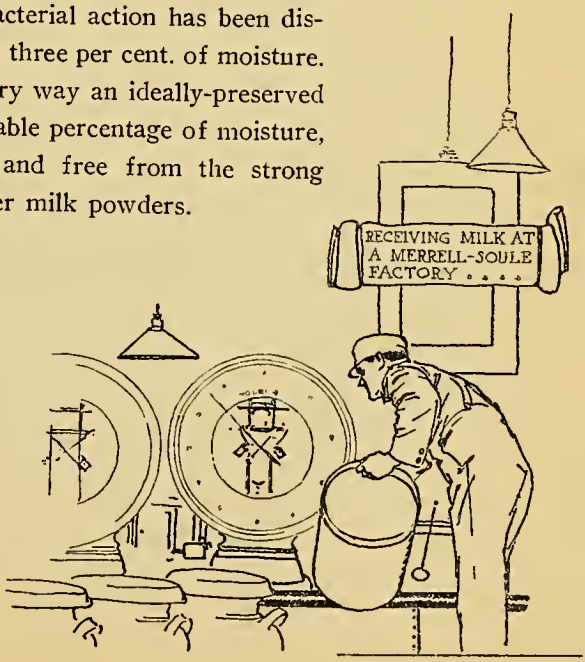
It is an important as well as a noteworthy fact that no chemical change is produced in the milk by the spraying process. There is no super-heating of the milk particles when they are blown into the current of hot air. Instead, the instant evaporation has a cooling effect—the process not only takes heat from the air, but also from the interior of the particles, so that the milk solids become cooler and cooler until perfectly dry.

It is not necessary to neutralize the acidity of the milk, for the moisture is removed so quickly that neither the albumen nor the casein is affected in any way by the concentration of the acid.

The powdered milk, in frequent tests, has been found to contain less than two per cent. of moisture—and no bacterial action has been discovered in milk powder containing less than three per cent. of moisture.

Merrell-Soule Powdered Milk is in every way an ideally-preserved milk—soluble, containing the lowest obtainable percentage of moisture, offering no breeding place for bacteria, and free from the strong "cooked flavor" so noticeable in many other milk powders.



Merrell-Soule Milk Products

THERE is a Merrell-Soule Powdered Milk product for every need that can be met by liquid milk or cream, condensed or evaporated milk, or buttermilk.

These products include Powdered Skimmed Milk, Butterfat Powders, of varying butterfat content, "Cream Powders," which contain up to 72 per cent. butterfat, and Powdered Buttermilk.

Powdered Skimmed Milk

Merrell-Soule Powdered Skimmed Milk may truthfully be said to afford the closest approach to an ideally preserved milk that can be found.

It is pure, fresh skimmed milk, reduced to powder form by the Merrell-Soule Spray Process. It will keep almost indefinitely, in cool, dry storage, and when it is "reconstituted" into liquid milk, by the simple process of dissolving it in water, the resultant beverage will be found as fresh and palatable as new milk from the cow. Decomposition having been prevented solely by dryness, and without changing the chemical composition of the milk, it can be demonstrated that no essential property of the fresh skimmed milk has been diminished or altered.

Merrell-Soule Powdered Skimmed Milk is used in dairies and creameries for standardizing milk, for making butter "starter," for the manufacture of liquid milk, cream and buttermilk. Ice cream makers use it for standardizing milk, for making liquid milk and cream, and for "milk solids."

The baker uses it in bread, cakes, custards, creams, piecrust—in any way that he would employ liquid milk. Confectioners find that it surpasses any other form of skimmed milk for the making of delicious, delicately-flavored caramels, milk coatings and fudges.

Hotels, clubs, steamships, restaurants, by using Merrell-Soule Powdered Skimmed Milk, avoid the annoyances of shortage, delivery troubles, souring. Fresh, pure liquid skimmed milk can be made up,

in any desired quantity, whenever needed, for drinking, cooking, or the making of ice cream.

Milk stations, by having Merrell-Soule Powdered Skimmed Milk on hand, are enabled to meet unexpected demands, and to take care of shortages. Condensaries are using Powdered Skimmed Milk in the manufacture of "Superheated Condensed" for the dairy trade.

Butterfat Powders

Merrell-Soule Butterfat Powders are made from milk which contains varying amounts of natural butterfat content.

For instance, No. 14 Butterfat Powder has as a base a "half-skimmed" milk, containing approximately 1.6 to 1.8 per cent. of butterfat. It is used for Prepared Cocoa, in Milk Chocolate, for confectionery, in biscuit, crackers and other bakery goods, and for the making of a rich grade of Lactated Buttermilk.

Fresh liquid pasteurized whole milk, standardized to contain 3.5 per cent. butterfat, is used for the manufacture of No. 25 Butterfat Milk Powder. In the powder, the percentage of butterfat runs from 26 to 27½ per cent. This product is commonly known as Powdered Whole Milk and can be used for all purposes for which ordinary cow's whole milk is used.

It is ideal for bakery purposes requiring whole milk, for the manufacture of milk chocolate and all milk confections, and for the production of Normal Whole Milk.

Both this powder and the No. 14 Butterfat Powder will remain sweet and in perfect condition for from three to six months, without refrigeration, and will keep indefinitely, in dry cold storage.

"Cream Powders"

In a group under the general designation of "Cream Powders" are the No. 50, No. 65 and No. 72 Merrell-Soule Butterfat Milk Powders.

The No. 50 is manufactured from milk containing 9 per cent. of butterfat, and the butterfat in the powder amounts to 50 per cent. In

the No. 65 the butterfat content in the milk base is 15 per cent., in the powder 65 per cent. The No. 72 is made from standard cream, containing 18 per cent. butterfat in liquid form. There is approximately 72 per cent. butterfat in the powder.

The No. 72 is therefore the only one of the three which can legitimately be termed a "Powdered Cream", though the other two are commonly referred to as "Cream Powders." The cream made from the No. 72 powder will not whip, as whipping cream must contain 26 to 28 per cent. of butterfat in the liquid form.

All the Merrell-Soule "Cream Powders" are unexcelled for the manufacture of Ice Cream and Confectionery. The No. 50 is widely used by bakers in fancy crackers and cakes. No. 72 may be reconstituted into Fresh Pasteurized Cream.

Powdered Buttermilk

After Merrell-Soule Company had successfully produced the various Powdered Milk products which have been described, the engineering and chemical departments sought a way to adapt the Merrell-Soule process to buttermilk.

It was found that the lactic acid contained in liquid buttermilk presented new problems which had to be met. All difficulties, however, were eventually overcome, and a highly satisfactory product obtained.

In order to manufacture Powdered Buttermilk commercially, it was necessary to insure a supply of liquid buttermilk great enough to warrant the erection of a factory for the manufacture of Powdered Buttermilk exclusively. To this end, an agreement was made with one of the largest manufacturers of creamery butter in the United States, with its creamery located at Omaha. Merrell-Soule Company obtains its supply of fresh liquid buttermilk from this company's churns.

As in all Merrell-Soule products, quality is the first consideration in the manufacture of Merrell-Soule Powdered Buttermilk. The creamery purchases its cream on a strict quality basis, and in the grading of the cream the buttermilk is also graded. Only buttermilk from

first-class cream is used in the manufacture of Merrell-Soule Powdered Buttermilk. Every sanitary precaution is employed, and the Omaha factory is under the direct supervision of the Merrell-Soule production and chemical departments, assuring a uniform product.

Merrell-Soule Powdered Buttermilk, guaranteed to comply with all Federal and State food laws, has come to be one of the most important and valuable products offered for the baker's use. For particulars of its uses and advantages in the bakery, see pages 38, 39, 40, 41, 42, 43.

Merrell-Soule Powdered Buttermilk is also employed with excellent results in cracker and biscuit manufacture, and for the manufacture of prepared flours. It can not be used for the making of liquid buttermilk which is to be used as a beverage, nor for the baking of custard or cream pies.

Uses of Merrell-Soule Powdered Milk Products

1. Bakeries:
   - a. Bread, Rolls, Sweet Yeast Dough Goods.
   - b. Powdered Buttermilk for Bread-Making.
   - c. Powdered Buttermilk a Preventative of "Rope".
   - d. Cakes.
   - e. Pie Crust, Pie Filling and Soft Pies.
2. Dairies:
   - a. Standard Skimmed Milk.
   - b. Manufacturing Milk and Cream.
   - c. Standardizing Milk and Cream.
   - d. Manufacture of Buttermilk and Cultured Milk.
3. Creameries:
   - a. Manufacturing Milk and Cream.
   - b. Standardizing Milk and Cream.
   - c. Manufacture of Buttermilk and Cultured Milk.
   - d. Manufacturing Starter for Butter-making.
4. Ice Cream Plants:
   - a. Manufacturing Milk and Cream.
   - b. Standardizing Milk and Cream.
   - c. Furnishing Skimmed Milk Solids.
   - d. Blending to Produce Complete Total Milk Solids.

5. Condensaries:
   a. Manufacturing Superheated Milk for the Ice Cream Trade.
6. Confectioners:
   a. Manufacture of Caramels and all Milk Confections.
7. Hotels, Restaurants, Steamships, etc.:
   a. For Cooking Purposes.
   b. Ice Cream Manufacture.
   c. Supply of Drinking Milk.
8. Physicians, Hospitals, Nurseries:
   a. Preparation of Modified Milk for Infant Feeding.

Merrell-Soule Powdered Milk Products in the Baking Industry

IN the following pages, it is our purpose to describe the general bakery uses of Merrell-Soule Powdered Skimmed Milk and Merrell-Soule Powdered Buttermilk, to give necessary technical information regarding the employment of these products as ingredients in the manufacture of baked goods, and to show the advantages gained by their use.

However, it is well to bear in mind that each day brings to light new discoveries made by men in the industry who are on the alert to extend their technical knowledge by research, investigation and experiment. Therefore it would be an impossibility for us to cover all the possible uses for our products in this book.

But we are confident that the reader will find herein much valuable instruction regarding the uses of Merrell-Soule Powdered Milk in the baking industry. We shall be more than pleased to hear from our readers who have questions to ask, and we will do our best to answer every inquiry clearly and fully.

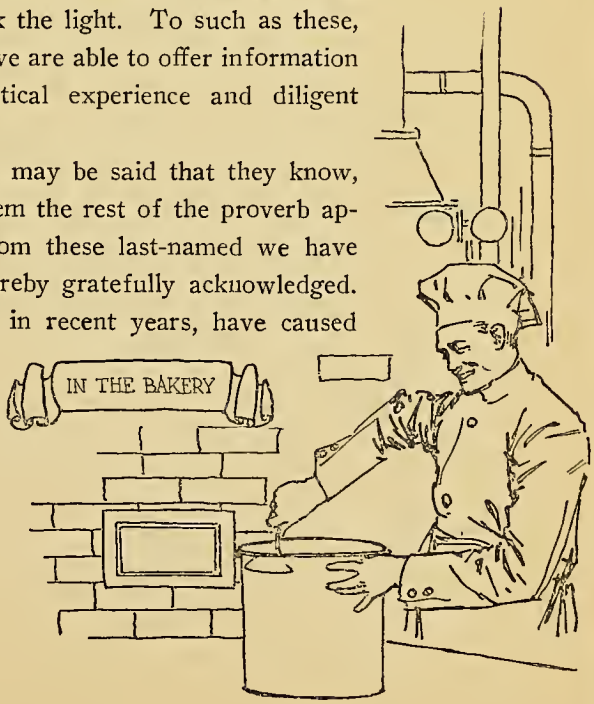
Bakers' Technical Service Department

Centuries ago the wise men of the East had a proverb to the effect that "he who knows not, and knows not that he knows not, is a fool; shun him!"

In another class they placed those who, knowing not, but knowing that they know not, have begun to seek the light. To such as these, among the bakers of the United States, we are able to offer information which has been gained through practical experience and diligent research.

Of a few in the baking industry, it may be said that they know, and they know that they know. To them the rest of the proverb applies, which says: "follow them!" From these last-named we have received many valuable suggestions—hereby gratefully acknowledged.

Revelations in the baking industry, in recent years, have caused



bakers to see as never before what vocational training means, and that technical training is a necessity to the man who is to hold his own, in the strenuous competition which prevails in the industry.

Merrell-Soule Company long ago discovered the important fact that men who have at least an elementary knowledge of technical matters appertaining to the baking industry will be best able to sell goods to the bakery trade. With this in mind, the Company established its Bakers Technical Service Department, managed by an expert possessing the necessary vocational training. Experimental service is conducted in connection with this department, and a well-equipped laboratory, together with the services of specially qualified chemists, is available for the working out of any technical problem concerning the use of Merrell-Soule Products.

It is the desire of Merrell-Soule Company to assist in bringing the baking industry to a higher plane, by giving the baker and the supply house salesman a direct insight into the manufacture, uses and advantages of Merrell-Soule products, brought by years of research to their present high standard of quality.

General Baking and Cooking Uses

For general baking and cooking purposes, Merrell-Soule Company offers the following Powdered Milk products:

Merrell-Soule Powdered Skimmed Milk, manufactured from separated milk, is used in the manufacture of bread, rolls, crullers, sweet yeast dough goods, crackers and biscuits, quick breads, cakes, cookies, cones, custards, cream fillings of all kinds and soft pie fillings.

Merrell-Soule No. 25 Butterfat Powder, a whole milk standardized to contain 3½ per cent. butterfat, and reduced to powder form, is used for fancy cakes, better grade cream fillings, custards, and in goods where additional butterfat and a fine butter flavor are desired.

Merrell-Soule Powdered Buttermilk is natural buttermilk, taken from the churns of one of the largest butter factories in the United

States and reduced to powder form. It is known as the greatest bread improver on the market and its use up to 2½ per cent. in yeast doughs of all kinds will result in advantages that cannot be obtained in any other way. Crullers and doughnuts containing this product have become a much sought after specialty in districts where they have been introduced by progressive bakers. As an ingredient for batter cakes, such as pancakes of all kinds, buckwheat cakes and griddle cakes, it has long been recognized by manufacturers of mixed patent pancake flours as an ideal material.

Advantages of Merrell-Soule Powdered Milk for Baking

We have said that it is difficult to enumerate all the advantages of a good Powdered Milk, for even our oldest users are still finding new ways of working with this product. The greater benefits, however, may be summed up in these words: "Supply, Cleanliness, Convenience, Economy."

Your supply is assured because the Merrell-Soule factories, in the milk producing districts, manufacture a surplus of Powdered Milk from absolutely fresh milk, in the flush periods, so that there is an ample supply of Powdered Milk for the consumer in the seasons when milk is scarce. Thus supply and demand are equalized.

Cleanliness is paramount. The dairies producing the liquid milk are carefully watched, resulting in ideal sanitary conditions, and assuring the consumer a clean and pure milk supply, and one of lower bacteria content than the usual market milk. Also, there are no sticky condensed milk containers standing around to draw flies and breed bacteria in the bakery, when the baker is using Merrell-Soule Powdered Milk to make up just the supply he needs each day.

Great convenience results from the fact that Merrell-Soule Powdered Milk is always ready for use, in any quantity.

Utmost economy is achieved by the transportation of the milk solids in powder form. Carrying charges are reduced to a minimum, and

there is no spoiling in case of freight delays. It does not require cold storage to carry stock. As one barrel of Powdered Milk contains the milk solids of 20 to 25 forty-quart cans of liquid milk, the baker is able to carry ahead at all times sufficient stock for all purposes, and may restore daily only as much milk as is required for that day. There need be no loss from sour milk.

Specific advantages applying to every class of baked goods are fully gone into in the following pages, which explain the definite uses, exact methods for handling and thoroughly tested formulas for the employment of Merrell-Soule Powdered Milk in the manufacture of baked goods.

Directions for Restoring Powdered Milk for Bakery Use

Merrell-Soule Powdered Skimmed Milk for bakery use. Mix 3½ ounces to 1 quart of water, or 14 ounces to 1 gallon of water. The best method is to place about half of the water in a pail or can, if you are working by hand, empty the sifted powder on top of the water, then beat up with an egg whip until dissolved. Add the rest of the water and stir again. If your bakery is equipped with a cake-mixing machine, put half the water in the kettle, adjust the whip attachment, put the sifted powder on top of the water while your machine is in motion. Run until thoroughly dissolved, and add balance of the water. For fine cream or custard work, it is well to strain the solution before adding to the rest of the ingredients. Water used in restoring skimmed milk should be tepid or lukewarm.

Merrell-Soule No. 25 Butterfat Powder, for bakery use. Mix 4½ ounces to a quart of water, or one pound of powder to 7 pounds of water for an even gallon of whole milk. Dissolve according to the same method as for skimmed milk. Warm water should be employed, to secure quicker solution, on account of the amount of butterfat contained in this product.

Merrell-Soule Powdered Buttermilk. Amount and method to be used is particularly gone into and explained in an article regarding its use in yeast doughs, in a succeeding chapter.

Merrell-Soule Powdered Milk can be used as a dry ingredient, that is, mixed with other dry ingredients before water is added to the batch, but we recommend this only in specific instances where formulas show this method, as we have found by much experimenting that for general cooking and baking purposes better results are obtained if the Powdered Milk is mixed with water and used as milk.

Powdered *versus* Liquid Milk — Quality, Cost, Yield

It has been demonstrated that Merrell-Soule Powdered Milk will give superior flavor and higher quality to baked goods than can be obtained by the use of fluid commercial milk. In addition, Powdered Milk gives the same percentage of nourishing properties as fresh milk, with the advantage that the baker can at will increase these properties by using an added amount of milk solids, which cannot be done when liquid milk is used.

As to comparative cost, it is easy for any baker to determine, by experimenting with small trial doughs, the increased volume in baked goods, both in size and weight, obtainable by reason of the moisture-absorbing properties of Powdered Milk, as against sweetened-condensed, condensed or evaporated, formerly used in these batches.

To assist the buyer of baking materials in arriving at lowest cost, we think it well to call attention to certain points to be considered when purchasing Powdered Milk, in comparison with Sweetened-Condensed, Condensed or Evaporated, of the same butterfat content.

The first cost of all milk is based on its solid content, that is, percentage of butterfat and other milk solids. In figuring comparative value, the buyer should ascertain, through careful analysis, the amount of solids contained in condensed, evaporated or sweetened-condensed.

The amount of added cane sugar shown in the solids must be taken into consideration at the market price of such sugar only. The solid content of these liquid products varies as does their price.

In Merrell-Soule Powdered Milk, the moisture content is set fast at 3 per cent. or less, because on this feature the keeping qualities of our Powdered Milk depend. It has been found that no bacterial action takes place in powder, the moisture content of which is so reduced. No foreign matter, no filler, no preservative is added.

A good test for showing the comparative value of Powdered Milk in expansive and absorptive qualities can be easily made by anyone, as indicated in the illustration, "A Good Baking Test Showing the Life of the Milk Powder." This is a positive proof of whether or not the baker is getting full value, and it plainly shows what Powdered Milk does in giving extra yield, expansion and life to doughs and mixes.

In determining comparative yield, it must be taken into consideration that instead of adding a liquid to the mix, the baker is using a solid, which will, on account of its albumen content and dried casein, absorb more water than high grade patent wheat flour.

In Yeast Raised Baked Goods

For all kinds of Bread, Rolls, Buns, Sweet Yeast Dough Goods, and Doughnuts, use 7 to 9 ounces of Merrell-Soule Powdered Skimmed Milk to each gallon of water, or, if figuring by weight of flour, use 3 to 4 per cent., or 6 to 8 pounds per barrel of flour.

Yeast doughs containing these amounts of milk, worked on a short and quick system will get a bloom with a rich crumb color and even texture, not obtainable through the use of any other method or ingredient. The crust will be thin and fine and the flavor most appetizing. The effect of adding milk to bread, in place of water is, other things being equal, to increase its nutriment.

The analyses given on page 100 represent the composition of milk. The casein and albumen are the nitrogenous constituents of the milk, and may be regarded as flesh-formers. The fat consists of stearine

and other constituents which give to butter its characteristic flavor. Milk sugar, or lactose, is the carbo-hydrate present in milk powder and is inverted by the action of the invertase, as supplied by yeast turned into galactose, a substance which is non-fermentable and, as a consequence, is not lost by being expelled as carbon dioxide, but is retained and helps to make up the additional weight in baked goods which results from the use of milk. The ash consists chiefly of phosphate of lime and potash, which act as a solvent on wheat gluten and very materially improve the constitution of the water used in yeast doughs, which is a very important feature in producing a first-class loaf of bread.

Taking as a maximum quantity 8 pounds of Powdered Milk per barrel of flour, and as a minimum quantity 5 pounds, the initial cost of the dough would be higher, with the use of the Powdered Milk, but it must be taken into account that the added solids make a larger output per barrel, because when milk is used the dough must be made softer on account of the binding effect of the milk. This requires a great additional quantity of water, which is not lost because of the moisture-retaining powers of the Powdered Milk during fermentation and baking, and is returned as yield great enough to take care of the higher first cost mentioned. The amount of milk between these maximum and minimum figures therefore is of no additional cost to the baker and he is given free a better flavored loaf of high dietetic value, improved in texture, color and physical properties of the crumb.

It may be of interest to add here that for giving additional quality, Merrell-Soule No. 25 Butterfat Powder may be employed as a milk ingredient capable of furnishing whole milk standardized to 3.5 per cent. butterfat. This percentage of fat present makes a most noticeable effect on the fineness of texture and color of crumb. The butterfat makes fineness of texture and thin crust, while the milk solids result in better bloom, owing to the unfermentable sugar of milk. This is left to caramelize during the process of baking, furnishing the distinctive characteristic appearance of the milk loaf.

Milk Bread

Of course, Powdered Skimmed Milk, used in connection with lard or vegetable fat, will make nearly as good quality as when No. 25 powder is used, but lard or vegetable fats only affect the texture and shortness, and even fresh butter added as a fat does not give that mild flavor imparted when whole milk made from No. 25 butterfat powder is used.

It may be that some of the bread sold as "milk bread" contains no milk, but most bakers are conscientious, and use a most liberal quantity of milk, the result being that they produce a beautiful and honest loaf. As there is no stipulated quantity of milk that should be used in bread known as "milk bread", the quality of many brands put out under that label is not high. It may be true that there is no recognized standard or shape for milk bread, but we think it high time for all progressive manufacturers to use at least the minimum amount of 2½ per cent. Powdered Milk in producing a standard loaf of bread. This amount increases the dietetic value of the bread and produces a commodity with changed properties, yielding nourishment in a new and concentrated form, and a quality hard for the housewife to rival.

Brown bread which is made with a great percentage of cereals may set up irritation in the stomach, but never when made with skimmed milk representing the equivalent of 50 per cent. of the liquid requirements of the mix.

Bread Formulas

We contend that there is no fixed bread formula. What we call a bread formula is merely a combination of ingredients proportioned to suit the conditions under which the baker is working. There are many books full of bread formulas, each a little different from the other, and all striving to obtain the quality so much sought after. A fixed bread formula is impossible, as all bakers are working under different conditions of climate, temperature, manner of handling and

shop conditions. In order to bring out an individual product, you must arrive at a standard character for your loaf. This special character and individuality so desired is produced by the addition of carbohydrates in the form of milk sugar and fat, added to the vital ingredients in bread making—flour, water, yeast and salt.

Milk, as we have seen, produces individual and distinctive excellence.

Calculating a Bread Formula

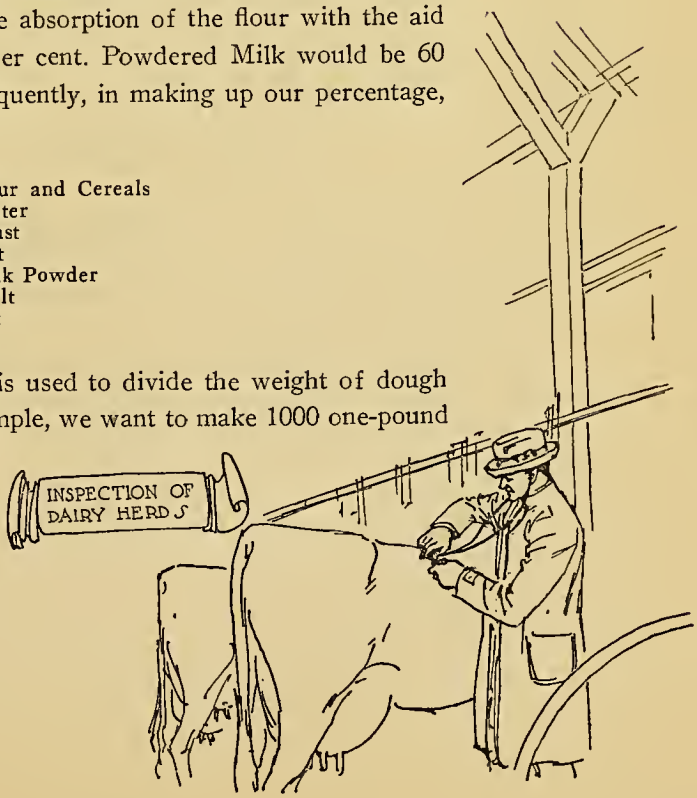
We consider, from experience, the best way to arrive at a bread formula is to figure the amount of pounds in baked bread required for a given order. Multiply this number of pounds by 18 ounces, which will represent the weight of the dough. To produce this amount of dough, divide its weight by the total percentage of ingredients to be used in making up this weight of dough. This will give the amount of flour to be used for this batch.

The most important point in arriving at a correctly composed formula is to know the absorptive power of your flour and the quality of your local water supply.

The amount of flour (or cereal substitutes) to be used in calculating a formula in this manner, represents 100 per cent., and taking for granted, in this instance, that the absorption of the flour with the aid of the maximum amount of 4 per cent. Powdered Milk would be 60 per cent. water, we would consequently, in making up our percentage, figure as follows:

Per Cent.	
100	Flour and Cereals
60	Water
2	Yeast
1.75	Salt
4	Milk Powder
1	Malt
1	Fat
Total 169.75%	

This total, 169.75 per cent., is used to divide the weight of dough required. We will say, for example, we want to make 1000 one-pound



loaves, which is equal to 1125 pounds of dough. We divide 1125 pounds by 169.75 per cent. which gives the quotient of 662 and represents the weight of the flour and cereal. This figure, 662, is then multiplied in rotation by all the per cent. figures of ingredients as given above. Starting with the percentage of water, it gives us in this instance 662 x 60 = 397, which figure represents the weight of the water. Next we multiply 662 by the percentage of yeast to be used, which would be in this instance 13 pounds, and the weight of other ingredients would be arrived at in rotation, as follows:

1125.0÷169.75	=662	lbs. flour and cereal
662×.60	=397	" water
662×.02	= 13	" yeast
662×.0175	= 11½	" salt
662×.04	= 26½	" milk powder
662×.01	= 6½	" malt
662×.01	= 6½	" fat
Total	1,123	lbs. dough

Dusting flour will take care of decimals, which were dropped in arriving at the weight of the different ingredients and take care of amount lost during fermentation.

For calculation of sponge doughs, the baker can take from 50 to 70 per cent. of the flour in the sponge, use 54 to 63 per cent. water, according to the kind of sponge he wants to make, the bulk of which is afterwards calculated off the percentage representing average absorption, when figuring water to be used in dough.

Method of Handling Doughs During Fermentation

Having found the correct weights of the ingredients, the next important thing is the method of mixing, and the conditions that affect correct fermentation.

In mixing doughs, it is best to dissolve the Powdered Milk in part of the quantity of water to be used, before adding to the batch. Many bakers have sifted the Powdered Milk in with the flour, losing sight

of the fact that there is generally not sufficient moisture left, when flour comes in contact with water, to properly dissolve the Powdered Milk. It requires a great deal more water and a little more time to put Powdered Milk in proper solution than it takes to dough up flour and water.

In bread making, or preparing other yeast doughs, if Powdered Milk is not dissolved separately, there is great danger that some of it will remain in the dough in its dry state and be baked in that way, with the result that part of its effect is lost. Besides, to add Powdered Milk undissolved in bread or other yeast doughs would be to defeat one of the economic reasons for its addition—that of absorbing and holding moisture.

Doughs with milk, to obtain best results, should be worked on a short, quick system. Temperature, however, should be maintained as far as possible between 80 and 82 degrees F. Of course the natural composition of the water has a great deal to do with the length of time required to mellow the gluten and age the dough, and for this reason the baker will find it necessary to modify his methods in order to get uniform results. A wide variance in texture or grain in bread, from day to day or from batch to batch, produced under seemingly the same conditions with the same ingredients, is not to be denied. There are several causes, any one of which will account for the difference between good and poor texture. When a baker has arrived at what is considered a well balanced formula, he should be on the alert to avoid the following:

(1) Improper fermentation.

(2) Improper handling or preparation of the dough previous to making into loaves.

(3) Over-proofing before baking.

(4) Ovens too hot or too cold.

The baker should watch his fermentation most carefully, as the time between under and over-fermentation is not long, and depends entirely upon his judgment.

Taking up the second cause of poor texture, that of improper handling of the dough before making into loaves, we might say it is impossible to make bread of a fine texture, or grain, without a certain amount of manipulation of the dough during the process of fermentation. If the baker is lazy in "punching" his dough at the right time or in "cutting over," or in properly rounding or molding, he cannot expect to turn out the same loaf that the careful competitor produces.

Over-proofing of the dough before baking is to be avoided. Bread containing a sufficient quantity of milk, backed up with a goodly amount of yeast, will spring in the oven, thus holding its cubic yield, while over-proofed bread will shrink, fall back and produce open texture with inclination to be dry and crumbling.

Improper heat of the oven is also a drawback to good bread. If the oven is too hot, causing the bread to crust before the loaf has had time to become heated through, the result will be poor grain or texture, as the gases within the loaf are imprisoned by the crust already formed. As these gases become more heated, they will eventually follow along the line of least resistance and break through the loaf at its weakest point of crust already formed. This causes the loaf to be ill-shaped and drawn, uneven and furrowed. Again if the oven is too cold, the loaf is too slowly heated to stop the action of fermentation in time, and the result is the same as that of over-proofing.

This discussion of the manufacture of bread, while not as lengthy as those gone into in technical books, is nevertheless of great benefit if the suggestions contained are followed by the reader. They will keep him out of trouble and lead him to produce, with little experimenting, superior bread and yeast dough goods of distinction. And he will find, if he is making poor bread, that the blame lies not with the Powdered Milk.

The fact that every baker we have known, who has adopted Merrell-Soule Powdered Milk as an ingredient in his bread, has increased his business seems to us to prove that milk bread is what the public wants, that the baker is producing a better loaf of bread than the housewife, and is getting her business.

First Factory of Merrell & Soule 1867-1881

A Good Baking Test, showing the Life of the Milk Powder

Make a thick batter of milk powder with water, place on a tin and bake in a hot oven. A live milk powder will puff up retaining the moisture, while a dead milk powder will not retain the moisture. Note the difference as shown in the cut.

Test to Establish Amount of Increased Yields in Pounds of Dough

Bread With 2½% Milk Solids vs. Bread Without Milk

The test below was made at one of the largest baking establishments in the United States and was certified to as correct by the manager of this bakery. Test made January, 1919.

Formula

	Control (without milk)	Test (Milk Bread)
Water	300 lbs.	300 lbs.
Flour	500 "	500 "
Yeast	7.5 "	7.5 "
Yeast Powder	2.5 "	2.5 "
Fat	7.5 "	7.5 "
Malt	5.0 "	6.0 "
Sugar	10.0 "	4.0 "
Salt	10.0 "	10.0 "
Merrell-Soule Skimmed Milk Powder	0.0 "	13.0 "
Extra water for dissolving milk powder		26.0 "
Total weight	842.5 lbs. dough	875.5 lbs. dough

YIELD

	Control Batch	Milk Bread
Loaves scaled 18 ozs. in dough	749	776
Loaves scaled as per test	747	791

POSSIBLE YIELD

(If scaled 18 ozs.)

$62.08 Milk Bread
59.92 Bread without Milk

$ 2.16 Gain in return

YIELD AS PER TEST

$63.28 Milk Bread
59.76 Bread without Milk

$ 3.52 Gain in return from Milk Bread

COST COMPARISON

Control (without milk) Credit 6 lbs. sugar used at 9½c = 57c	Milk Bread Additional Cost
1 lb. Malt Extract at 8½c	= $ .085
13 lbs. Merrell-Soule Skimmed Milk Powder at 25c	= 3.25
	$3.335
Credit sugar saved	.57
Total cost increase on batch 500 lbs. flour made with 2½% milk solids	$2.765
Normal yield extra bread sold at 8c per pound	2.16
Total cost increase on batch of 500 lbs. flour	$ .605

Sweet Yeast Dough Goods

The amount of Merrell-Soule Powdered Skimmed Milk or No. 25 butterfat powder to be used commonly runs from 7 to 9 ounces, to each gallon of water used in the batch, but is always purely a question of quality. In times when eggs and butter are scarce or dear, an increased quantity of Powdered Milk in the batch will make up for considerable decrease in the other ingredients, without materially reducing the quality or nourishing value of the finished product.

This really is such a broad subject that to treat it exhaustively would require more space than is available in this book. Therefore we shall deal but briefly with goods of this class that are generally known and profitable.

Arriving at a Sweet Yeast Dough Formula

Recipes for coffee cake doughs vary but little. But every baker who would profit by his individuality must have a pet method of his own, whereby the material is put together. We shall try to answer the question as to what method tends to bring out the best results from material at hand.

Many bakers seem to think that all that is necessary in putting a batch of sweet yeast dough together is to place the material in a bowl, dissolve the yeast, stir, and add the flour. This is very simple, but not effective.

There are quite a few bakers who adhere to a sponge method in this class of goods and for quick doughs. We agree that this means a big saving in the amount of yeast necessary. Apart from this, however, there is nothing really commendable about a method of this kind.

It seems certain that very few bakers would think of putting even the cheapest kind of a cake together without first creaming the butter and sugar and working in the eggs slowly, thereby lightening the materials by the creation of air cells. But there are very few of these same bakers who realize that this method, applied to the preparation

of sweet doughs, has the same effect, and gives a more thorough and even distribution of materials while the dough is in the process of fermentation. For a sweet yeast dough for general purposes the following is a good formula:

12 oz. Merrell-Soule Powdered Skimmed or Whole Milk
12 oz. Fat mixed with butter
12 oz. Sugar
6 oz. Yeast
4 Eggs
½ oz. Salt
2 qt. Water 75 to 85 degrees F.
Little Mace and Lemon Oil (or any other flavor desired)
Flour to make medium stiff dough

Undoubtedly the best method that we have found for embodying these materials into sweet yeast dough is the following:

First dissolve separately the yeast in a little warm water and add a little sugar and flour. Now place in the bowl or mixer the eggs, sugar, spices and milk. Blend these together, add the remainder of the water and make into a medium soft dough with flour. When the dough is thoroughly smooth add the butter, which has been creamed a little on the bench. Incorporate this thoroughly into the dough, then add the yeast, which will by this time have quite a start, and work through the dough just to "clear". This dough, as all milk doughs, if kept "young" up to the time of making up and panning, then given full proof before going into the oven, will result in greater bulk in proportion to the weight of the dough than dough made by any other method.

Almost every baker is familiar with the general run of goods usually manufactured from sweet yeast dough, such as coffee cake goods, snails, pretzels, stollen, streusel, etc., by adding fruit or rolling in additional butter, sprinkling with crumbs or nuts or finishing off with fresh or canned fruits, thereby expressing the baker's individuality and peculiar style.

Powdered Buttermilk

Uses and Value in Baking

THE value of Buttermilk as a health food has long been recognized. Liquid buttermilk has been in use in the manufacture of soda goods, such as soda biscuits, Irish soda bread, buckwheat cakes, the various griddle cakes, and in molasses and spiced goods. Some bread makers, also, have used liquid buttermilk.

Merrell-Soule Powdered Buttermilk offers buttermilk in the dry, powdered form and its remarkable food value, along with its excellent baking properties, speedily recommended it for commercial uses, especially in bread making. Communications from all parts of the country tell of excellent results being obtained from Merrell-Soule Powdered Buttermilk. These come principally from bread and cracker bakers.

Merrell-Soule Powdered Buttermilk offers one of nature's most valuable foods, and with the knowledge that it has always been esteemed as an ingredient in yeast doughs and soda leavened goods, we find the following interesting difference.

Take every one of the good points, except the higher butterfat content of our No. 25 butterfat powder, enumerated in the preceding pages, add to them the following facts; and you have the advantages obtainable from Merrell-Soule Powdered Buttermilk. Our analysis shows it similar to skimmed milk in composition (except that it is higher in butterfat) and possessed of acidity, both valuable assets.

Its Lactic Acid Content and Value of Lactic Acid

The softening of the gluten (the most important result of fermentation), due to the large per cent. of lactic acid contained in the powdered buttermilk, will incur a considerable saving of time and produce a livelier and more healthy fermentation, relieving any strain on the yeast and reserving the yeast functions to produce that desirable "spring" in the oven, which every baker is so anxious to get.

This quantity of lactic acid is also of immense value to all bakers, in that it will positively prevent the occurrence of "rope," the most

dreaded disease of the bakery. Rope bacilli cannot exist in the presence of a small quantity of lactic acid in the dough.

Let this be noted—that vinegar, acetic acid and commercial acid compounds are used for and will prevent rope. But that is the only excuse they have for being in the dough. They destroy the bloom of the bread, make poor texture, and do not increase the yield. Instead of that, they raise the price of the moisture content of your loaf. Their use is full of danger.

The lactic acid in buttermilk will make any excessive amount of starch more palatable and consequently more digestible. It will also give you a whiter crumb, on account of its bleaching qualities.

Butter Fat Contained in Powdered Buttermilk

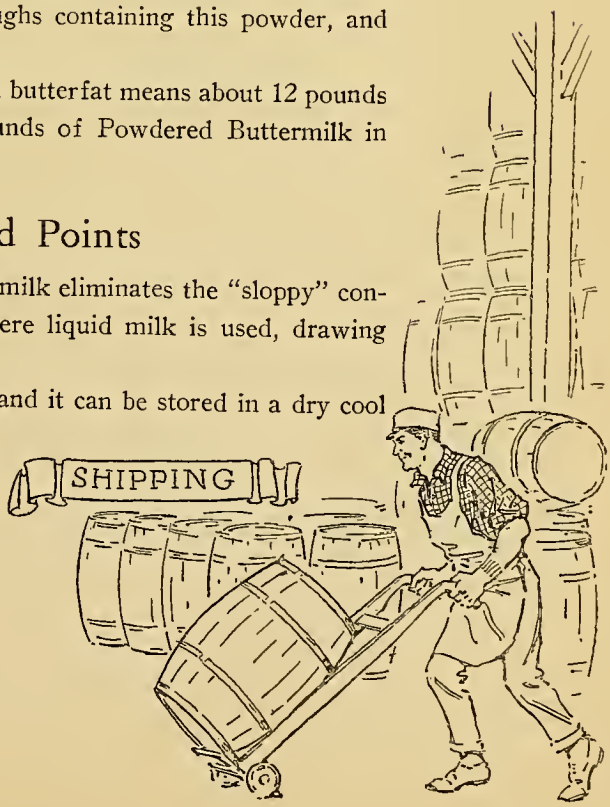
Butterfat is the highest quality of shortening available. Since the buttermilk powder contains from 8 to 10 per cent. fat, the baker will either enjoy a considerable saving in other fats or else he will produce better quality. On a preceding page, in speaking of "Butterfat Powder," we have explained that butterfat is composed of stearine and other constituents which give to butter its characteristic flavor. This flavor, because of the large per cent. of butterfat contained in Powdered Buttermilk, is transferred to the doughs containing this powder, and explains why it is so desirable.

It is well to realize that 10 per cent. butterfat means about 12 pounds of creamery butter to every 100 pounds of Powdered Buttermilk in your barrel.

Other Good Points

The dry state of Powdered Buttermilk eliminates the "sloppy" conditions usually found in bakeries where liquid milk is used, drawing flies and vermin.

Its keeping qualities are excellent and it can be stored in a dry cool place almost indefinitely.



All the advantages of our other milk products, such as Economy, Supply, Cleanliness and Convenience also pertain to Merrell-Soule Powdered Buttermilk.

Directions for Use

We recommend the use of Merrell-Soule Powdered Buttermilk for goods raised with yeast or bicarbonate of soda only, as in baking powder goods the lactic acid content of this powder will have to be taken into consideration both as to strength and volume. The cream tartar, phosphate or other acid content of the baking powder mix will have to be cut down in proportion, or the soda content increased.

In yeast dough goods an ounce to a quart of water, or 2 per cent. if figured by the weight of flour used, would give us 4 pounds to the barrel, which is the minimum that ought to be employed. 2½ per cent., or 5 pounds to the barrel is, on account of the lactic acid content, the maximum amount that should be used. It should be thoroughly dissolved in water before being added to the dough.

Many bakers who wish to produce a quality loaf are using an additional quantity of Merrell-Soule Powdered Skimmed Milk with the maximum allowance of 2½ per cent. Powdered Buttermilk.

Stir the powder in the buttermilk barrel every time you take out a quantity. This keeps it from caking.

Buttermilk Bread

FORMULAS for this class of goods can easily be worked out, using a schedule as previously explained.

There is no shop trouble with Powdered Buttermilk, and the fermentation in the doughs, although a little speedier, will not present any problems or necessitate any considerable change in methods.

The word "Buttermilk" has great advertising value. Buttermilk bread, buns and doughnuts should immediately become popular in localities where they are introduced. Merrell-Soule Company will be glad to furnish display cards with advertising suggestions to purchasers of this product.

Rope: Its Formation and Habits

While we have made passing mention of Rope, in the pages devoted to Powdered Buttermilk, we feel that the importance of this most dreaded plague of the bakery demands further attention. Besides, although bakery trade papers, experts and lecturers have given their attention to the subject, and the United States Government has issued printed directions for eliminating the trouble, there still remains much to be said of practical value to the average baker.

Origin of Rope

Rope in bread is the second life cycle of a spore originating from bacilli that come, in the first place, direct from the soil, being blown up in the dust which settles upon the ripening ears of grain. Many of them adhere to the outside of the grain-berry and get transferred into the flour with particles of bran. They are supported by the enzymes or ferments which are found in the nitrogenous underlayers of seed skin and in the embryos or seed germs. Potatoes have been credited with being associated with the rope producing germ on account of growing in the ground. However there is no scientific proof of this identity except such as may be based on microscopic appearance. There are many other conjectures equally unproved. The next important

source of origin is through infection by dust, sweepings or dirt containing spores which may have remained dormant from some previous epidemic.

Its Development

Ropiness seldom develops, so far as can be judged by the naked eye, during the first eight hours after the loaf has been baked. But in the event of bacilli being sufficiently abundant in the original dough, and the surrounding conditions being favorable to their growth and multiplication, it will become obnoxiously evident within the succeeding eight hours, and will then mature rapidly and prove highly objectionable. The center of the loaf will break down, when the rope has run a fairly long course, and the crumb not consumed by decomposition can be rubbed into a molasses-like mass, which when pulled apart will disclose long strings of slime. Hence the name rope.

Heat Does Not Destroy These Germs

Even the strongest and longest heat of an oven does not destroy this germ. The spores possess an exceptional vitality, and after a baked loaf has been laid aside, the bacilli germinate and yield a new generation, which starts the life cycle on its way again.

Acidity Affects Them

A certain amount of acidity in this dough is destructive to the germ. It is therefore well that the baker make his dough slightly acid. Soured milk or lactic acid is the most desirable medium, and one ounce of Merrell-Soule Powdered Buttermilk to each quart of water used in yeast doughs is sufficient to check the power of any organism which may be present. Commercial acids and vinegar produce the same results, but on account of their strength they are dangerous to the bloom of the loaf and color of the crumb, and the baker will more wisely use milk, which has always been one of the ingredients of bakery products.

Methods of Elimination

If ropiness establishes itself in a bakery, it is extremely difficult to eradicate. For this reason bakers should vigilantly guard against it by making their doughs slightly acid, keeping their shops well ventilated, using the sponge system as much as practicable, and keeping their flour and cereals away from damp places, stacked so that air can circulate well around the bags and barrels.

A commercial acid, such as vinegar or compounds made for the purpose, should be used to spray or wash all utensils, machines, floors and walls of the bakery, not overlooking the packing room, store, delivery and shipping equipment. The Merrell-Soule Technical Service Department will be glad to furnish information to any baker who has this trouble, designed to help his specific case.

Use of Merrell-Soule Products in Cake Baking

IT is not our purpose to present an exhaustive treatise on modern practical cake baking in this chapter. We merely desire to give some valuable, yet simple, up-to-date recipes showing the advantages of using Merrell-Soule Powdered Milk in cake baking, that will enable the beginner, as well as the expert baker, to turn out high class cake goods at a comparatively low cost.

All recipes contain Merrell-Soule Powdered Skimmed Milk, to be mixed in in its dry state, or restored to liquid milk, as directed.

For Cakes in General

Successful cake bakers have long realized the benefit of using an entirely soluble powdered milk. Most bakers who have been induced to buy cheap milk powders have had sad experiences on account of the insolubility of these powders. This is the main reason why Merrell-Soule Powdered Milk is so uniformly used in the shops of successful representative bakers throughout the country. They have long since found out that their ability to obtain a readily soluble milk powder renders liquid fresh milk no longer necessary in the making of quality baked goods, for Merrell-Soule Powdered Milk will do everything that fresh cows' milk will do, at less cost and trouble.

Cake Receipes

In presenting the following recipes, we wish to say that they have been thoroughly tried and proved, constitute an excellent selection of medium priced commercial baked goods, and are so arranged that they can be easily referred to at any time. Let us give this advice, first of all— don't guess at quantities. Measure and weigh all ingredients carefully.

Ingredients used in these recipes can be substituted by the use of powdered egg, dissolved at the rate of one pound in three pints of water, which is equivalent to 3½ dozen shell eggs. Use the same

quantity of dissolved egg as you would shell eggs. For instance, if your recipe calls for one pint of egg or ten shell eggs, use one pint of dissolved egg powder.

It has been proven that cereal flours, such as corn flour, rice flour, corn starch and tapioca flour can be used with excellent results. Rice flour and corn starch are preferred. When these are used, it is best to add them when creaming the sugar and shortening. This will show quite an improvement in the appearance of the grain in the cake.

Common Cakes and Quick Breads

Milk Biscuits

6 lb. Flour
1 lb. Lard
4½ oz. Baking Powder
Salt
8 oz. Merrell-Soule Skimmed Milk Powder dissolved in
2¼ quarts water

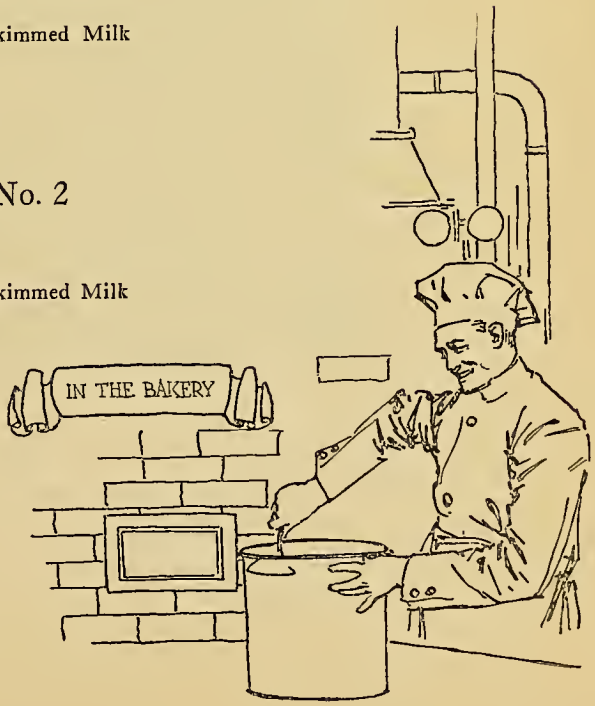
Sift flour and baking powder in a bowl, add salt and lard, rub between the hands until fine, then add milk powder dissolved in water. Mix thoroughly and throw out on bench well dusted with flour, pin out about ¾ inch in thickness and cut with biscuit cutter. Place on a pan so they will touch. Bake in a brisk oven.

Cup Cakes No. 1

2 lb. Sugar
1¼ lb. Butter and Lard
10 Eggs
4 oz. Merrell-Soule Powdered Skimmed Milk
4 lb. Flour
2 oz. Cream Tartar
1 oz. Soda
1 qt. Water
Lemon and Mace Flavor

Cup Cakes No. 2

1½ lb. Sugar
12 oz. Butter
¾ pt. Egg Whites
4 oz. Merrell-Soule Powdered Skimmed Milk
3 lb. Flour
2 oz. Baking Powder
Vanilla Flavor



Rub sugar, butter and Powdered Milk together until light, adding a few eggs at a time. Sieve in cream tartar and flour, make bay and pour in soda dissolved in water. Mix and drop in cup cake tins. When a recipe says baking powder, as No. 2, always sieve powder in the flour.

Spice Cups

1 pt. Molasses
6 oz. Sugar
6 oz. Lard
2 oz. Merrell-Soule Powdered Buttermilk dissolved in
1 pt. Water
1 oz. Soda
2 lb. Flour
Spices

Rub sugar, lard and soda in bowl, stir in molasses, add spice, cinnamon, ginger and cloves, half teaspoon each, add buttermilk powder dissolved in water, mix in flour. Drop in tins and bake in brisk oven.

Corn Bread

2 lb. Corn Meal
1 lb. Wheat Flour
½ lb. Butter or Fat
½ lb. Sugar
½ oz. Salt
6 Eggs
4 oz. Merrell-Soule Powdered Skimmed Milk dissolved in
1 qt. Water
2½ oz. Baking Powder

Sieve corn meal, flour and baking powder in a bowl, add salt and sugar, stir beaten egg into dissolved Powdered Milk and water, pour into dry ingredients. Mix. If this does not make a good batter, add a little water. Now stir in melted butter. Pour in greased baking sheet and bake in medium oven.

Corn Muffins

Use corn bread mixture, drop in cup cake tins, and bake in a brisk oven.

Fried Cakes

1¼ lb. Sugar
4 oz. Butter
4 Eggs
3½ oz. Merrell-Soule Powdered Skimmed Milk dissolved in
3½ lb. Flour
1 qt. Water
2 oz. Baking Powder
Mace
Salt

Cup-Cakes

Milk Biscuits

Sweet Doughs, Coffee Cakes, Hot Cross Buns, Etc.

Hot Cross Buns

Make a straight dough:

10 qt. Water
2 lb. Merrell-Soule Powdered Skimmed Milk
3¾ lb. Sugar
12 oz. Yeast
3 lb. Butter Substitute
2 lb. Compound Lard
6 oz. Salt
5 pt. Eggs
Juice and Rind of 4 lemons
Flour to make stiff dough
3 lb. Small Raisins

Place the buns close together on tins and wash with eggs. After they are raised half way, split them with a sharp knife, then finish raising with a little steam. When baked, ice with ordinary icing or dust with sugar.

Sheet Cakes

Cake Base for all varieties for Slices, Squares or Pyramids.

1½ lb. Sugar
8 oz. Lard
6 Eggs
3 oz. Merrell-Soule Powdered Skimmed Milk dissolved in
1½ pt. Water
1½ oz. Baking Powder
2½ lb. Flour
Lemon Flavor
Salt

Rub sugar, lard and eggs, sift on flour and baking powder, add milk dissolved in water and mix. Bake in greased and floured sheets. When cool, cut in any shape desired, after setting together with icing, cream or jelly.

Layer Cakes

Mixture for Large Layer Cakes:

Rub well together	8	oz. Powdered Sugar
	6	oz. Merrell-Soule Powdered Skimmed Milk
	½	oz. Salt
	12	oz. Lard
	12	oz. Butter
and		a little vanilla
Then add	1	pt. Yolks
	1	pt. Mixed Eggs
	1	qt. Water
Then sift together and add	4¼	lb. Flour (spring)
	1	lb. Substitute (starch)
	1½	lb. Powdered Sugar
	1½	oz. Baking Powder

Method: Mix thoroughly into a medium soft batter, then scale into layer tins.

Spread out flat and bake in medium oven. This batch makes about 35 layers.

Wine Cake

Cream well	3	lb. Powdered Sugar
	1	oz. Soda
	2	oz. Salt
	8	oz. Merrell-Soule Powdered Skimmed Milk
	1¾	lb. Compound Lard
Then add gradually	1½	pt. Eggs
Then	2	qt. Water
Sift and then add	6	lb. Bread Flour
	2	oz. Cream Tartar

Method: Mix well and bake in paper lined tins. Cut on top with a knife dipped in oil, before baking, this will produce a nice "split".

Merrell-Soule Golden Anniversary Cake

(Commercial Pound Cake Mix)

Rub well until light	15	lb. Powdered Sugar
	1	lb. Flour
	1	lb. Merrell-Soule Powdered Skimmed Milk
	¼	lb. Salt
	½	lb. Butter Flavor
	6	lb. Compound Lard
	2½	lb. Margarine or Butter
	½	pt. Vanilla
		Little Egg Coloring
Then add slowly	10	pt. Eggs
Then	5	pt. Cold Water
Then sift together and mix in	16	lb. Flour
	1	lb. Powdered Sugar

Beat this mixture until very light and smooth, and then fill in paper lined tins.

Silver Cake

Cream well	2	lb. Powdered Sugar
	½	oz. Salt
	5	oz. Merrell-Soule Powdered Skimmed Milk
	4	oz. Butter Flavor
	1	lb. Compound Lard
		Vanilla or Almond Extract
Then add gradually	2½	lb. Bread Flour
	1	qt. Stiff Beaten Egg Whites
	1	qt. Water
	1	oz. Baking Powder

Beat up well and fill in paper lined tins. Sprinkle powdered or granulated sugar on top and bake in good oven.

Water Sponge Cake

(With Powdered Milk)

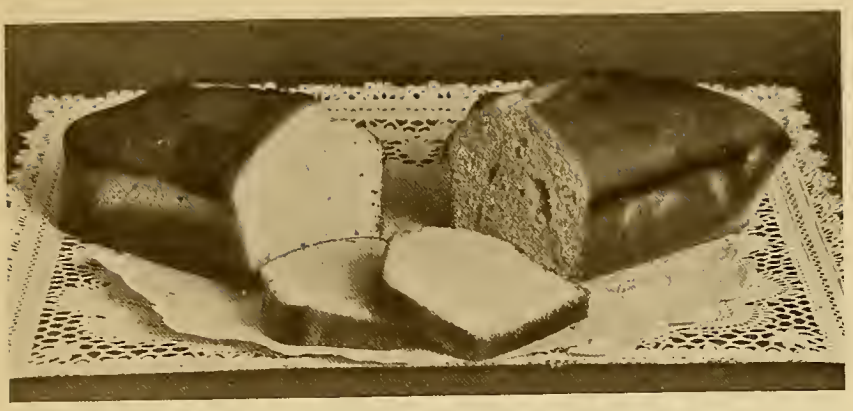
Beat	2	lb. Powdered Sugar
	2	pt. Yolks
	1	pt. Hot Water
		A little Vanilla
Then add carefully	2	lb. 10 oz. Bread Flour
	4	oz. Powdered Skimmed Milk
	½	oz. Baking Powder
	½	oz. Salt

Bake in paper lined tins.

Cookies, Jumbles, Snaps, Drop Cakes and Fancy Cakes

Cookie Dough No. 1

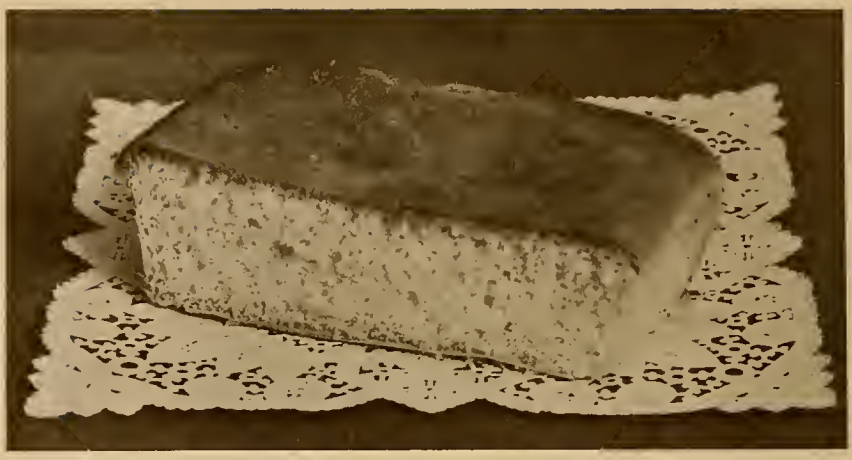
Cream well	1½	lb. Butter
	1½	lb. Lard
	5	lb. Powdered Sugar
	2	oz. Soda
	4	oz. Merrell-Soule Powdered Skimmed Milk
Then add slowly	1	pt. Eggs
Then sift on	8½	lb. Flour
	3	oz. Cream Tartar
Make bay and pour in	1	qt. Water



Wine Cake

Merrell-Soule Golden Anniversary Cake

(See page 49)



Water Sponge Cake (With Powdered Milk)

Silver Cake

Cookie Dough No. 2

Mix the same as Cookie Dough No. 1.

	7 lb.	Sugar
	2 lb.	Butter
	1½ lb.	Lard
	½ pt.	Eggs
	2 oz.	Ammonia
	½ lb.	Merrell-Soule Powdered Skimmed Milk
	2¼ qt.	Water
		A little Egg Coloring and Flavor
Then	14 lb.	Flour

Out of these two cookie doughs you can make (See illustrations opposite page 47).

Sugar Cookies	Almond Cookies
Cocoanut Cookies	Peanut Cookies
Seed Cookies	Spice, Nut or Raisin Cookies

(NOTE: For Fruit Cookies, etc., see recipes under the heading of "Confectioners Mince.")

Drop Cakes

Cream together	6 lb.	Sugar
	3 lb.	Compound Lard
	½ lb.	Butter
	½ oz.	Ammonia
		Vanilla
Then add	3 pt.	Eggs
	3 pt.	Water in which is dissolved
	6 oz.	Merrell-Soule Powdered Skimmed Milk
	6 oz.	Baking Powder
	12 lb.	Flour

Method: Mix into a smooth soft dough, then drop through your hands on greased and dusted tins or fill into paper cases, and bake in good oven. These drop cakes can be made with chocolate and spices. For chocolate add 1½ lbs. of cocoa and 1 lb. powdered sugar to the above recipe.

For Pie Baking

Pie Crust and Pie Filling

A GOOD "bakers pie" is judged not only by the nature of the crust, but also by the quality of the filling and fullness of the pie. To combine both points, conforming to the standard set by the public, and also to sell at a profit, means to possess a full understanding of the pie baking business.

Pie Crust

It is difficult to give any set recipe for pie paste. Flours and lards vary so much in quality that it is really best to let the baker adjust a recipe to the materials at hand, after calling his attention to a few essential facts.

One shipment of lard may be tough, another light and short; one contains more moisture and another more fat, so if the recipe given does not produce satisfactory results, look to your materials. Flours vary in softness and likewise water-absorbing qualities. Therefore it is well that both flour and lard in the manufacture of paste should be well chosen and adapted to a formula, if you would produce good pie crust.

Pie Formula and Method

To arrive at a formula for pie paste, the baker should ascertain how much water the flour, when mixed with fat, will actually take. If you know this, and apply the knowledge, it will make a good deal of difference as against the method pursued by the baker who keeps on pouring water into his dry ingredients, little by little, until finally he arrives at what he thinks is the right consistency.

To make an ordinary, reasonably-priced good crust, you must weigh your flour and lard, instead of guessing at it, and dissolve the salt in the required amount of water, being certain how much water it takes to mix the dough so you may pour in the full amount at once, thereby saving the overworking of the dough. As an example we might say ordinary winter wheat flour takes one quart of water, four

pounds of flour, 2 pounds of lard, one ounce of salt, two ounces Merrell-Soule Powdered Skimmed Milk.

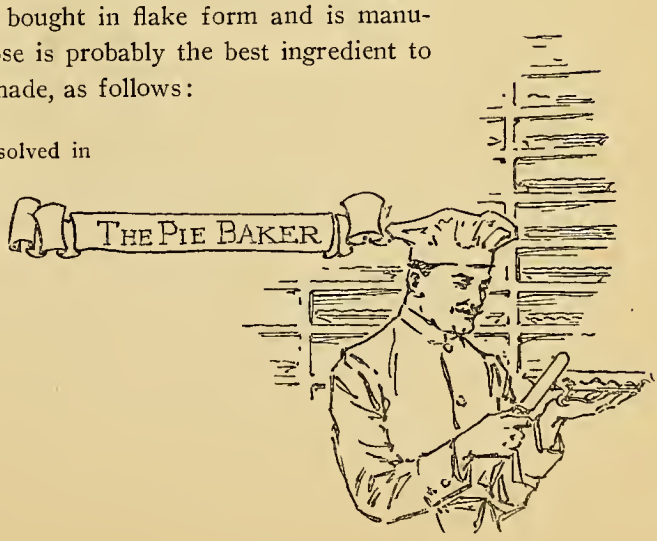
Very satisfactory results have been reported by some successful pie bakers, from the addition of two ounces of Merrell-Soule Powdered Buttermilk, thoroughly dissolved in the water of this mix. The Powdered Buttermilk has a peculiar effect on the gluten, mellowing it by the lactic acid contained. Further, Powdered Buttermilk is known to have great leavening value and the lactic acid flavor is very agreeable, especially when great quantities of cereals, other than wheat flour, are used. It also tends to make the entire baked crust more palatable and digestible.

The method for mixing pie ingredients is simple enough. Rub the lard through the flour and add all the salted water, at a low temperature, at once and mix without overworking, which is positively harmful to a flaky and short pie crust.

Pie Filler

The first profit in pie lies in the filler, or thickening which stabilizes the fruit content of the filling. The public prefers a full pie. If you cannot make a full pie out of fruit and sugar and sell it at a profit in your locality, you must use stabilizers or thickeners to fortify the fruit content of your filling. For this many bakers use corn starch, which is a fair material, but makes a filling of a tough nature, and the second day the pie looks flat and unsalable. Some bakers use wheat flour, which is of course to be desired in place of corn starch if a filler must be used. The worst thing to use for this purpose is cake crumbs. These old cakes are always more or less rancid, also, the many different materials in the cake do not at all help the flavor of the pie. A gelatinized corn flake which can be bought in flake form and is manufactured especially for this purpose is probably the best ingredient to use. Another good filler can be made, as follows:

12 qt. Water
2 lb. Ground Tapioca dissolved in little cold water
6 lb. Sugar



Put all in a kettle on the fire and stir until the milkiness of the tapioca disappears, when the mixture is done. It should never boil, only become glossy in appearance. It is absolutely tasteless and will bring out the most delicate flavor of any fruit or admixture.

Pie Fillings

Every baker seems to have his own method of preparing pie fillings, especially if fresh fruit is plentiful or he is so situated that he can get a good price for a product requiring no filler. Therefore we will touch only lightly on this subject, but would like to advise this—sharpen the taste of any fruit possessing an insipid flavor with lemon juice or citric acid. Also, be careful that your fruit is in such a condition that it will be properly cooked in the pie while baking. Some fruits need to be partly cooked before being placed in the pies. If no so-called filler is used and your fruit is inclined to be sloppy after the addition of sugar, we advise that it be cooked over the stove for a few minutes, then add 2 to 3 ounces of flour to each gallon of fruit.

The Best Sellers

Firm, smooth custard pies of all sorts, most seasonable in spring and summer, and delicately flavored mincemeat and pumpkin pies, in big demand during fall, winter and spring, are no doubt the most favored varieties and best sellers.

Merrell-Soule Company having supplied the essential ingredients of these varieties for many years, feels competent to offer suggestions to pie bakers for the improvement of these best sellers, especially the employment of Merrell-Soule products therein.

Custard Filling for Custard Pies

Custard No. 1

5 oz. Sugar
5 oz. Merrell-Soule Powdered Skimmed Milk
4 Eggs
4 Yolks
1 qt. Water
Little Vanilla, Mace and Salt for flavoring and seasoning

Custard No. 2

4 oz. Sugar
3 oz. Flour or Starch
1 oz. Butter
4 oz. Merrell-Soule Powdered Skimmed Milk
2 Eggs
1 qt. Water
Little Vanilla, Mace, Salt for flavoring and seasoning

Method for Making Custard

Sift the dry ingredients into a can or kettle. Break in the eggs and stir with a whip until you have a smooth consistency. Then add water and stir well so that all dry ingredients are dissolved. Strain off, allow any froth on top to settle and dip from the bottom when filling pies.

There are many more ways of varying the ingredients given in the above formula, thereby producing different grades of goods. In connection with this, we have a few pointers accumulated through long experience and the exchange of ideas with users of our milk products, as follows:

Suggestions for Custard Pie Making

Many bakers have trouble with watery custard pie. This is not the fault of the milk powder or any other ingredient, but is caused by baking too long. A custard pie is done as soon as it is firm, no matter what color it may be, and must then be taken from the oven. Merrell-Soule Powdered Milk is better than fresh cow's milk in custard work because the baker can increase the milk solid content of his mix at will and the dry milk helps to thicken the custard, making the pie sweeter and firmer. We have a formula from a successful user of our product, as follows:

Custard No. 3

If you mix 4 lb. Sugar
Add 1 lb. Lard or Butter in a bowl
Then 2 qt. Egg Yolks
1 lb. Spring Flour
2 lb. Merrell-Soule Powdered Skimmed Milk

You will have a regular dough. Now gradually add 10 quarts of water, strain, and next fill your pie bottom in the oven with a dipper. This will make a firm and sweet custard and sets much faster than corn starch custard.

A good idea followed by many bakers is weighing the ingredients required for as many custard pies used in a week or two. For instance, if you make four pies a day, or 24 a week, weigh the required amount of sugar, starch or flour, Powdered Milk, salt and mace, mix and sift together and put away in a can or box, and every time you make a quantity of pies, weigh off the amount required for that number. Mix your eggs and water and stir into the dry ingredients. This saves time in weighing and does away with the guessing of the salt and flavor, which is hard in small mixes. The same is done with pumpkin pies, adding to the whole amount the required spices. This enables you to make uniformly spiced and tasting pumpkin pie, which is probably the most important feature.

Recipes for Soft Pies

Caramel Custard

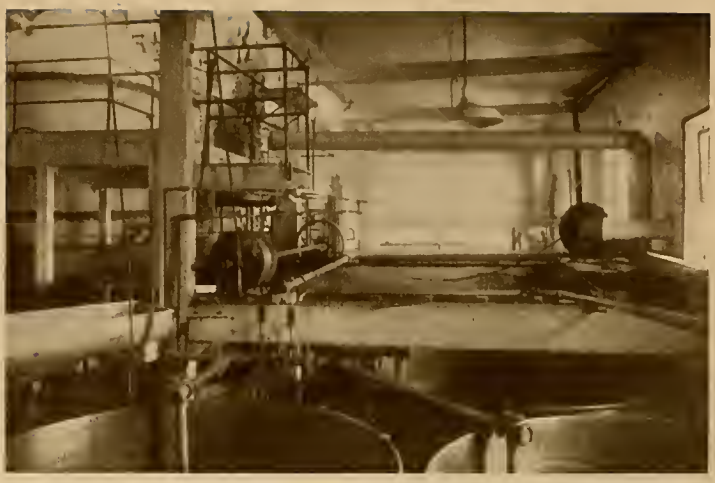
For this variety, select any given custard recipe of the foregoing paragraph, substitute "C" sugar or maple sugar for the white granulated sugar of the recipe and color with a little burnt sugar or caramel coloring.

Cheese Custard

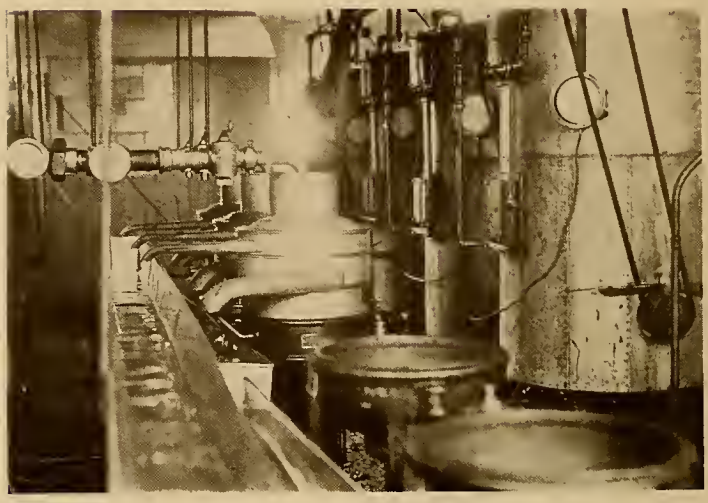
2 Eggs
2 oz. Merrell-Soule Powdered Skimmed Milk
8 oz. Sugar
4 oz. Butter
1 oz. Corn Starch
1 Lemon
1 lb. Cottage Cheese

Cream sugar, butter, corn starch and Powdered Milk until light. Whip eggs and stir them in. Add juice and grated lemon rind. Incorporate cottage or pot cheese, which has previously been run through

Merrell-Soule Powdered Milk Factory, Arcade, N. Y.
Capacity 200,000 Pounds Milk Daily



Condensary, Arcade, N. Y.



Separators and Pasteurizing Apparatus
Arcade, New York

a sieve, in order to make it smooth. Stir all together and fill into lined pie pans. Scatter on a few small seedless raisins and dust over with cinnamon. Bake same as custard pie, until set.

Chocolate Custard

For this class of goods, select any one of the custard recipes given in the preceding paragraph, but before mixing the water with the dry ingredients, dissolve three ounces of cocoa powder or sweet chocolate, cocoa or chocolate liquor or any preparation suitable for flavoring and giving the custard a chocolate character.

Cocoanut Custard

For cocoanut custard, take any of the custard recipes suited to your business, and before filling crust, sprinkle a quantity of shredded, short-cut or threaded cocoanut into the bottom.

Pumpkin or Squash Pie

6 oz. Sugar
5 oz. Merrell-Soule Powdered Skimmed Milk
1 oz. Black Molasses
3 Eggs
1 qt. Prepared Pumpkin or Squash
2 oz. Flour or Starch
1 qt. Water
Salt

Spices may be varied to suit the taste of your particular trade. Mace and ginger or cinnamon, ginger and grated nutmeg are good combinations.

The easiest way is to mix all the dry ingredients first, stir in the eggs and molasses, then the pumpkin and salt. Mix well and pour in the water. A number of bakers add the water hot, on account, sometimes, of the consistency of the pumpkin, the hot water tending to distribute the pumpkin or squash more evenly. Best results are probably obtained by allowing the mixture to stand a while, stirring it now and then before filling it into the crust.

Sweet Potato Pie No. 1

6 oz. Sugar
4 oz. Merrell-Soule Powdered Skimmed Milk
3 Eggs
1 qt. Cooked Sweet Potatoes finely mashed
1 qt. Water
Salt
Lemon Flavor

Mix and treat the same as pumpkin pie.

Sweet Potato Pie No. 2

Take a good sized sweet potato, peel and grate, line a deep pie pan with pie dough, put in the grated potato and fill with a custard mix, the same as for custard pie, and bake.

Cooked Cream for Pie Filling

Before giving recipes for cream pies, we want to call the particular baker's attention to the fact that pie paste as made ordinarily does not make the best shells or linings for cream pies. With this in view, we give a recipe herewith, that, although it contains other ingredients than the pie paste given in the foregoing paragraph, will not cost any more to produce.

Paste for Cream Pie Shells

3 lb. Flour
8 oz. Fat, Compound, Lard or Butter
10 oz. Sugar
3 Eggs
4 oz. Merrell-Soule Powdered Skimmed Milk
½ oz. Baking Powder
As much cold water as dry ingredients will take
½ oz. Salt, reduce or increase according to amount of salt contained in fat

Rub flour, baking powder, sugar, butter, Powdered Milk, as you would pie paste. Make a hole in center, add egg, water and salt. Work smooth. Roll, cut and line pie tins with this dough. Prick with fork and bake off, before filling with cooked custard, while hot.

Vanilla Cream

4 Eggs
6 oz. Sugar
4 oz. Powdered Milk
1 oz. Butter
2 oz. Corn Starch
1 qt. Water
Vanilla Flavor

Place Powdered Milk, sugar and water on the fire, stirring well. Beat eggs and corn starch together. Before milk comes to boil, dip out some, and when milk comes to a boil, pour on eggs and starch, stirring. Pour this slowly, stirring rapidly, back into the balance of the milk and sugar until it thickens. Be careful that you do not cook this mixture, because it will curdle your eggs. Add flavor after mixture is off the fire.

Lemon Cream

3 Eggs
5 oz. Merrell-Soule Powdered Skimmed Milk
8 oz. Sugar
3 Lemons
3 oz. Corn Starch
2½ pt. Water
2 oz. Butter

Grate rinds of two lemons and squeeze the juice of three, place sugar, water and Powdered Milk on the fire, stirring occasionally. Beat eggs and corn starch until smooth, stir in grated lemon rinds and juice. When milk and sugar begins to boil, add the eggs, corn starch and lemon juice as mixed, stirring rapidly. Take off the fire when it thickens and beat in two ounces good butter.

Meringue for Pies

Most cream pies are offered with a meringue top. With this in view we have collected the following recipes:

No. 1

6 oz. Egg Albumen
5 lb. Granulated Sugar
2 qt. Water

Dissolve the albumen in water in a glass or porcelain dish, soaking it a few hours ahead. Add the sugar to the dissolved albumen, pour in kettle, start machine and let run at high speed until it becomes firm. Add your flavor.

No. 2

1 pt. Egg Whites
¾ lb. Powdered Sugar
Pinch of Cream Tartar

Beat up the whites until stiff, add pinch of cream of tartar and then gradually beat in the powdered sugar.

Merrell-Soule Powdered Milk Factory at Frewsburg, N. Y.
Equipped to Handle 80,000 Pounds of Milk Daily

Merrell-Soule Powdered Milk in the Dairy

THE use of Merrell-Soule Powdered Skimmed Milk in Dairies is becoming more and more extensive, as the advantages of its use are better realized.

The dairyman will find that Merrell-Soule Powdered Skimmed Milk will not only save him time and money, but will also improve the quality of his milk and cream. Too often he has to pour away milk and cream that has soured. There is no such waste when he can make up just as much milk or cream as he wants, on the day he wants it. All he requires is Merrell-Soule Powdered Skimmed Milk, sweet butter and a small emulsifying machine.

Thus equipped, he can be independent, because his supply is assured. He need not trouble to contract with a farmer for cream and milk, and seasons of milk shortage will not worry him. He will have no waste, no old-flavored milk, no dissatisfied customers. Cold storage takes care of his supply of sweet butter, and the Merrell-Soule Powdered Skimmed Milk will keep indefinitely in any cool, dry place.

Standard Skimmed Milk

Standard Skimmed Milk varies slightly as to its solid content during the various seasons of the year, but by referring to many hundreds of tests in our own laboratory, we find the average Skimmed Milk will test around 9% solids. As Merrell-Soule Powdered Skimmed Milk contains approximately 2 to 2.5% moisture, we recommend the use of 9¼ to 9½ pounds of powder, and the balance water, to make 100 lbs. of Skimmed Milk.

As the powder runs very constant in moisture, the customer could easily mix to any desired solid content, and to any amount of Skimmed Milk desired. Say, for instance, 20 cans of Skimmed Milk are wanted. A 10-gallon can of Skimmed Milk weighs approximately 86 lbs. Multiply the 20 by 86, and you have 1,720 lbs., the amount desired. Next multiply the 1,720 lbs. by 9.5, the amount of Powdered

Skimmed Milk used for each 100 lbs., and you have 163 lbs. of powder, to use and the balance water, or 1,557 lbs.

There are many ways of reconstituting the powder and water back to liquid milk. If very small amounts of Skimmed Milk are desired, the water can be placed in a bowl or basin, the powder placed on top of the water, and put back into solution with an egg beater. Or, it can be shaken back into solution by the use of a common fruit jar. If a few gallons are desired, the water can be weighed into a milk can, the powder placed on top of the water, and then beaten back into solution with a baker's whip.

In the larger plants, starter tanks, ripeners, buttermilk machines, mixers, etc., can be used for large amounts. The mixing machines, which cause cross or counter currents in the solutions, will mix to a perfect solution very quickly. Starter tanks can be used very nicely by soldering a baffle strip of heavy tin along the coil.

In making the larger amounts of Skimmed Milk from Powdered Skimmed Milk and water, we would advise:

Place the required amount of water in the mixing tank, start up the paddle or coil, then turn just a slight amount of steam into the jacket or through the coil. Sift the powder into the water which is being agitated, and by the time the temperature has reached 90 to 100° Fahr. the powder will all be dissolved. Then quickly raise the temperature to 145°. Hold for thirty minutes, then cool quickly to at least 45°, and you will have a perfectly pasteurized product that can be put to any use for which you prefer Skimmed Milk.

Manufactured Milk and Cream

From time to time new and important uses are found for milk and cream. Changes in season, droughts, etc., affect the supply, and many times during the rush of the season the dairyman is confronted by difficulty in procuring milk and cream enough to take care of his business.

But to the dairyman who believes in looking ahead, there is a ready solution to the shortage problem, for by the use of an Emulsor, Creamer, or Homogenizer, with Merrell-Soule Powdered Skimmed Milk and Sweet Butter, any quantity of Milk or Sweet Cream, of any butterfat standard, can be produced on short notice.

The manufacturers of the various machines give full directions on just how to operate them with the use of Powdered Milk, and the operation will be found exceedingly simple.

The dairyman will find that Merrell-Soule Powdered Skimmed Milk will not only save time and money, but will also increase the quality of his milk and cream, and at the same time will eliminate the possibility of souring through over-supply.

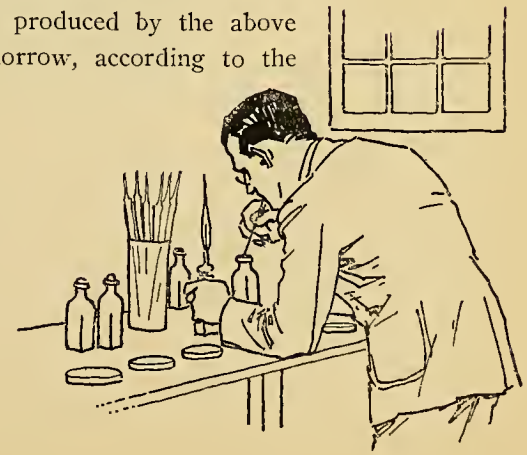
During certain seasons of the year, the dairyman may have a surplus of whole milk, the butterfat from which he can easily convert into butter and put in cold storage until the shortage time arrives. Then, by the use of Powdered Milk and water, this butter can be easily converted into a high-class milk, which will tide the dairyman over the shortage period and hold his business.

The dairyman who does not have any surplus fat during any season of the year can buy butter at the low price of the season, put it in cold storage, and then use as wanted. Care must be taken in selecting the butter, as only first-class unsalted butter should be used if a high-grade milk or cream is desired.

If the cream is to be shipped long distances as fresh cream, the butter should be made from churned sweet cream, no starter being used. But if the cream is to be used locally and for ice cream, starter-ripened butter can be used.

The dairyman should remember that Merrell-Soule Powdered Skimmed Milk is always uniform in flavor, solubility, etc., and should see to it that the unsalted butter to be used is of the same quality. Then, results which are most gratifying will follow.

Any quantity of milk or cream can be produced by the above method, 50 gallons today, 250 gallons tomorrow, according to the capacity of the apparatus.



Formula for Making Milk and Cream

Ordinary unsalted butter contains approximately 84% butterfat. The balance is other solids and moisture. The Powdered Skimmed Milk contains about two per cent. of moisture.

The following is a short formula for ascertaining the number of pounds of unsalted butter, Powdered Skimmed Milk and water to be used in the production of milk or cream of any desired butterfat content.

1. Amount desired (in pounds) multiplied by percentage of butterfat desired, and divided by .84, equals pounds unsalted butter to be used.

2. Amount desired, minus amount unsalted butterfat, multiplied by .095, equals pounds Powdered Skimmed Milk to be used.

3. Amount desired minus sum of amount of unsalted butter and amount of Powdered Skimmed Milk equals pounds water to be used.

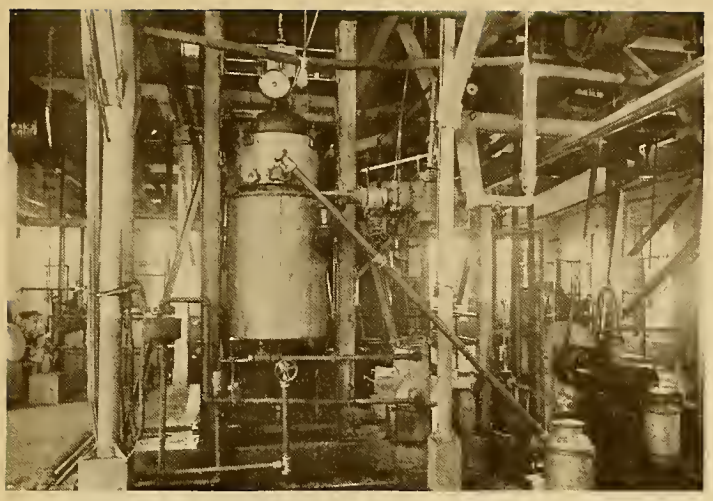
EXPLANATION:

In using the above formula we must first change the number of gallons of product desired into pounds. For this purpose we recommend the following weights:

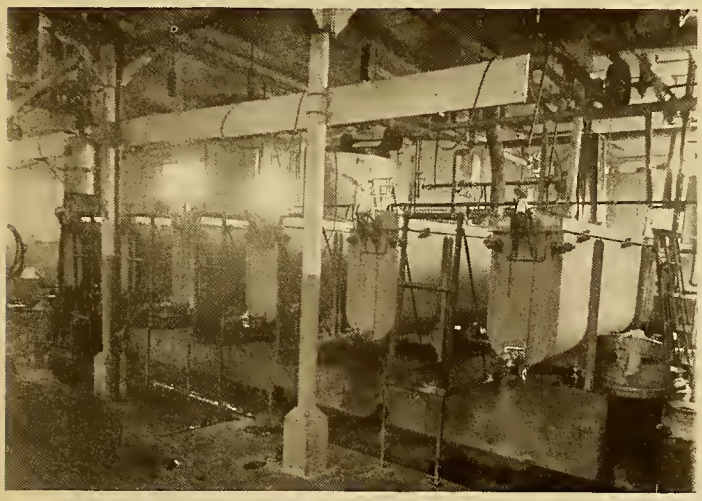
1 gallon skimmed milk	8.6 lbs.
1 gallon whole milk	8.5 lbs.
1 gallon 20% cream	8.4 lbs.
1 gallon 30% cream	8.3 lbs.
1 gallon 40% cream	8.2 lbs.

1. If, therefore, 50 gallons of 20% cream are wanted we must multiply 50 by 8.4, making 420 pounds to be placed as "amount desired."

This "amount desired" must then be multiplied by .20 in this case, as the cream desired must contain 20% butterfat. This would then give us 420 multiplied by .20 equals 84 lbs., which is the amount of butterfat needed.



Merrell-Soule Continuous Condenser,
Waterford, Pa.



Pasteurizing Apparatus, Merrell-Soule Factory,
Waterford, Pa.

Merrell-Soule Factory, Waterford, Pa. Daily Capacity 60,000 Pounds of Milk

It is safe to consider that average unsalted butter will contain 84% butterfat, although for accuracy's sake, it is well to test the butter. By dividing 84 by .84 we, therefore, get 100 pounds as the amount of butter needed in making the 50 gallons of 20% cream.

2. From the amount required we must then deduct the butterfat to be used, i. e., 420 lbs., minus 84 lbs., or 336 lbs., of liquid skimmed milk. In reducing this skimmed milk to its equivalent in Powdered Skimmed Milk, it must be multiplied by 9½%, giving 336, multiplied by .095, equals 31.9 pounds of Merrell-Soule Powdered Skimmed Milk to be used.

3. By adding the Powdered Skimmed Milk and butter which we are to use together and subtracting the sum of these from the total amount desired, we have the amount of water to be used.

100 lbs. butter plus 31.9 lbs. Merrell-Soule Powdered Skimmed Milk equals 131.9 lbs.

420 lbs. wanted minus 131.9 lbs. equals 288.1 lbs. water needed. Therefore:

1. Amount desired (420 lbs.) multiplied by percentage butterfat desired (20%) divided by .84 equals amount of butter to be used (100 lbs.).

2. Amount desired (420 lbs.) minus amount butterfat (84 lbs.) multiplied by .095 equals pounds Powdered Skimmed Milk to be used (31.9 lbs.).

3. Amount desired (420 lbs.) minus the sum of butter (100 lbs.) and Powdered Skimmed Milk (31.9 lbs.) equals pounds of water to be used (288.1 lbs.).

Formula for Ascertaining the Number of Pounds of Milk or Cream of Any Desired Butterfat Which Can be Manufactured From a Given Weight of Merrell-Soule Powdered Skimmed Milk:

1. From 100 lbs. of the desired milk or cream deduct the weight of the fat contained in it. Result is skimmed milk.

2. Skimmed milk multiplied by .095 equals the powder equivalent to 100 lbs. of milk or cream. Divide this number by 100 to obtain the powder equivalent to one pound of milk or cream.

3. Divide the original weight of powder by this one-pound equivalent, to obtain the desired quantity of milk or cream.

4. Compute the weight of fat in the total milk or cream.

5. Divide the weight of fat by .84 to get the equivalent in butter.

6. From the total weight found in No. 3 deduct the weight of butter plus powder to get the amount of water.

Formula for Ascertaining the Amount of Milk or Cream of Any Desired Butterfat Content From a Given Weight of Butter:

1. Compute the weight of the fat in the butter by muliplying by .84.

2. Divide the weight of fat by the percentage of fat (expressed in decimals) in the milk or cream desired: i. e., 4% is expressed .04, 20% is expressed .20.

The result is the weight of milk or cream desired.

3. Total weight of milk or cream minus the weight of fat equals the weight of skimmed milk.

4. Weight of skimmed milk multiplied by .095 gives the weight of powder.

5. Total weight of milk or cream minus the weight of butter plus powder gives the weight of water.

The above formulas cover the methods of arriving at amounts of Powdered Skimmed Milk, butter and water to use. For the convenience of our readers we give below amounts of butter, Merrell-Soule Powdered Skimmed Milk and water required to make ten gallons of milk cream of standard butterfat contents.

	3%	3.3%	3.5%	4%	18%	20%	22%
Butter	3.03 lbs.	3.34 lbs.	3.54 lbs.	4.04 lbs.	18.0 lbs.	20.0 lbs.	22.0 lbs.
Merrell-Soule Skimmed Milk Powder	7.83	7.81	7.79	7.75	6.38	6.54	6.22
Water	74.14	73.85	73.67	73.21	59.62	57.46	55.78
	85.00 lbs.	85.00 lbs.	85.00 lbs.	85.00 lbs.	84.00 lbs.	84.00 lbs.	84.00 lbs.

	25%	30%	38%	40%	42%	45%
Butter	24.85 lbs.	29.64 lbs.	37.1 lbs.	3 .05 lbs.	41.0 lbs.	43.9 lbs.
Merrell-Soule Skimmed Milk Powder	5.91	5.52	4.83	4.67	4.52	4.14
Water	52.64	47.84	40.07	38.28	36.48	33.46
	83.5 lbs.	83.0 lbs.	82.0 lbs.	82.0 lbs.	82.0 lbs.	81.5 lbs.

Directions for Handling Mixture

The following will give a general idea of just how to handle the mix to get the best results.

The operator should be very careful to see that all apparatus and utensils are absolutely clean and in good working condition. He should be very careful in all weighings or measurings of the ingredients. If care is used the finished porduct can be easily made to come within 1% of the butterfat test wanted without standardization, and the total solids test will show up on the lactometer within the range prescribed.

In starting the mix, weigh or measure the full amount of water to be used into the mixing tank. Water should be clean and pure. Start the agitator or coil and bring the temperature of the water to 70 or 80° F.

Add the Merrell-Soule Powdered Skimmed Milk by sifting it on top of the water. Keep the temperature at about 80 until the powder is all dissolved, then add the butter, which has been sliced into small chunks, and raise the temperature not too quickly to from 145° to 148° F., and hold for 30 minutes. Watch the temperature closely, as too high a temperature will cause a cooked flavor in the finished milk or cream, while too low a temperature will result in sediment and in the mix being improperly pasteurized.

The Emulsor, Creamer or Homogenizer should be up to the proper speed or pressure necessary to get the best results, and the mix put through at the capacity of the machine. The operator should watch the cooling carefully and keep the product as it goes over the cooler at all times below 50° F. From 38 to 45° is the desirable cooling temperature.

If the Emulsor is used, the finished product should be allowed to stand a short time before bottling or canning, so that all the air incorporated in the process may be eliminated.

Milk or cream manufactured in this manner should be given the same attention as fresh milk or cream, as it will act as such and will sour if not kept cool.

All these rules are important, and should be followed closely.

Standardizing Milk and Cream

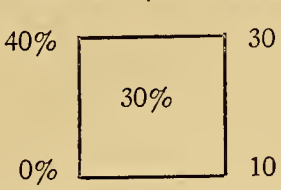
The manner of making up the skimmed milk from Powdered Skimmed Milk and water has already been shown and with this skimmed milk on hand, cream can be standardized to any desired butterfat content. From our own practical experience in the cream business, we find that a ten-gallon can of cream, of the various percentages, weighs approximately as follows:

10	gallons	20%	weighs	84	lbs.
10	"	22%	"	84	"
10	"	25%	"	83½	"
10	"	30%	"	83	"
10	"	40%	"	82	"
10	"	45%	"	81½	"

Practically every creamery man is familiar with standardization methods, but for the assistance of any who may not thoroughly understand them, we will give two illustrations, using the method given by Professor Pearson, known as the "rule of thumb" method.

Suppose we have on hand skimmed milk and 40% cream, and want to make 20 cans of 30% cream.

30% cream weighs 83 lbs. to the can
Skimmed milk tests .0% for butterfat.
That is, you would consider .0% for standardization purposes.

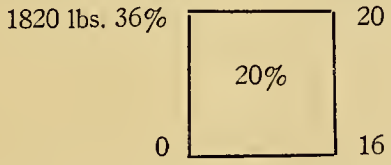


Draw a square, place the desired percentage in the center, place the highest test in the upper left hand corner and lowest test in the lower left hand corner, and subtract as shown in the above illustration.

The illustration in this case shows that in making 30% cream you would use to each 30 parts or pounds of the 40% cream 10 parts or pounds of the skimmed milk. As 20 cans is the desired amount, multiply 20 by 83, which gives 1,660 lbs. By adding 30 and 10 we get 40; divide 1,660 by 40, which gives 41.5. Then multipy 30 and 10 each by 41.5, and we find we would use 1,245 lbs. of the 40% cream and 415 lbs. of skimmed milk to make the cream desired.

Again, say we have 1,820 lbs. of 36% cream and wish to use it all in making 20% cream. How much skimmed milk would have to be used? This is a very common problem.

Figure the square the same as in the other problem.



This shows that to every 20 lbs. of 36% cream 16 lbs. of skimmed milk should be used, so divide the 1,820 by 20, which gives 91, and multiply this figure by 16, which gives the amount of skimmed milk to use, namely 1,456 lbs. By adding the 1,820 lbs. to 1,456 lbs. we will get 3,276 lbs. of the 20% cream.

Any standardizing problem can be easily figured out by this method, using either skimmed milk or whole milk, with higher percentages of cream.

Manufacture of Buttermilk, Commercial Buttermilk and Cultured Milks

Buttermilk is the product that remains when fat is removed from milk or cream, sweet or sour, in the process of churning.

Good buttermilk makes a pleasant drink and is beneficial to the health. Many of the best doctors prescribe buttermilk or cultured milk. For these reasons buttermilk is becoming very popular, and there is a constantly growing demand for this product.

There does not seem to be enough churning done at the present time to supply the demand for buttermilk, and on account of this lack, as well as transportation difficulties, many firms are manufacturing buttermilk or commercial cultured milk in large quantities. This product is giving excellent satisfaction. In many cases the cultured milk is superior to cream-churned buttermilk, on account of the dairyman's ability to control body and flavor.

In order to make good buttermilk or cultured milk, skimmed milk of first-class quality must be used. Merrell-Soule Powdered Skimemd Milk will fill this requirement and many more. In many cases this skimmed milk powder is far superior to liquid skimmed milk for buttermilk or cultured milk-making, on account of the fact that liquid skimmed milk cannot be shipped any great distance and remain in first-class condition.

In making cultured milk, use Merrell-Soule Powdered Skimmed Milk and pure water, in the proportion of 12 oz. of powder to each gallon of water, and follow the same procedure as in making starter for butter-making. (See page 74.) Thoroughly dissolve the powder in the water, in a ripener, starter tank or buttermilk machine, and heat to 185° for at least 30 minutes, then quickly cool to at least 65° and inoculate with the "mother starter." A good, clean "mother starter"

should be carried along with every possible precaution to prevent contamination. The manner of handling the "mother starter" is explained elsewhere, under the heading of "starters."

Maintaining a temperature of 65° after inoculation gives a little slower development of acid, but at this temperature the product remains better flavored and the bacteria are more active than when a higher temperature is maintained.

When the fine curd commences to form the temperature should be dropped promptly to at least 50° to prevent toughening of the curd. The curd should then be broken up by a thorough churning in the tanks, or by being transferred to the regular churn.

The flavor can be improved by the addition of a small amount of whole milk or light cream, added just before churning. The price received for this product must to a certain extent govern the amount of whole milk or cream used.

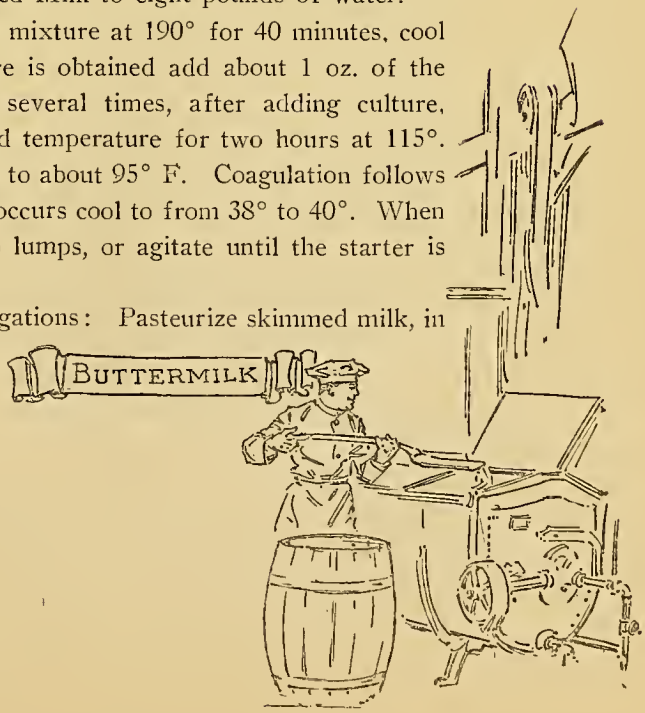
The finished product should be smooth, free from lumps, and show a separation of curd only on long standing.

Some makers require the use of Bacillus Bulgaricus Culture. To grow this great care must be used.

Bulgarian Buttermilk: To make Bacillus Bulgaricus Starter, one small bottle containing about 1 oz. of liquid Bulgaricus Culture obtained from the best source should be used, with a mixture of one pound of Merrell-Soule Powdered Skimmed Milk to eight pounds of water.

Pasteurize the skimmed milk mixture at 190° for 40 minutes, cool at 115°. After that temperature is obtained add about 1 oz. of the pure Bulgaricus Culture. Stir several times, after adding culture, during the first half hour. Hold temperature for two hours at 115°. Allow to cool gradually in cooler to about 95° F. Coagulation follows in five or six hours. After this occurs cool to from 38° to 40°. When cool stir thoroughly to break up lumps, or agitate until the starter is smooth.

Second and Successive Propagations: Pasteurize skimmed milk, in



the proportion of one part powder to eight parts water, at 185° F., cool to 115° F., add the Bulgarian Starter in the proportion of eight ounces Starter to every eight gallons of skimmed milk. Stir ten minutes. Let stand until the acidity is .20 to .25, then immediately place in cooler, where temperature is about 40° F. In about seven to twelve hours the milk will have curdled, with the characteristic acid flavor. It is then ready to bottle. A small amount may be added to common Lactic Starter if desired.

Flavor: Both Bulgarian and common Lactic Starter make very fine buttermilk, by churning with a small amount of cream in the churn. This gives the fine butter flavor that the trade desires.

The foregoing covers the making of culture for large quantities of buttermilk. Some makers prefer using half Bulgaricus and half Lactis Acidi to make the finished buttermilk in large quantities, or one-third Bulgaricus and two-thirds Lactis Acidi.

To make a large quantity of buttermilk on the one-third and two-thirds basis, mix the amount of skimmed milk powder that you require into the buttermilk. Take two-thirds of this and pasteurize at 185° for 45 minutes. Cool at once to from 70° to 80° F., add one quart Lactis Acidi Starter to each eight gallons of milk. Hold at same temperature until curdled. When curdling takes place, cool at once to 40° and agitate curds until they are broken up or smooth.

Take the remaining one-third of the large quantity of skimmed milk and treat as when making Bulgaricus Starter. When both quantities are cold and thoroughly stirred, add the one to the other, mix, and bottle cold. The buttermilk is then ready to use.

It is well to reserve some of each culture for the following day's culture. The culture can be kept in this way until the flavor begins to "go off", when new culture must be made as above described.

Troubles in Buttermilk

A common obstacle to the production of good buttermilk is separation of the whey. It may be caused by:

1. Bad milk, or milk not properly pasteurized. Use Merrell-Soule Powdered Skimmed Milk. If inferior milk must be used, pasteurize it twice, letting it stand five or eight hours at 80° between times. It may make a passable product in time of shortage, but maintained quality is positively assured only by the use of Merrell-Soule Powdered Skimmed Milk.

2. Poor Cultures. Get fresh culture frequently, and handle with great care. It is a good plan to carry two or more, so as to be sure of one in case the other becomes contaminated.

3. Foaming. Keep the speeds of the machines low enough to avoid foaming.

4. Temperature. Cool the product quickly and keep it cool throughout the handling.

Suggestions on Marketing

Do not use Bulgaricus for mild acid buttermilk.

See that the product is kept cold at soda fountains, restaurants, etc. Supply them, fresh, daily. A warm or stale product is unpalatable and loses trade.

Let the physicians know that you have a pure product and they will recommend it. They appreciate the medicinal value of fermented milk, especially of the Bulgarian variety.

Advertise. Read up on the buttermilk organism and talk it among your friends.

Adopt a trade name for your product.

The creameryman or dairyman who has not looked up the buttermilk question in his vicinity should do so without delay. The people are rapidly becoming educated on this subject. Physicians realize the value of cultured milk and prescribe it to many people. The manufacture of buttermilk is an industry in itself, and there is every prospect of an unlimited consumption.

Uses in the Creamery

MERRELL-SOULE POWDERED SKIMMED MILK is used in the Creamery for manufacturing milk and cream, for standardizing milk and cream for the manufacture of Commercial Buttermilk, and for making Starter to be used in Butter Manufacture.

The three uses first named have been fully described in the preceding chapter, with the required formulas. We will, therefore, in this chapter, deal in detail only with the use of Merrell-Soule Powdered Skimmed Milk in the manufacture of Starter.

Starter for Butter-making

Every buttermaker today knows the value of a good starter in butter-making, as he uses the starter to control the flavor and quality of his product.

A well-developed, active starter is as desirable in the whole-milk creamery as it is in the gathered-cream plant, for with its use the up-to-date buttermaker has all conditions well under his control at all times.

A poor starter is worse than none at all, as it will make a poor quality of butter even if the cream is first-class in every respect.

A good starter for butter-making should conform to the following characteristics:

1. It should be made from milk of the highest quality, which runs uniform from day to day.
2. A good standard culture should be used.
3. When coagulated, the curd should be perfectly homogeneous, showing no gas bubbles or free whey on the surface.
4. The taste should be mild and agreeably acid.
5. The acidity should range from 0.5 to 0.7%.
6. When shaken the curd should break up into a smooth, creamy liquid, free from any coarse lumps.

A careful buttermaker, with the proper equipment and a supply of Merrell-Soule Powdered Skimmed Milk, can always make a strictly

first-class starter, for with the skimmed milk powder he has his starter milk available at all times, and does not have to depend upon any patron or dairyman for his supply.

Large or small quantities can be made up. It is always of the same uniform quality, and there is no waste or loss of surplus starter milk.

Uniform skimmed milk of quality is the basis of starter success, and Merrell-Soule Powdered Skimmed Milk meets this requirement.

The "Mother Starter"

In the propagation of starters, the buttermaker should keep a small amount of the starter growing in sterile milk. This is known as the "mother starter." From this "mother starter" the larger amounts for the cream-ripening are made.

The method for the propagation of the "mother starter" is as follows:

Take 3 to 3½ ounces of Merrell-Soule Powdered Skimmed Milk and thoroughly mix with one quart of water by using a beater or small whip. When thoroughly mixed, put in a quart fruit jar or milk bottle until about three-quarters full, heat to 185° and hold from 45 minutes to one hour. Then cool quickly to at least 65°. The pure culture starter should then be added, the contents well shaken, and then set away for about 24 hours in a place where the temperature is constant. At the end of this time, the milk should be curdled, and should have developed the desired characteristics. It should then be transferred into previously sterilized milk for the second propagation.

It is always best to keep two or three "mother starters" on hand, so that if one becomes poor or bad-flavored, another can be used.

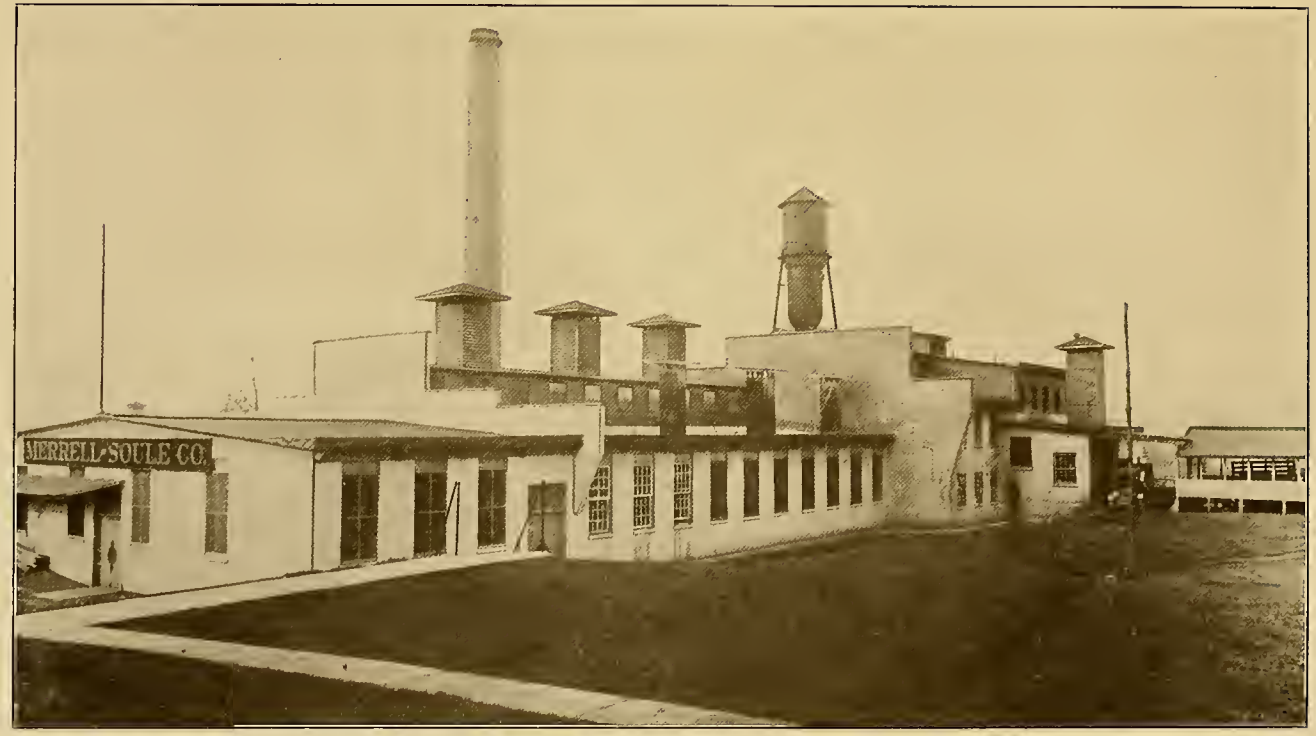
To keep the starter in good condition, the transfer into the sterile milk should be made as soon as possible after the curd is formed. If this is not convenient, place in an ice box, so as to retard development, and the starter will hold its vitality. At this point the acidity of the "mother starter" should be about 0.6%.

From this "mother starter" the starter to be added to the cream is made. Skimmed milk made from Merrell-Soule Powdered Skimmed Milk and water, and which has been previously pasteurized to 185° for at least 30 minutes, is innoculated by transferring an amount of the "mother starter", which will coagulate the skimmed milk and have an acidity of around 0.6% when ready for use the following day. A little practice will soon show just how much of the starter to add each time.

Buttermakers use different temperatures for ripening the starter, but from our own experience we would advise a low temperature for ripening, as this keeps the starter active and holds the acidity down.

Highly acid, over-ripe starters are in many cases the cause of a metallic flavor, and of other flavors which cause butter to sell for less than the market price.

A careful buttermaker, with the aid of Merrell-Soule Powdered Skimmed Milk for starter making, is always equipped to make prize-winning butter.



Powdering Plant, Union City, Pa. Capacity 125,000 Pounds Daily

Advantages for Ice Cream Making

THE ice cream manufacturer demands a milk or cream product which is clean, which will not sour quickly, which is not a breeder of bacteria, and which gives him the largest percentage of milk solids in proportion both to its bulk and its cost.

All these essentials he finds in Merrell-Soule Powdered Milk.

Its powdered form insures the greatest possible purity and cleanness, as is attested by many authorities.

There need be no loss through souring, no sticky, half-empty cans standing around, gathering flies and breeding bacteria, when Merrell-Soule Powdered Milk is used. The ice cream man makes up just what he needs for the day's business. He can make up a big supply of cream, for a sweltering day's run, or a small amount for a cool day. A sudden drop in temperature will not leave him with a lot of cream on hand that must either be used or spoiled.

It has been proved that Merrell-Soule Powdered Milk shows a far smaller bacteria count than any other form of milk, and it offers no breeding place for microbes.

Merrell-Soule Powdered Milk can be put to many uses in the ice cream factory:

1. In the production of milk or cream from Powdered Skimmed Milk, butter and water, previously explained fully under the heading "In the Dairy."

2. The production of skimmed milk from powder and water, which has been explained under the head of "Standard Skimmed Milk."

3. The standardization of the milk solids in the ice cream batch.

4. Furnishing the necessary skimmed milk solids.

5. Blending Butter and the Powdered Skimmed Milk with liquid whole milk of any fat content, for the complete total milk solids of the batch.

Other uses could be mentioned, but these will give the ice cream maker an idea of the importance of Merrell-Soule Powdered Skimmed Milk in his business.

Many of the large ice cream makers are beginning to realize the losses which they incur every year through using condensed milk to raise the percent of milk solids in their ice cream.

By the use of Powdered Skimmed Milk they have an easy and accurate means of holding the solids to any desired percentage.

Merrell-Soule Powdered Skimmed Milk does not take the place of gelatines, ice cream powders, etc., which prevent the ice crystals in ice cream, but it does provide the solids-not-fats, which give "body" and texture to the ice cream and makes it smooth, velvety and palatable.

Almost every ice cream maker has his own formula for his mix, which gives the best satisfaction to the trade he serves, and for this reason we will not print any ice cream formulas. We will be glad, however, to furnish formulas which have given good results, to any ice cream maker who applies to us.

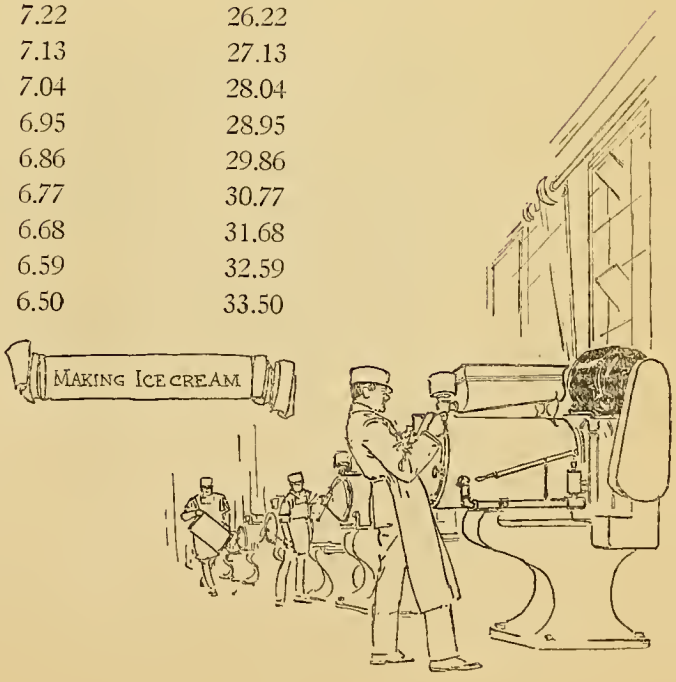
In our own experimenting, and in practical work in some of the large ice cream factories, we have found the Powdered Skimmed Milk to be a wonderful help to ice cream makers in a great many ways. Some of these have been mentioned here, others will soon be discovered by any ice cream manufacturer as soon as he begins the use of Merrell-Soule Powdered Milk.

For the benefit of the ice cream maker, we are giving the following schedule of fats, solids-not-fats and total solids of milk and cream, of the different percentages from 0 to 50%. This will be found very helpful in standardizing and blending fats and solids-not-fats with whole milk, for the ice cream batch.

Total Solids and Solids-Not-Fats in Skimmed Milk, Milk and Cream

Calculations Based on 8.91% S. N. F. in Milk Serum.

Fat Test in %	S. N. F. in %	T. S. in %
0	8.91	8.91
1	8.82	9.82
2	8.73	10.73
3	8.64	11.64
4	8.55	12.55
5	8.46	13.46
6	8.38	14.38
7	8.29	15.29
8	8.20	16.20
9	8.11	17.11
10	8.02	18.02
11	7.95	18.93
12	7.84	19.84
13	7.75	20.75
14	7.66	21.66
15	7.57	22.57
16	7.48	23.48
17	7.40	24.40
18	7.31	25.31
19	7.22	26.22
20	7.13	27.13
21	7.04	28.04
22	6.95	28.95
23	6.86	29.86
24	6.77	30.77
25	6.68	31.68
26	6.59	32.59
27	6.50	33.50



Fat Test in %	S. N. F. in %	T. S. in %
28	6.42	34.42
29	6.33	35.33
30	6.24	36.24
31	6.15	37.15
32	6.06	38.06
33	5.97	38.97
34	5.88	39.88
35	5.79	40.79
36	5.70	41.70
37	5.61	42.61
38	5.52	43.52
39	5.44	44.44
40	5.35	45.35
41	5.26	46.46
42	5.17	47.17
43	5.08	48.08
44	4.99	48.99
45	4.90	49.90
46	4.81	50.81
47	4.72	51.72
48	4.63	52.63
49	4.54	53.54
50	4.45	54.45

Milk of the same solids content of condensed milk can be manufactured from the Powdered Skimmed Milk, butter, and water, and can be used the same as condensed milk in the batch.

Say, for instance, an 8% butterfat and 26% total solids is wanted. Figure the butter as containing 84% butterfat and the skimmed milk as containing 2½% moisture. Figuring on the basis of 100 lbs., we would have 8 lbs. butterfat.

8 divided by .84 equals 9.5 of butter to use.

26 minus 8 equals 16 lbs. of skimmed milk solids.

18 divided by .97½ equals 18½ lbs. of powder to use.

9.5 plus .18.5 equals 28.

100 minus 28 equals 72 lbs. amount of water to use.

The manufacturing of this blend should be handled as explained in the making of milk or cream, under "Merrell-Soule Powdered Skimmed Milk in the Dairy."

Milk of any fat content or any solids-not-fats content, can be handled successfully in this manner, and a very fine product will be the result. The ice cream maker never has to worry about his supply of condensed milk if he has some sweet butter and Merrell-Soule Powdered Skimmed Milk in storage.

We will gladly go into detail with any ice cream manufacturer on the use of Powdered Skimmed Milk in an ice cream formula, if he will send us his formula, methods of mixing, etc.

In the Condensary

THE condensed mlk plant that manufactures Condensed Skimmed Milk, Condensed Whole Milk, or Superheated Milk for the ice cream trade, will find Merrell-Soule Powdered Skimmed Milk a big help in times of shortages. The plant that has a surplus of butterfat during the flush months can make sweet butter, hold it till the shortage months, and then, with Powdered Skimmed Milk, increase their output.

In the manufacture of superheated bulk milk for the ice cream trade, there are two methods which can be used, either of which will produce a fine product.

If 3% milk is used as the base for the batch, figure out the number of pounds of water and powder necessary. Run the water into the hot wells or Fore-warmers, and turn direct steam into the water, which will give the water quite violent agitation. Sift the required Powdered Skimmed Milk into the water and stir with a long-handled agitator. As soon as the powder is all dissolved, add the butter necessary to bring to 3%, or whatever test is desired, the butter should be sliced into small pieces. The temperature of the mix should be around 155 to 160°. Hold at this temperature for 10 minutes, then proceed as in the regular condensing. If the operator is careful and painstaking in weighing, dissolving the powder and butter, and pasteurizing, a first-class product will be obtained.

If the butter required be dissolved in fresh liquid skimmed milk, a saturated solution of Powdered Skimmed Milk and water can be used to supply the additional solids, and at the same time lessen the time of the batch at the condensing pan. A twenty per cent. solids solution can easily be used in the following manner:

Dissolve the butter in fresh Liquid Skimmed Milk. Dissolve the heavy Powder Solution, using a ripener, mixing tank or an agitator, the same as explained above. Draw the butter solution into the condensing pan first, then follow with the Powdered Skimmed Milk solution, and proceed as in regular condensing.

A very satisfactory product can be made in this manner.

Merrell-Soule Powdered Milk

In Candy-Making

LEADING candy manufacturers of the country are today using Merrell-Soule Powdered Cream and Milk, in constantly-increasing quantities, because they have proved the many and decided advantages of these products over evaporated milk, condensed milk, or sweet cream, in the manufacture of caramels, milk coatings, fudge and other milk confections.

There are many reasons why Merrell-Soule Powdered Milk steadily gains in favor among confectioners. First of all is the obvious fact that there can be no loss from souring, as is continually the case where liquid milk and cream are used. If the candy maker wants ten gallons of cream today, he can make it up, use it up, and close the day with a clean, empty can, ready for the next day's requirements.

While Merrell-Soule Milk and Cream Powders will not keep forever, they possess the very decided advantage of remaining in a sweet and perfect condition for several months, when kept in cool, dry storage.

The confectioner who uses them has his supply always and instantly at hand. Shortages of milk and cream or delivery troubles need not disturb him. Both waste and delay are eliminated from his calendar.

* * * * * * * * * * *

Next, and equally important, is the saving of time and consequent increase of output enjoyed by the candy man who uses the Merrell-Soule products.

A candy maker, for instance, in making up a batch of caramels, and using liquid cream or condensed milk, has to stir the candy, on the fire, until all the water has been boiled out.

Consider what this means—if the candy man is using six pounds of fresh cream, four and a half pounds of it is water, which simply has to be boiled out. Evaporated milk contains 74% of water which has to be boiled away.

In the use of Merrell-Soule Milk or Cream Powder, the amount of water added to the powder, to dissolve it, is just about half the

amount contained in liquid cream, and there is therefore just half as much water to boil away. It will readily be seen that considerable time will be gained in the cooking of each batch, and that the confectioner's output will be accordingly increased, without any increase of labor or equipment.

A third advantage, one which is well known to every confectioner using the Merrell-Soule preparations, is the much finer milk or cream flavor noticeable in any caramel or milk coating made with Merrell-Soule Powdered Cream or Milk.

The reason is simple. The application of a high degree of heat to milk or cream is bound to destroy its delicate flavor. As it is necessary to cook the liquid milk or cream used in making caramels, fudge, milk coatings, etc., until the water has been boiled away, it is impossible to avoid injuring the flavor.

When the Merrell-Soule preparations are used, the cream or milk powder is not added until the batch is nearly cooked, and the rich, delicate flavor of the cream remains in the candy. Another reason for the superior flavor of all confections made with the Merrell-Soule Milk or Cream Powders is that the spray process, by which these powders are manufactured, does not affect the albumen in the milk. It remains absolutely alive, and to its presence is largely due what is everywhere recognized as the natural, delicate milk flavor.

Caramels made with Merrell-Soule Powdered Milk are lighter in color than those in which liquid or condensed milk is used, and are also "shorter-eating"—that is, they are firm in texture, and "bite off" when being eaten, instead of being "chewy" and stringy.

* * * * * * * * * * *

The various kinds of Merrell-Soule Powdered Cream and Milk contain widely-varying percentages of butterfat. But each kind contains always the same exact, regulated percentage, hence every batch of candy or coating made from a given recipe will turn out exactly like every other batch made from that recipe—a distinct advantage over the results obtained from the use of liquid, condensed or evap-

Merrell-Soule Powdered Milk Factory, Little Valley, N. Y.

orated milk or cream, in which butterfat percentages are always an unknown quantity.

We are not including recipes for the candy maker, because of differing methods and varying conditions of work in different establishments. We shall be glad, however, to hear from any manufacturer and will be glad to furnish recipes, together with our advice as to how he may obtain the best possible results from the use of Merrell-Soule Powdered Milk in his factory, and under the general conditions which are to be found there.

We also offer to candy manufacturers who use Merrell-Soule Powdered Milk the services of an expert candy maker, who will, upon request, visit the factory of a customer who desires a personal demonstration of the uses of our product, and show just how the best results are to be obtained.

Hotels, Restaurants, Steamships, Etc.

MERRELL-SOULE Powdered Milk Products are used by clubs, hotels, restaurants and on shipboard, for all purposes that would be answered by fresh liquid milk and cream.

For Cooking

The use of Merrell-Soule Powdered Milk is particularly advantageous in cream soups, cream sauces, sweet sauces, and gravies. Much fresh milk used for this purpose, in these establishments is lost by scorching, souring and breaking, because the supply for cooking is generally milk left over from the previous day's supply purchased for drinking purposes.

Scorching of this liquid milk occurs if it is heated, as is often done, by putting it in a vessel on the range without a double boiler containing hot water, or heating it on a steam table. Liquid milk, coming from the ice box ice cold, scorches easily, whereas mixing Merrell-Soule Milk Powder with hot water will eliminate trouble of this kind.

Souring or curdling of milk occurs very often in milk that has been held over, and the practice also results in "breaking," which occurs frequently, when a hot soup or sauce made with milk must be left for continuous serving in the steam table or bain marie. This "breaking" makes the soup or sauce unfit for serving and not only wastes the liquid milk used but also, in many instances makes any food served in the cream of no further use, the curdled or broken state of the cream sauce preventing proper washing off.

Merrell-Soule Skimmed Milk and No. 25 Powders are ideal ingredients to use, the supply on hand being always ready for use, uniformly pasteurized, perfectly fresh and in first class condition.

The restauranteur or steward will save himself much worry and money if he furnishes his cooks Merrell-Soule Milk Products as the milk ingredients for preparing dishes, especially as carried on the ready-to-serve menu, and for stock sauces and desserts.

Soups and Sauces

The best way to use Merrell-Soule Powdered Milk in cooking is to restore whatever quantity of milk is required, using one pound of the powder for each gallon required.

Make a smooth paste, by adding slowly some cold water to the required amount of milk powder, then pour on hot water of 150° F. and beat up the mix while pouring. Set the milk container in steam table or hot water bath and use it as you formerly did liquid fresh milk.

Directions

In making cream sauces or soups, the standard thickening requirements per quart of milk is a roux made up of one ounce of fat, drippings or butter with two ounces soft flour.

Place the fat in kettle or pot on the range, allowing it to melt, add flour and mace or nutmeg, either whole or grated, and salt, stir with a whip. When this roux is boiling, pour in slowly and stir briskly to prevent lumping, the required proportion of milk as indicated above. This makes a cream sauce of heavy consistency, which for cream soups can be thinned down with the liquor or juice of the vegetable, meat or fish which furnishes the character of the soup.

Cream sauce is used as a base for over half of the dishes on the American menu, and as a garniture or gravy in appetizingly serving many articles of food.

Cream soups are big favorites and the base as noted above allows the chef to use a greater amount of cooked vegetable juices, meat stocks or shell-fish liquors by employing them in reconstituting the milk instead of using water, as directed, thereby creating a better tasting, stronger flavored and more concentrated food than when fresh milk is used in connection with the liquors or juices which are to give the soup or sauce its character, the bulk of liquid milk making concentration impossible.

For Puddings

For this class of goods, the best way to use Merrell-Soule Powdered Milk is to restore milk by using 3½ ounces of powdered milk per quart of water required, and proceed with the recipe as formerly in making rice, tapioca, sage, bread, cabinet, cottage, farina, imperial, duchesse or any other pudding or its sauce.

Milk for Drinking Purposes

The use of Merrell-Soule Powdered Milk insures to hotels, restaurants, clubs, etc., a never-failing supply of liquid milk and cream for drinking purposes, for use in coffee and tea, and other needs. Shortage of milk, delivery troubles, waste through souring, will not longer annoy the hotel man or restaurant manager who keeps on hand a supply of Merrell-Soule Powdered Milk, from which he can make up at any time any desired quantity of skimmed milk, whole milk or cream.

Full directions for the restoring of Merrell-Soule Powdered Milk to liquid form, giving milk or cream of any desired butterfat content, will be found under the heading "In the Dairy".

Particularly is Merrell-Soule Powdered Milk a boon to steamship stewards. It has been impossible, of course, to use fresh milk and cream on shipboard for more than a day or two after leaving port. By the use of Merrell-Soule Powdered Milk, ocean travelers may have fresh milk and cream every day of their voyage, no matter how many days or weeks it may consume.

Making Ice Cream

Economy is only one of many advantages to be gained by the use of Merrell-Soule Powdered Milk for ice cream making, in hotels, clubs, restaurants, and on shipboard. All that is necessary is to restore the Powdered Milk to liquid milk or cream of any butterfat content desired, then use just the same as fresh milk or cream.

Valuable information may be found, in this connection, under the heading "In the Ice Cream Plant".

Merrell-Soule Powdered Milk for Infant Feeding

"MODIFIED Milk" is milk that has been especially prepared for the use of infants.

Its ingredients have been changed, in their quantitative relation, by dilution, and by the addition of ingredients normal to milk, or substitutes for natural milk ingredients.

Modified milk should be made from the purest milk obtainable. For this reason Merrell-Soule Powdered Milk is the ideal product to employ. It is pure, fresh milk reduced to powder form, by a process which does not change the milk sugar, injure the casein nor coagulate the lact-albumen.

Merrell-Soule Powdered Milk will keep for months. It cannot sour, on account of the almost total absence of moisture, and for the same reason no growth of bacteria can take place. The milk-fat contained is somewhat more easily digested than the fat of liquid milk, owing to a breaking-up of the fat-globules during the process of manufacture.

City milk is sometimes 48 hours old when delivered. Merrell-Soule Powdered Milk, when reconstituted back into liquid milk, is perfectly fresh, both in quality and in flavor.

And it is *clean*. Bear in mind that pasteurization does not make dirty milk clean, and that "pasteurized milk" is not always the same thing as clean milk. Merrell-Soule Powdered Milk is pure, clean milk from constantly inspected dairy farms, pasteurized and then reduced to powder form.

There are numerous other advantages connected with the preparation of Modified Milk from Merrell-Soule Powdered Milk.

For one thing, no ice is required to keep the powder. Small amounts may be dissolved as wanted, and each will be as fresh when used as when it left the factory. Cool, dry storage is all that is necessary to preserve Merrell-Soule Powdered Milk for months, without deterioration.

Comparing the use of Merrell-Soule Powdered Milk with liquid

milk, for modification purposes, this must be remembered—that Merrell-Soule Powdered Milk can be shipped thousands of miles, through heat or cold, without change. Distance and time, of course, are strong factors in the deterioration of liquid milk.

Merrell-Soule Powdered Milk is made in country districts, where the air is clean and pure, and from milk fresh from the cows. Most "modified milk laboratories" are in centers of dense population, and at great distance from the cows whose milk is used in these laboratory modifications.

Also, it is not possible that a "food" preserved in tin or glass, by being "super-heated" or cooked, can retain the anti-scorbutic quality held to pertain only to "fresh" foods. The spray process by which Merrell-Soule Powdered Milk is made is a process of preservation by dessication—not by heat, with the sterilization that commonly results.

The Merrell-Soule process, be it remembered, does not sterilize the milk, but leaves all its "life" and freshness intact.

There are certain recognized tests which distinguish between "fresh" food substances and those whose "life" and freshness have been destroyed. Several tests of this character are used on milk, and they are very effective in distinguishing a cooked, sterilized, or over-pasteurized milk from a fresh milk.

Probably the best test of this character is Leffman's, which directs that hydrogen peroxide be added to the milk in the presence of paraphenylene diamine. If the milk is fresh, a blue color appears at once; whereas, if the milk has been over-heated there is no change in color.

Leffman states that the presence or absence of certain organized principles, the nature of which is not fully known, is shown by this test. The test will show that the sterilized milk gives no blue color, the fresh milk gives a blue color quickly. A milk powder solution in which the milk powder used is that made by the Merrell-Soule Spray Process gives a blue color in the same length of time and of the same intensity as the fresh milk.

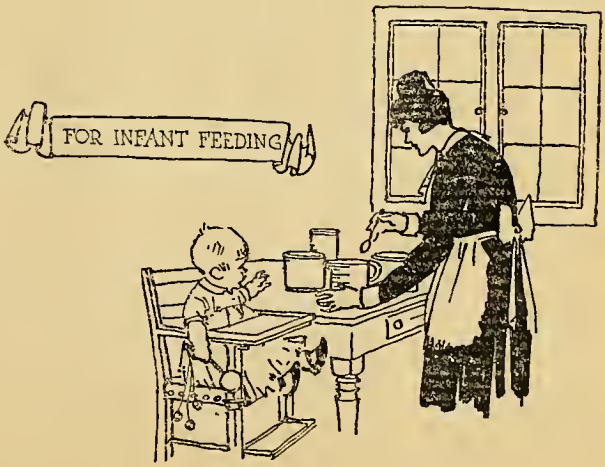
The fact that the life quality of the original liquid milk is not de-

stroyed by the spray process of dessication has been further proved by Mendel and Osborne, in their work upon proteins, at the Connecticut Agricultural Experiment Station and by Prof. E. V. McCollum, at Johns Hopkins University, Baltimore, Md. White rats fed on "milk food" composed of powdered whole milk manufactured by the Merrell-Soule Spray process gave a natural curve of growth, and rats previously stunted by insufficient nourishment became normal when fed upon this milk.

Merrell-Soule Powdered Milk can be used as a basis for all modifications of milk. Milk sugar, malt sugar or cane sugar may be used, as desired, and any percentage of fat may be obtained by the addition of fresh cream, or Merrell-Soule Powdered Cream.

For invalid dietary, this milk, when reconstituted with water, can be used for the preparation of junket and all other delicate milk foods.

For a drinking milk, Merrell-Soule Milk, reconstituted with water, has all of the qualities of fresh milk.



For Millers and Manufacturers

AMONG the largest users of Merrell-Soule Powdered Milk Products are millers, and manufacturers of prepared pancake flours. Many of the best known brands on the market today contain, as their protein or albumen constituent, Merrell-Soule Powdered Skimmed Milk or Powdered Buttermilk.

Usually these flours are, according to directions, available for baking by simply mixing them with a given amount of cold water, to the consistency required for the article to be baked, without the necessity of adding eggs or fat. The protein or albumen content of such a mixture must needs be high in order to make it a well-balanced ration of high food value. The fact that this value is furnished by the use of Powdered Milk means, of course, that the mixture must contain a goodly portion of the powder.

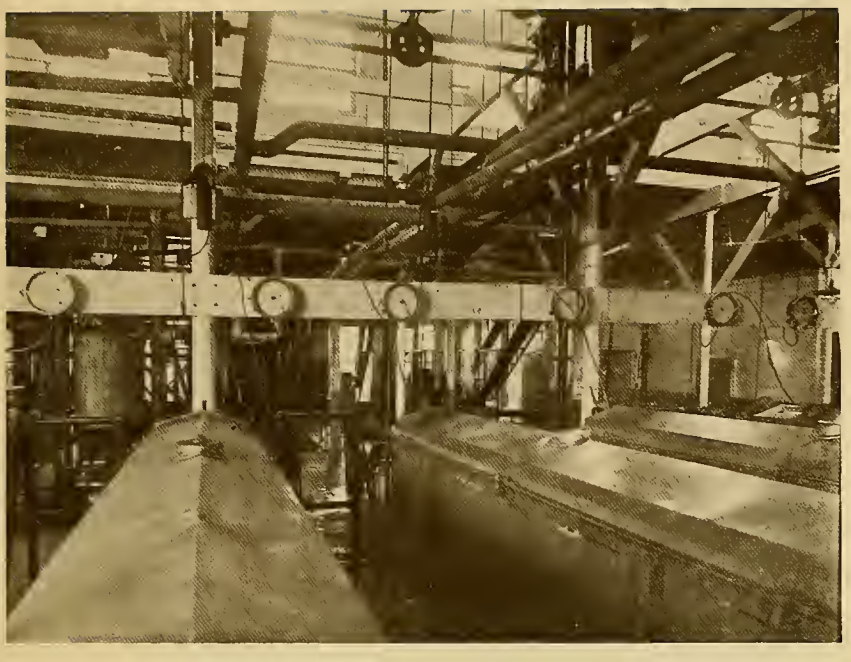
One of the strongest points in favor of Merrell-Soule Powdered Milk, for the use of these manufacturers, is the Merrell-Soule process of drying milk, fully explained elsewhere in this book. By the Merrell-Soule process condensation is halted before any of the milk albumen has cooked, and neither the casein nor the albumen is affected in any way by concentration of the milk acids.

The manufacturer of prepared doughnut mixed or pancake flours who buys Merrell-Soule Powdered Milk is assured of the quality of his milk albumen content, which is the most essential part of his mix, being, in its true and natural state, readily soluble in cold water.

A principal reason why these manufacturers prefer Powdered Milk for the albumen constituent of their mixture, is on account of its quick solubility, as compared with albumen when introduced by employing dried egg, which has to be soaked for a time before it can be restored.

Milk Powders which leave a sediment or are only partly soluble, on account of coagulated albumen, are of little or no value.

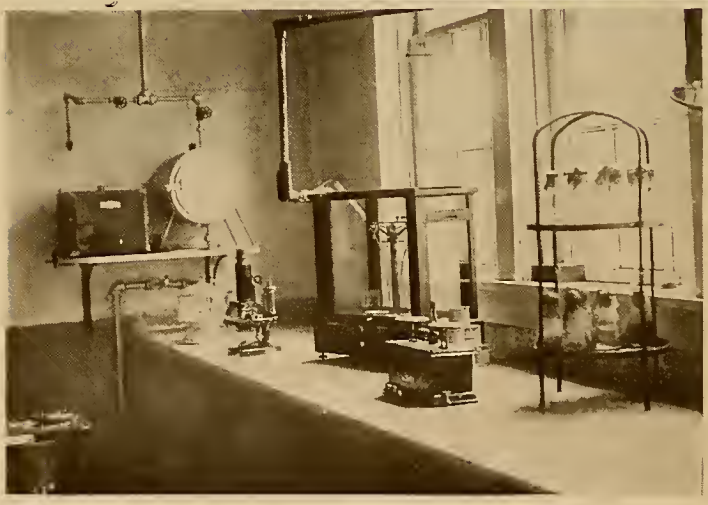
Our expert chemists, and the Bakers' Technical Service Department of the Merrell-Soule Company, will gladly give any specific technical information desired, or make tests necessary to develop any idea pertaining to this very important industry.



General View of Creamery, Waterford, Pa.

Chemical Laboratory, Merrell-Soule Co., Syracuse, N. Y.

Bacteriological Laboratory, Syracuse, N. Y.



Bacteriological Laboratory, Arcade, N. Y.

Simple Tests for the Buyer of Powdered Milk

"POWDERED MILK" and "Dry Milk" are names used to cover a variety of products, differing widely in many important respects.

The name "Merrell-Soule Powdered Milk" stands for qualities which are not possessed by any other Powdered Milk, or "Dry Milk." This is well known to those who have used the Merrell-Soule product, and have also tried other brands.

The inducement to use some other make, rather than Merrell-Soule Powdered Milk, has been, oftentimes, the seeming economy of being able to buy at a slightly lower price. We are confident that we do not overstate when we say that in practically every such instance the result has been, instead of true economy, the exact reverse—that which has been gained in difference of price has been more than offset by a decided difference in those qualities which give to Powdered Milk its real value and efficiency in the bakery, the dairy, the creamery, the ice cream plant, the candy factory, the hotel or the home.

Many of the disappointing and sometimes costly experiences which attend the use of inferior brands of Powdered Milk could be avoided if the buyer would take the trouble to make a few simple tests, which would show him the difference between Powdered Milk which represents the Merrell-Soule standard of manufacture and the products made by other companies where this high standard does not obtain.

The results obtained in the Merrell-Soule factories through steadfast adherence to this standard of excellence are uniform and definite. In this connection, we beg to call attention to an extract, appearing elsewhere in this volume, from Professor O. F. Hunziker's book, "Condensed Milk and Milk Powder." Professor Hunziker, as the preface to his book states, visited Condensed Milk and Powdered Milk factories in this country and in Europe, in order to obtain the material for his work, and its consequent completeness and accuracy have made it an authoritative treatise on the products with which it deals.

Among the qualities to be particularly noted in Merrell-Soule Powdered Milk, and often found lacking in other brands, are:

(1) Freedom from sediment;
(2) Low percentage of moisture;
(3) True milk flavor;
(4) Absence of undesirable bacteria;
(5) Proper percentage of butterfat;
(6) Presence of albumen in natural state.

All these qualities are of the highest importance to the consumer of Powdered Milk, and each may be definitely determined by tests not difficult to make. Apply these tests to Merrell-Soule Powdered Milk, and to any other Powdered Milk, or "Dry Milk", offered in competition, and you will find why it is to your advantage to pay a few cents more per pound, to obtain the Quality for which the name Merrell-Soule stands.

Sediment

The sediment test is perhaps the most simple. Just dissolve the proper quantity of Merrell-Soule Powdered Milk in one glass, any other brand in another glass. Let them stand for an hour, then compare them. You will find that there is a complete solution of Merrell-Soule Powdered Milk, with no sediment. In the other glass—judging from our own tests and those of many customers who have given us their experiences—you will find a sediment, varying in quantity, in color, and in amount of objectionable matter contained.

The presence of sediment is always undesirable, whatever its cause. There may be several causes. Some processes of drying milk admit dirt and other foreign matter, which is mixed in with the powder, and appears as dark-colored particles in the sediment. Sometimes there is a reddish or brown sediment, caused by the milk particles having been overheated during the drying process.

In almost all products other than Merrell-Soule Powdered Milk, there is a sediment of milk solids—sometimes containing undesirable foreign matter and sometimes not—due to the fact that the powder has not been manufactured in such a manner as to dissolve quickly and

completely in water. The reason there is no sediment in Merrell-Soule Powdered Milk is, simply and solely, the Merrell-Soule perfected process, by which a powder is manufactured that contains every solid ingredient of pure, fresh milk, in soluble form, ready to unite perfectly and instantly with water.

Whatever the purpose for which you are using Powdered Milk, you cannot obtain as satisfactory and as efficient results with a powder which dissolves only partially, or which contains foreign matter, as you can with Merrell-Soule Powdered Milk.

Moisture

Testing for moisture is important. The whole secret of keeping Powdered Milk for a long period of time is contained in the one word, Dryness. Dryness means death to bacteria, and dryness is one of the strong points of Merrell-Soule Powdered Milk.

In Professor W. A. Stocking's "Manual of Milk Products," a comprehensive and very informative work recently published (Macmillan, 1917), it is stated that "The question of bacteria is entirely one of proper control up to the moment when the milk is dried. That it is possible to exercise this control is shown by the results of counts made on daily samples covering long periods of time. During the past year something like 2,800 dry samples were counted in the Merrell-Soule laboratory. Of these, 96 per cent. were below 25,000 per c.c., and had an average of about 2,000 per c.c. figured to the liquid basis."

There are a number of reasons for this remarkably low bacteria count in Merrell-Soule Powdered Milk. First, the fact that constant supervision is exercised by the Merrell-Soule Company over dairy conditions at the farms from which fresh milk is received, insuring the highest degree of cleanliness and sanitation. Second, that the milk is handled under the most sanitary conditions at the Merrell-Soule factories. Third, that it is thoroughly pasteurized. Fourth, the extreme dryness of the powder produced.

It is also noteworthy that bacteria will not propagate in Powdered Milk of the dryness which marks the Merrell-Soule product. On this point Professor Stocking says: "There is rather a tendency for such bacteria as are present to slowly die off."

Merrell-Soule Powdered Milk contains only from two to three per cent. of moisture—a lower percentage, so far as we have been able to learn, than that found in other powdered or "dry" milk products.

The test for moisture is one easily made. It consists simply of drying a quantity of the powder in a wide, shallow weighing bottle, to constant weight. The loss of weight noted, when constant weight has been attained, represents, of course, the moisture which has been removed.

Five hours is generally sufficient for drying. Do not dry longer than this without weighing. It has been noted that a slight increase in weight takes place after long drying, probably from oxidation of some of the constituents. The test should be made, if possible, in a vacuum oven at 95 to 100 degrees Centigrade. In the absence of a vacuum oven, an ordinary water or steam oven having a temperature of from 99 to 100 degrees Centigrade may be used. In this case, about ten hours should be allowed for the drying. The results will generally be a trifle low, but sufficiently accurate for purposes of comparison.

This point of dryness is one which has constant and close attention at the laboratory of the Merrell-Soule Company, in Syracuse. Each day the laboratory receives samples of every lot of Powdered Milk made at all the Merrell-Soule factories. Moisture tests are made of these samples, to determine whether powder of the requisite dryness is being produced. If not, notice is immediately given to the factory in question, and some condition which should be corrected is looked after at once. If, for instance, a sample shows that powder is being made containing 3 or 3½ per cent. of moisture, the machinery can be adjusted immediately upon receipt of notification, so as to make 2½ per cent. or less.

Condensary at Gainsville, N. Y. Capacity 30,000 Pounds Daily

Receiving and Weighing Milk at Arcade

Ready for Shipment

Flavor

The test for flavor is obvious. Simply make up a glass of Merrell-Soule Powdered Skimmed Milk, or Whole Milk, and another of any competitive product. Taste them both, for pure, fresh milk flavor. We know, from experience, in which sample you will recognize and enjoy the unmistakable rich flavor of fresh pasteurized cow's milk.

Bacteria

The test to determine whether Powdered Milk contains undesirable bacteria is one which will require a little longer than any of the foregoing.

Mix up samples of each of the products it is desired to test, and let them stand long enough to sour. The reconstituted milk made from Merrell-Soule Powdered Milk will sour just as cows' milk does, and the sour milk which results may be used for any purpose commonly served by sour milk.

When undesirable bacteria are present, the reconstituted milk will not sour properly, and will be different in odor and flavor from good sour milk. Generally the difference is accentuated by formation in the liquid of a gassy curd, rendering the sour milk unfit for use.

Butterfat

It is, of course, important to know whether the stated or proper percentage of butterfat is contained in any given make of Powdered Milk. There are several methods in use, among them the Babcock method, the Werner-Schmidt method, and extraction by pure ethyl ether of a specific gravity of 0.720. At the Merrell-Soule laboratories satisfactory results are being obtained by a modification of the Babcock method, worked out by N. G. Redmond, of the Merrell-Soule staff of chemists. In addition to being accurate, this method possesses the added value of being quick, simple and inexpensive. Following is a

description of the method by which a determination in duplicate can be made in less than an hour:

Weigh 2.5 grams of Powdered Milk and transfer it to an ordinary Babcock milk bottle, graduated to 10 per cent. A glass funnel (about 2 inches in diameter and with the stem cut off to ½ inch) is inserted in the neck of the bottle and is of great help in transferring the powder. Add 31 c.c. of dilute sulphuric acid (395 c.c. concentrated H_2SO_4 diluted to one liter) and place the bottle upright in a dish of gently boiling water. Shake frequently and keep in the boiling water until all the powder is dissolved and the solution is dark brown in color. This usually takes from 7 to 10 minutes. After removing the bottle from the water add 12 c.c. concentrated H_2SO_4 (sp. gr. 1.82-1.83) and mix thoroughly, taking care to keep the solution out of the neck of the bottle. Agitate with a rotary motion. Place the bottle in a centrifuge and whirl for 4 or 5 minutes. Add hot water until the solution reaches the lower end of the neck, whirl again for one minute, then add hot water until the fat rises. Whirl again for one minute. In order to secure accurate results, the fat column must be read at a temperature not above 140 degrees Fahrenheit. By setting the bottle in water the desired temperature may be reached. Readings should be made to 0.05 on the bottle. The reading multiplied by 7.2 gives the percentage of fat.

Babcock bottles vary in volume. It is more convenient to use bottles which hold at least 45 c.c. of water when filled to the lower end of the neck. The bottle should be thoroughly cleaned, rinsed with alcohol and dried (to prevent powder sticking in the neck) before using. This insures clear and accurate readings. Commercial sulphuric acid has been used in making the dilute H_2SO_4 solution and good results were obtained. It is better, however, to use chemically pure acid and thus avoid contamination of the fat column by impurities in the acid.

Albumen

One of the important features of the Merrell-Soule process is that it leaves the albumen in the milk in its natural state. There is no heating of the milk particles, at any stage of the process, to a point where the albumen is coagulated. There are various Powdered Milk and "Dry Milk" products in which the albumen has been coagulated—a most undesirable happening, and one seriously affecting the value of the milk powder, whatever may be the use for which it is intended.

There is a very simple test for determining whether a powdered milk contains albumen in its natural state, or whether the albumen has been coagulated by cooking. Just make a thick batter of the powdered milk and water. Place on a tin and bake in a hot oven. A milk powder containing "live" albumen will puff up on the pan, retaining the moisture. Milk powder containing "dead" albumen will not puff up, but lie flat on the pan, the moisture evaporating and leaving a dark, inert mass. (See cut opposite page 35.)

We trust that these tests have been so clearly explained that anyone may apply them. Should there be anything which is not entirely understood by any reader, we would be glad to be so advised, and to give whatever further information may be desired.

Comparative Analyses

The following comparative analyses are interesting, as showing the percentage composition of the various Merrell-Soule milk products:

Percentage Composition

	Butterfat	Casein	Albumen	Milk Sugar	Ash (Salts)	Moisture
Merrell-Soule Skimmed Milk Powder	1.35%	29.79%	7.91%	49.94%	8.21%	2.80%
Skimmed Powder Restored 1—9½	.13	2.84	.75	4.76	.78	90.74
Average Skimmed Milk 9% Milk Solids	.12	2.76	.73	4.63	.76	91.00

The above analyses are taken from an average of several thousand tests made in the Merrell-Soule Laboratory.

Merrell-Soule No. 14 Butterfat Milk Powder	14.20%	25.56%	6.70%	44.41%	7.01%	2.12%
Merrell-Soule No. 14 Restored 1—8½	1.50	2.69	.71	4.63	.73	89.69
Merrell-Soule No. 25 Butterfat Milk Powder	28.20%	21.22%	5.45%	37.88%	5.75%	1.50%
Merrell-Soule No. 25 Butterfat Milk Powder Restored 1—7	3.52	2.65	.68	4.74	.72	87.69
Whole Milk (3.5%)	3.50	2.60	.66	4.63	.70	87.91
Condensed Milk—25.52% Total Milk Solids—7.82% Butterfat	7.82	5.53	1.47	9.30	1.40	74.48
Merrell-Soule No. 25 Restored 1—3	7.05	5.30	1.36	9.47	1.44	75.38
Merrell-Soule No. 50 Butterfat Milk Powder	50.40%	15.17%	4.02%	25.45%	4.16%	.80%
Same restored in water 1—5	8.40	2.53	.67	4.24	.69	83.47
Merrell-Soule No. 65 Butterfat Milk Powder	65.15%	10.60%	2.82%	17.86%	2.91%	.66%
Merrell-Soule No. 65 Milk Powder Restored (1—3⅓)	15.12	2.44	.65	4.12	.67	77.00
Merrell-Soule No. 72 Cream Powder	71.15%	8.79%	2.33%	14.74%	2.43%	.56%
Merrell-Soule No. 72 Cream Powder Restored 1—2.9	18.25	2.25	.55	3.76	.62	74.57
18% Average Cream	18.00	2.25	.61	3.81	.62	74.71
20% Cream	20.00%	2.21%	.59%	3.75%	.61%	72.84%
22% Cream	22.00	2.13	.57	3.57	.59	71.14
30% Cream	30.00	1.94	.51	3.24	.53	63.78

Federal Standards

Following are the Federal Standards for Dried Milk and Dried Skimmed Milk:

Dried Milk is the product resulting from the removal of water from milk, and contains, all tolerances being allowed for, not less than twenty-six per cent. (26.0%) of milk fat, and not more than five per cent (5.0%) of moisture.

Dried Skimmed Milk is the product resulting from the removal of water from skimmed milk and contains, all tolerances being allowed for, not more than five per cent. (5.0%) of moisture.

Composition and Analysis of Desiccated Milk and Cream

MUCH interest and value attaches to the following "Notes on the Composition and Analysis of Desiccated Milk and Cream," written by R. S. Fleming, Chief Chemist, Merrell-Soule Company, and appearing in the Journal of Industrial and Engineering Chemistry:

The analysis of desiccated milk presents several difficulties which do not appear in the analysis of fresh liquid milk, and serious errors have been made through assuming that methods which apply to the one would necessarily apply to the other. Especially is this the case in the estimation of butterfat.

Before making the analysis the sample should be thoroughly mixed and then placed in a tightly stoppered bottle to prevent the absorption of moisture, most milk powders being quite hygroscopic.

Moisture is estimated by drying in a wide shallow weighing bottle one or two grams of milk powder to constant weight, preferably in a vacuum oven at 95° to 100° C. Five hours is generally sufficient. Do not dry longer than this without weighing. A slight increase in weight takes place after long drying, probably from oxidation of some of the constituents. In the absence of a vacuum oven an ordinary water or steam oven having a temperature of 99° to 100° would give fair results, but it takes considerably longer, about 10 hours, and even then the results are likely to be a trifle low. (See page 95.)

Milk sugar can be best determined gravimetrically as follows: Weigh out in a small beaker 2½ grams of the milk powder or such a quantity that there is not over 0.3 per cent. of sugar in the purified solution. Add a little warm water at about 50° C. and stir up the mixture to a smooth paste, then add more warm water and wash into a 500 c. c. flask. Shake up with the warm water until thoroughly dissolved. Small particles of the milk powder are liable to remain undissolved if care is not taken. Cool and make up the volume to about 400 c. c. Add 10 c. c. to Fehling's copper sulphate solution and proceed as in A. O. A. C. methods, *Bull.* 107, Bureau of Chemistry,

pages 119 and 242. Preferably deposit the reduced copper electrolytically from sulphuric acid solution.

Cane Sugar, if present, can be estimated readily by a modification of the Stokes and Bodner method, by which the cane sugar is inverted by means of citric acid, the citric acid having no inverting action on the milk sugar. In a 250 c.c. Erlenmeyer flask, place 50 c.c. of the sugar solution prepared as for milk sugar determination by precipitating proteins, etc., with copper sulphate and carefully neutralizing. Add 0.5 gram of citric acid. Boil with reflux condenser for 35 minutes. Neutralize and determine the reducing power of the solution in same way as for milk sugar, adding the boiling Fehling solution directly to the flask containing the sugar solution. From the weight of copper found, subtract the amount found in previous determination for the milk sugar, multiply by the factor 0.5395 as given by Allen, Volume 1, page 284. This gives the amount of cane sugar.

Casein is rather difficult to determine from the fact that it precipitates in very fine particles that clog the filter. The following has been found by the writer to be the most satisfactory of several methods tried: To 50 c.c. of a 10 per cent. solution of the milk powder at 40° C. add 2 c.c. of a warm saturated solution of potassium alum. Allow to settle. Filter on a large filter paper (15cm.). If the filtrate is not clear, re-filter through same paper. Transfer precipitate to filter. Wash and place filter papers and contents in a Kjeldahl flask. Determine nitrogen by any of the Kjeldahl modifications. If the Gunning method is used, add a little anhydrous copper sulphate to hasten the reaction. Three hours' digestion by this method is generally sufficient. Use the factor 6.38.

Albumen is approximately determined by subtracting the casein from the total protein. The latter may be determined by digesting one gram of milk powder and proceeding in the regular way. It is to be noted that in milks which have been highly heated the albumen is partially or wholly coagulated. In that case the suspended albumen will precipitate with the casein, making the percentage of the latter higher than it should be.

Ash is best determined by incinerating one or two grams in a platinum dish at a low red heat. For the first half hour use a very low flame.

Butterfat may be determined by any of the following methods:

First. Extraction with pure ethyl ether of a specific gravity of 0.720 (anhydrous ether + 0.5 per cent. by volume of water) as described by McLellan, *Analyst*, 1908, page 353. It is unnecessary, however, to soak over night and re-extract. Sixteen hours' continuous extraction in a Soxhlet or a direct extraction apparatus is sufficient. Schleicher & Schuell's double thick extraction cartridges are excellent for retaining the fine particles of milk powder.

Second. The Werner-Schmidt method. This method is most conveniently applied as follows: Weigh out one gram of milk powder. Place on a well annealed glass stoppered tube of at least 80 c.c. capacity. Add 5 c.c. of water. Shake until homogeneous, then add 7.5 c.c. of concentrated hydrochloric acid (sp. gr. 1.19). Shake until dissolved. Remove the stopper. Place in boiling water bath for five minutes, shaking gently to keep the mixture agitated. Remove and cool. Then add pure ethyl ether. Shake vigorously, allow to settle for ten minutes. Remove ethereal layer to a weighted flask by means of a wash bottle connection. Repeat the extraction three times. Evaporate off the ether and dry in the water oven. Cool and weigh. Should the fat be contaminated, as it will be at times, dissolve out the fat with petroleum ether, leaving the impurities adhering to the flask. Dry and re-weigh. Subtract the impurities.

Third. A new method worked out by Redmond in this laboratory has been found to give splendid results. (See page 97.)

Fourth. The Rose-Gottlieb method has been found to give satisfactory results, but is somewhat tedious.

The following methods have been found to be unsatisfactory as they give low results: Adams, Babcock, extraction with anhydrous ether or chloroform.

The *composition* of milk powder varies within wide limits. Very

recently cream powder has been put on the market which has almost as high a butterfat content as butter itself. Small amounts of cane sugar are frequently added. Modified milk for infants has much less casein, more albumen and more milk sugar than normal milk. The accompanying table gives the analyses of a number of different milk and cream powders:

No.	Butter-fat	Casein	Albu-men	Milk sugar	Cane sugar	Ash	Mois-ture	Total
1	29.12	24.06	1.86	37.52		5.72	1.48	99.76
2	1.81	32.31	5.85	49.32		8.21	2.53	100.03
3	15.26	27.18	4.84	43.92		6.46	2.03	99.69
4	0.6	2.3	10.20	77.2		9.10	1.40	100.80
5	11.25	11.30	7.57	60.10		7.66	1.37	99.25
6	53.08	16.89		26.04		3.78	0.81	100.60
7	67.64	12.21		15.92		2.67	0.76	99.20
8	21.00	18.90		23.82	29.98	3.93	2.94	100.57
9				47.16	2.25			
10				49.71	1.54			

No. 1, made from whole milk.

No. 2, made from skimmed milk.

No. 3, made from half skimmed and half whole.

No. 4, made from whey, the casein having been largely removed.

No. 5, made from whole milk modified with whey. When dissolved with the proper proportion of water it has approximately the composition of human milk.

No. 6, made from light cream and No. 7 from heavier cream.

Nos. 1-7, made from known milks.

No. 8, evidently from whole milk with the addition of cane sugar.

Nos. 9 and 10, evidently from skimmed milk with the addition of small amounts of cane sugar.

Nos. 8-10, made from unknown milks.

Scope and Importance of Merrell-Soule Laboratory Work

THE importance of laboratory work in connection with a food manufacturing plant has of late years been fully recognized. Laboratory control is now considered a vital necessity. The Merrell-Soule Company early recognized this and opened a department for this kind of work. Its value is especially apparent along the line of sanitary supervision of the goods manufactured.

The work carried on in the Merrell-Soule laboratory is most varied in character. It may be conveniently divided into three main lines; routine, special, and research. The routine work has to do with the examination and analysis of the different products manufactured; it also deals with the raw materials used. The special work covers analyses and tests out of the ordinary, special investigations, help to customers, and such like. The research work has to do with the deeper problems, such as the causes of changes in food products, keeping qualities, changes in flavor, and so forth.

Much of the routine work carried on is in connection with the various Merrell-Soule milk products. Milk, on account of its peculiar susceptibility to bacterial and chemical change, requires close attention. Possibly in no other line is sanitary control so important. To exercise this control to the best advantage, samples of every day's make of milk powder are sent into the laboratory and are there bacteriologically examined. In addition to this, special bacteriological examinations are made in the plants. Liquid milk and cream samples are taken and examined. In addition to the bacteria counts made, other tests are carried on. The samples are examined for flavor, moisture, butterfat and solubility. During the year the number of routine tests amounts to from fifteen to twenty thousand. In this connection it may be stated that it has been found advisable to open a branch laboratory at the Arcade plant to help take care of the routine work.

The advantages of this work are apparent. First of all, the firm has confidence, in sending out its products, that they will be absolutely

pure and wholesome; that they will be uniform; that they will comply with federal and state requirements; and, best of all from a business standpoint, that they will please the customer. The customer practically has a guarantee that these products are standard, and when used in manufacturing his own commodities will give uniformly satisfactory results.

Along with the routine work, we are constantly carrying on special work. This includes analyses of other food products, making up formulas, and giving help to our customers. The purpose of this latter feature is to give bakers, ice cream men, confectioners, and others, such help as we can with the problems confronting them in their work. In this way we keep in close touch with them and it proves a benefit to both parties.

Some of this work which we have called special, might equally well be classified as research work. The research work proper, however, has to do with the improvement of our products; study of the causes of decomposition and change of flavor; means of preventing these changes; it also has to do with getting out new products. New products frequently take much time and work before they are brought to such a state of perfection that they are ready to put on the market.

Another line of research is that of applying the Merrell-Soule process of dessication to other products than those usually handled. For instance, the following materials have been successfully dried; dextrine, starch, glucose, malt extract and malt sugar. The process has been applied to other material than food products, e.g. blood serum, dye materials, tanning liquors, and sulphite waste. All these form a very extensive and interesting field of research.

Protective Food—The Place of Powdered Milk in Human Nutrition

By E. V. McCOLLUM, Ph. D.

Professor of Biochemistry, School of Hygiene and Public Health, of the Johns Hopkins University

THE position of milk as compared with other human food-stuffs has greatly changed within the last six years.

From time immemorial it has been appreciated by the observing that milk is the only food upon which the very young infant can live and grow. Its importance in the diet of the adult has not until within recent years been sufficiently appreciated.

Less than ten years ago the producer of butter had a discouraging outlook. The making of butter substitutes had become so perfected that products were made which looked and tasted more or less like natural butter. They were derived from beef fat, or from certain vegetable oils, and could be sold at a price with which butter could not compete. The manufacturer advertised his product as the equal of butter in appetizing qualities and in nutritive value. Digestion experiments had shown that the animal and vegetable fats were all very nearly completely digested and absorbed, and were utilized equally well for the production of heat or work within the body.

Experiments had further shown that the amount of energy which could be derived by the human body from a pound of butter substitute was essentially the same as from a pound of butter. The difference between the natural product and the substitute, according to the manufacturers of the substitute, lay entirely in the price, and this was greatly in favor of the imitation product.

A new and timely observation was made by the writer and Miss Marguerite Davis in 1912, which demonstrated that butter fat contains something which is not found in the vegetable fats, and in but very small amounts in the body fats of animals such as lard or beef fat, and that this something is indispensable for the maintenance of health

either in the young or the adult animal. Without it no growth can take place, even when the diet is entirely satisfactory so far as a chemist can tell by the methods of his laboratory. It was proved that butter fat has dietary properties which are not possessed by any butter substitutes in anything like the same degree, and is superior to them as a food. This observation gave a new opportunity for the butter producer, because it enabled him to compete with the butter substitute without the necessity of competing in price.

Milk has never been fully appreciated by mankind. It has been compared with other food-stuffs both with respect to cost, and with respect to protein content and energy value. The researches of recent years have made it clear that such comparisons are not warranted, because milk possesses certain dietary properties which make it an indispensable constituent of the human dietary. There are faults in any diet derived solely from cereal grains, tubers, edible roots and meats, which are so serious that faulty growth, and the early appearance of the signs of old age will surely result unless they are corrected. These involve a shortage of certain mineral elements, and an unknown dietary essential which is especially abundant in milk fats.

The only practicable way in which these can be corrected in every-day life is through the liberal use of milk, eggs and the leafy portion of the plant. The list of leafy foods which is taken by man in America includes spinach, cabbage, lettuce, cauliflower, Brussels sprouts, and a few other leaves, such as turnip tops and beet tops, lamb's quarters, etc., which are employed as greens. It is not practicable for man to attempt to consume enough of the leafy portion of the plants named to entirely correct the faults of the remainder of his diet. Milk and eggs should be included, and by far the more economical of the two is milk.

During the last two years I have attempted to square the results of our experience with animals with human experience generally in the matter of diet. We have, in many hundreds of trials, been successful in making diets which will promote growth and health and vigor during

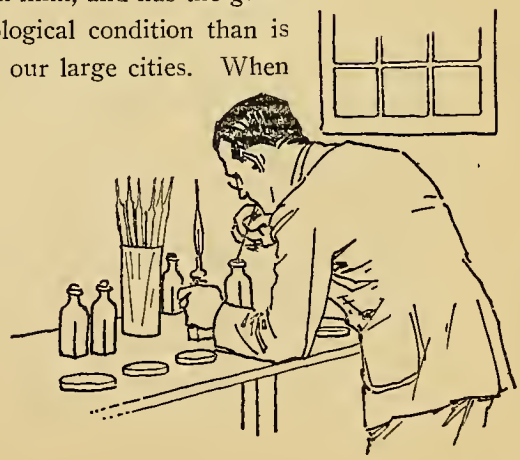
the full span of life only when the food mixtures contain liberal amounts of either milk, eggs, or the leafy vegetables. My associates and I have been so impressed with the necessity of having these in the diet, that we have designated them as the "protective foods", because they correct the dietary faults of any combination of foods which we are likely to eat.

Most people do not appreciate the food value of milk, and this for several reasons. First, it is a liquid, and does not stand up by itself, and has frequently been looked upon as a beverage rather than a food.

Second, milk is less appetizing than the meats, and there is a strong temptation, where the expenditure for food must be restricted, to purchase meat rather than milk. This is a fundamental mistake, for meats, although good food in certain respects, do not have the special dietary properties possessed by milk.

Third, milk has been frequently discussed from the standpoint of cleanliness, and as a carrier of disease. There exists now a body of experimental evidence which serves to establish the fact that by the liberal use of milk in the diet, our present standards of health and freedom from certain diseases, notably tuberculosis and pellagra, can be greatly improved. Faulty nutrition is the most important pre-disposing factor contributing to the high incidence of the latter disease, and a large fraction of the children of the United States are suffering from malnutrition, or, one may safely say, from lack of sufficient milk. By milk I mean, of course, milk of good quality from the bacteriological standpoint. In many instances these children are not suffering from an actual lack of sufficient calories, although many of course do. The trouble lies with the quality of their diet.

I have been much impressed with the possibilities in the use of powdered milk. I have convinced myself that when properly prepared it has essentially the dietary properties of fresh milk, and has the great advantage of being in a much better bacteriological condition than is the average bottled milk which is delivered in our large cities. When



one realizes the achievements in the manufacture of powdered milk in such a form that it passes readily into solution, with means at hand within the home, and considers its cleanness and keeping qualities, one must be impressed with the fact that a new era has dawned in the handling of milk supplies for large cities.

There can be no doubt that converting milk into dry powder while it is fresh, and transporting it to the city, or anywhere for that matter, in a dry condition, then reconstituting it where it is to be used, will supply a product which is much more wholesome than is much of the milk which is now delivered in many of the large cities of this country. I have been interested in powdered milk as a possible solution of the problem of securing a clean milk supply, and feel that in the present state of perfection of the processes for the manufacture and re-emulsification of butter fat in a clean water solution of powdered skimmed milk, the solution of a great problem has been practically achieved.

So far as I have been able to determine, by experiments on animals, the milk powders which I have employed have essentially the same dietary properties as has fresh milk. I believe powdered milk has a great future.

An Extract from "Manual of Milk Products"

By PROF. WM. M. STOCKING

WE believe that no better account could be given of the nature, properties and advantages of Powdered Milk manufactured by the Merrell-Soule Spray Process than that which appears in "Manual of Milk Products," by Wm. A. Stocking, Professor of Dairy Industry at Cornell University (Copyright, The Macmillan Company, 1917).

Professor Stocking is recognized as an authority on milk products, and we take pleasure in presenting the following excerpts from his interesting and comprehensive work:

"Powdered milk has many advantages over liquid milk. First of all, there are the keeping qualities. Whereas liquid milk at the best will keep only a few days, dry milk will keep many months. In fact, some grades of it, properly protected from moisture, etc., will keep indefinitely. No bacterial action, so far as we have been able to determine, takes place in the dry product. There is rather a tendency for such bacteria as are present to slowly die off.

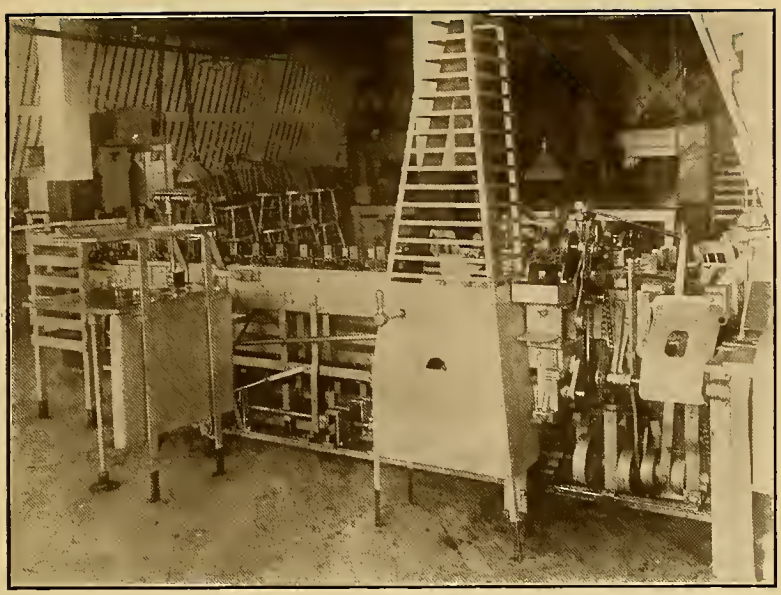
"The question of bacteria is entirely one of proper control up to the moment when the milk is dried. That it is possible to exercise this control is shown by the results of counts made on daily samples covering long periods of time. During the past year something like 2800 dry samples were counted in the Merrell-Soule laboratory. Of these 96 per cent. were below 25,000 per cubic centimeter, and had an average of about 2000 per cubic centimeter, figured to the liquid basis.

"The spray process of drying milk presents some very important advantages over other processes. These advantages are not all apparent at first. In fact, it is a question whether the original inventor fully realized the importance of his discovery. Chief of these is the rapidity with which evaporation takes place. We have every reason to believe that each particle of liquid as it is shot through the air gives off moisture so rapidly that the milk solids are kept in a cool condition until per-

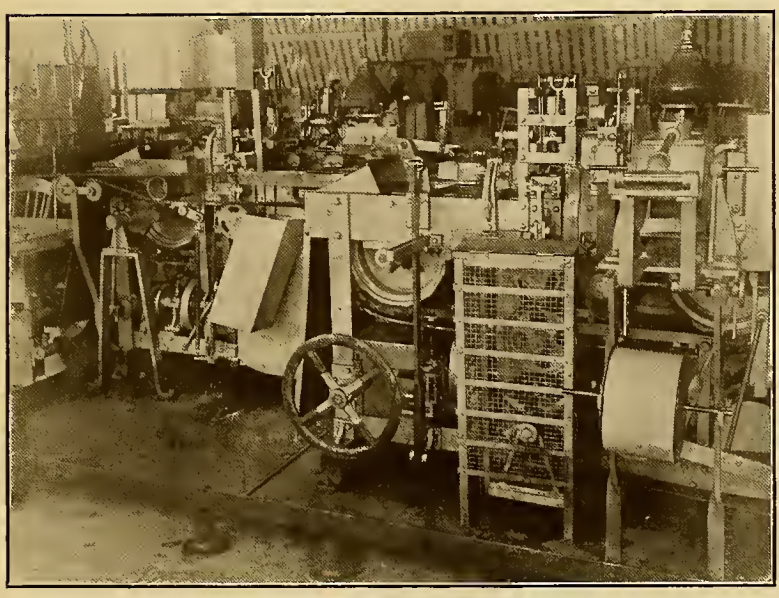
fectly dry. This is in accord with the well-known physical law that the evaporation of liquids uses up heat.

"In the ordinary condensation of milk it is well understood that if concentration be carried beyond certain limits there is an injury to the milk solids. There seems to be a critical stage somewhere between high concentration and dryness where prolonged heating does much damage. With the spray process this stage is passed through instantaneously. After the dry condition is reached, comparatively high temperatures will do no harm.

"Whether the above reasoning is correct or not, the fact remains that milk dried by the spray process, in distinction from other processes, retains all its natural properties. On the addition of water it goes back to its original state. There is no sediment. The casein retains its colloidal structure. The albumen is not coagulated. The butterfat is in complete emulsion in its natural globular form. The enzymes are still active. In fact, as far as we know the restored milk is identical in properties with the original milk."



Carton Sealer which Automatically Seals Both Ends of None Such Mince Meat Packages



Wrapping Machine Especially Designed for None Such Mince Meat

None Such Mince Meat, a Nationally Famous Food Product

SOMETIMES a product dominates its field so completely that its individual name or brand comes to stand for the product itself.

Among nationally-advertised American food products which have attained this distinction, None Such Mince Meat stands forth prominently. To the American housewife and to the grocer with whom she deals, Condensed Mince Meat means None Such.

For thirty-three years None Such Mince Meat has enjoyed a steady gain in favor, until today the annual output would provide something like a hundred million pieces of rich, nourishing mince pie.

The first None Such Mince Meat was made at Syracuse in 1885, and the tremendous growth of this industry, from a very small beginning to its present magnitude, is a splendid tribute to Merrell-Soule Quality.

When the first experiments in the manufacture of condensed mince meat were made, it was feared that the idea presented a commercial impossibility. But one difficulty after another was overcome, until a product was obtained which, while greatly reduced in bulk and moisture, retained all the rich flavor and nourishing qualities of the best Mince Meat.

None Such Mince Meat is put up for household use in cartons, each carton containing nine ounces, or sufficient for the making of one full-sized mince pie. There is no more familiar article on the American grocer's shelf or counter than this convenient food package bearing the None Such label.

How None Such Mince Meat is Made

In the manufacture of None Such Mince Meat, the ingredients used are chopped beef, apples, raisins, cane sugar, lemon and orange peel, salt, spices, suet, vinegar and pure boiled cider.

All are of the best quality obtainable, and are thoroughly cleansed by processes which remove all foreign matter, before they go to the

mixing machines. And every part of the factory—floor, walls, every piece of machinery—is kept spotlessly clean and sanitary.

The "opening room" is the first point of interest to a visitor who makes a tour of the None Such factory. Here are cases of frozen beef, bags of dried apples, barrels of sugar and 50-pound boxes of raisins. The raisins come from California, where most of the raisins of the United States are grown. The boxes are opened, the raisins conveyed to another floor, where they are thoroughly washed and stemmed. Next they are sorted, then sent to sorting tables, where girls pick out stems and defective raisins which have escaped the machines.

After they have thus been thoroughly inspected, the raisins go to a sterilizer, which softens them for the seeding. When seeded, they are ready to be put into the mince meat. The raisin seeds—of which 400 to 500 pounds a day are extracted—are ground, and sold as food for live stock, being valuable for their fat, sugar and protein content.

The dried apples, taken from the bags, are dropped into a washer which cleans them thoroughly. From the washer they go to a drying box and sterilizer, where excess moisture is removed. As they come out of the sterilizer on a carrier, they are sorted by girls who remove skins, cores and defective apples. They are then sent down a chute to bins in the grinding room.

The beef, which comes to the opening room in a frozen state, is sliced thin by machinery. It is sliced for two reasons—first, that it will require less time for cooking than would chunks, and, second, that the juice will not be cooked out of it. After being cooked, it is quickly cooled by currents of air.

The sugar is put through a grinding machine, which breaks up all lumps, then weighed into exact quantities, for mixing.

The first mixing operation takes place in what is known as the grinding room. Here the apples, beef, dried orange and lemon peel, and salt, are carefully weighed out and dropped into a hopper, from which the mixture is fed into large worm-driven grinders. These are similar in operation to the meat grinders in common household use.

The ingredients pass through two of these grinders in succession. The ground product is then dumped into metal, tin-lined containers and carried by an automatic conveyor to the mixing room. Meanwhile, the sugar is also being conveyed to this room.

In the mixing room the containers, filled alternately with sugar and with the ground beef, apples, salt and peel, automatically dump into the mixers. These are large bowl-like affairs, in which powerful arms revolve through the material to be mixed. While this is going on, the spices and seeded raisins are mixed in. When the mixing is nearly completed, boiled cider and vinegar are sprayed in. After they have been thoroughly assimilated, the product is ready to be packed.

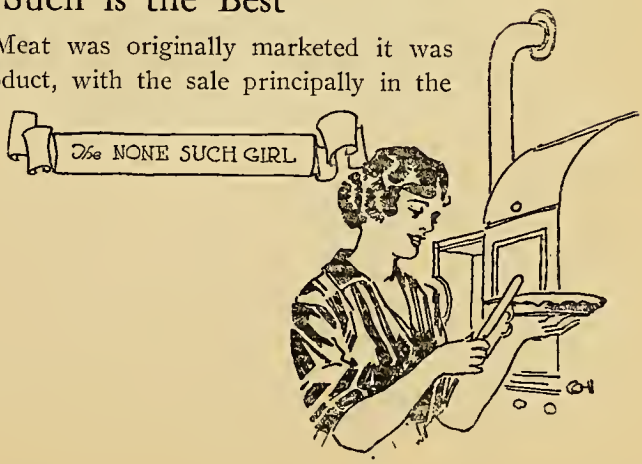
The mixing machines are on the floor above the press, and directly over it. It is therefore an easy matter to tip the bowl part of the mixer over, allowing the mince meat to slide down an enclosed chute to the press.

This press is a most interesting machine. It turns out uniform cakes, which do not vary a thirty-second of an ounce in weight, at the rate of 75 cakes per minute. The cakes are automatically put on a belt which carries them to the wrapping machine. Here they are wrapped in paraffin paper by another remarkable piece of machinery, designed and built on the premises. The wrapped cakes are carried to girls who place them in cartons, which are fed into a sealing machine, which seals both ends of the cartons. The finished packages are then placed in cases, ready to be nailed up by machinery, and sent on a gravity conveyor to any part of the shipping room floor, or direct into freight cars on a siding alongside the shipping room.

The capacity of the None Such factory is over thirty tons a day. The busiest season, of course, is in fall and early winter, when mince pie becomes an essential part of the menu in every real American household, hotel or restaurant.

Why None Such is the Best

When None Such Mince Meat was originally marketed it was regarded as a "seasonable" product, with the sale principally in the



holiday season, including Thanksgiving, Christmas, and the winter months. But as years went by it developed more and more into a staple all-year-round seller, and to-day None Such Mince Meat is sold during the summer months in most localities.

This has been brought about partly through the Merrell-Soule quality guarantee, which protects customers against loss through None Such becoming unsalable for any reason, in any section of the country; and, more recently, through the development of new uses, and the furnishing of new recipes in which None Such Mince Meat is used as an ingredient of lighter desserts, sandwiches, and in other ways. Among our new recipes are None Such Jems, None Such Jelly, None Such Sandwiches, None Such Relish, None Such Dressing for Duck, Turkey, etc., Oatmeal Cookies with None Such filling, None Such Croquettes, None Such Salad, Tomatoes stuffed with None Such.

These recipes are featured to-day in all our advertising campaigns, and many of them will undoubtedly become as popular in the American home as None Such Mince Pie has been for many years. In all these new recipes None Such Mince Meat is prepared for use exactly as it is for pies. By preparing several packages of None Such Mince Meat at one time, and putting it away in fruit-jars, the housewife will have it ready for use; and it will be possible for her to prepare one of these tempting dishes for the unexpected guest, the afternoon tea or supper party.

In modern cooking, the food values of all the items on a menu are given more consideration than ever before. When food was plentiful and cheap, and meals were prepared with no thought of food values, None Such Mince Pie was eaten for its goodness—its rich, delicious flavor. To-day it is esteemed as a dessert combining all the advantages of fine flavor with a real value as a food, and on that account easily retains its place at the head of the list of American home desserts.

Of all the dishes prepared by the American housewife, none brings her more praise for her skill in cooking than a delicious pie. There are hotels and restaurants which are known far and wide for the

Fruit Layer or Spice Fruit, Iced

Black Fruit Cake

(See page 115)

excellence of their pies, and the greatest interest in the cooking competitions held by churches, schools, etc., centers in the pie contests. As no pie can be better than its filling, the housewife who uses None Such Mince Meat begins right.

None Such and the Retail Grocer

The retail grocer has played an important part in building up the wide distribution and sale which None Such now enjoys. When None Such was originally marketed, practically the only commercial mince meat was wet mince meat, sold in bulk from open pails. Grocers were not slow to grasp the superiority of Condensed Mince Meat in packages; and to-day it is hardly necessary to dwell upon the advantages of package over bulk mince meat. They may be briefly set forth as follows:

Cleanliness: None Such is contained in air-tight, dust-proof packages; contents not touched in handling; Bulk Mince Meat is kept in open pails, exposed to dirt and dust, freely handled both in manufacturing and selling. Economy: None Such makes 20 ounces of Mince Meat, ready for crust; 20 ounces of Bulk Mince Meat cost more than double the price of a package of None Such. Convenience: Several packages of None Such may be bought, and prepared at once or used as needed; only small quantities of Bulk Mince Meat can be purchased at a time, on account of deterioration. None Such is an identified product, always uniform in quality, made from the best materials in a factory where there is a fixed standard of manufacture. Only one brand is put out, and visitors are always welcome. Bulk Mince Meat is often an unidentified product, with no definite standard of quality, made in a factory where public inspection is not invited.

The retail grocer has long since seen the many disadvantages of bulk merchandise, and the decided advantages of package goods, which include increased profits, decreased selling cost, higher quality of goods, and a greater attractiveness.

The much greater convenience of handling the None Such packages keeps down the merchant's selling expense. He requires less space, fewer clerks, is protected against loss by spoilage, and can do more business with less capital invested in stock. The figures given out by sugar refiners, showing the loss in handling sugar from barrels; and by scale manufacturers, showing the loss by weight that attends the handling of all bulk products, have shown him the wisdom of selling package goods. There is no loss on None Such Mince Meat—profits are not wiped out by wasted goods left in the bottom of the pail, as may be the case with bulk mince meat.

The attractiveness of an up-to-date grocery, with its spick-and-span shelves of package goods, can best be appreciated by recalling the old-fashioned store, with its mussy open pails, barrels, and boxes. Package goods, with their standard value, have also helped to eliminate the unfair competition of unknown bulk goods, inferior in quality, and sold only on a price basis.

The modern retail grocer has also seen the advantage of buying, among package brands, those which are the best known and the readiest sellers. Those are the brands which stay sold, give satisfaction, and hold and increase his trade. With any nationally known brand goes the manufacturers' guarantee of quality merchandise, for no manufacturer would waste money by advertising goods lacking in quality.

In 1918 an investigation of food products, conducted by a magazine with a national circulation, resulted in the following figures, on mince meat: Total number replies, 1714; total number using commercial mince meat, 1514; total number not naming brand, 30; total number naming brand, 1484; total number naming None Such, 1000.

None Such and the Wholesale Grocer

These figures are ample evidence that the retail grocer handling None Such Mince Meat is selling what the great majority of the people want. None Such Mince Meat is very generally handled by the whole-

sale grocery trade throughout the United States, and the Merrell-Soule Company's policy has always included close co-operation with the jobbing trade. A large number of wholesalers, recognizing the minimum sale effort necessary for None Such, handle this brand exclusively, and their volume of business shows large totals.

Some of the largest jobbers make regular campaigns during the summer months in the interest of None Such Mince Meat for fall delivery. With the wholesale grocery trade to-day, the constantly increasing number of items carried, the higher prices of all merchandise, and consequent additional capital invested in stocks, have made it imperative that lines be carried and selling efforts made on items which yield the quickest turnover and have the surest protection against even the smallest loss. The jobber's salesman's time is now too valuable to be wasted on unknown brands of goods, the salability of which is doubtful, and which, if he does sell them, frequently cause differences with his customers, who, unable to sell an unknown brand, naturally want the jobber to relieve them of their stock.

A jobber's salesman knows that when he sells None Such Mince Meat it stays sold, and probably no one better appreciates the value of nationally advertised brands than the progressive wholesale grocery salesman. Selling a customer goods which will retail readily and bring repeat orders is a decided satisfaction. The good feeling developed is a certain source of additional business and profit to his house and therefore a valuable asset to the salesman.

More than ever to-day the wholesale grocery salesman has an opportunity to show his retail customers the advantage of buying standard goods of unquestionable quality, nationally known, and backed up by national advertising. None Such Mince Meat is the only Package Mince Meat nationally advertised and distributed, and has the prestige of friendly relations and confidence built up during the fifty years' business experience of Merrell-Soule Company.

Bakers' Brick Mince Meat

Merrell-Soule Bakers' Brick Condensed Mince Meat is None Such Mince Meat, especially put up for bakers' use in five-pound bricks. The bricks are packed six to the case. Each brick is wrapped in paraffin paper and encased in a tight carton. The end of the carton opens easily and the paraffin paper folds back, so that any amount required can be cut off, and the remainder neatly rewrapped and boxed. There is no waste, no muss, no loss of time.

The baker who uses the Merrell-Soule Bakers' Brick Mince Meat may be sure that he has an extremely high quality product—a perfect blend of spices, beef, salt, suet, apples, raisins, lemon and orange peel, bound with cane sugar, vinegar and pure boiled cider. All these ingredients are of best quality and are thoroughly cleansed, by a process which removes all foreign matter, before they go to the mixing machine. Merrell-Soule Bakers' Brick manufactured by the same process as None Such Mince Meat, is the most economical,. clean and wholesome form of mince meat to use in the making of mince pies, producing a fine, well-flavored pie that has been a trade builder for a multitude of bakers, and is today one of the most popular pie ingredients on the market.

In the Bakery

It is offered to the baker as a well-balanced fruit filler, an ideal ingredient for producing an excellent fruit cookie, coffee ring filler, or layer cake center. It may be used as the main ingredient in making the finest grade of fruit cake, and quality holiday and wedding goods.

Following is a recipe for Mince Pie Filling which we have found to give uniformly excellent results:

Use one quart of water for each pound of Merrell-Soule Condensed Mince Meat. Break up the mince meat, pour hot water over it, boil five or ten mintues, allow it to cool before using. It is best to prepare this, the same as all other pie fillings, a day ahead.

(For Pie Crust, and Pie Fillings other than Mince, see Pages 52-60)

Plum Pudding

Large Mix

50 lb. Merrell-Soule Bakers Brick Mince Meat
6 Oranges
16 Lemons
6 qt. Chopped Apples
1 qt. Egg Yoke
1 qt. Molasses
1 qt. Condensed Apple Cider
2 lb. Merrell-Soule Powdered Skimmed Milk or Buttermilk
1 lb. Cinnamon
2 oz. Cloves
2 oz. Ginger
2 oz. Allspice
¾ lb. Salt
1 oz. Baking Soda (If buttermilk is used, increase to 2 oz.)

Method: Grind up fine the oranges, lemons and apples through meat chopper, mix all the ingredients well and add the following:

10 lb. Sultana Raisins
10 lb. Cake Crumbs
2 lb. Bread Crumbs which have been soaked in milk
4 lb. Bread Flour

Mix again well, then fill in greased pudding tins, dusted with cake crumbs and cover up tight.

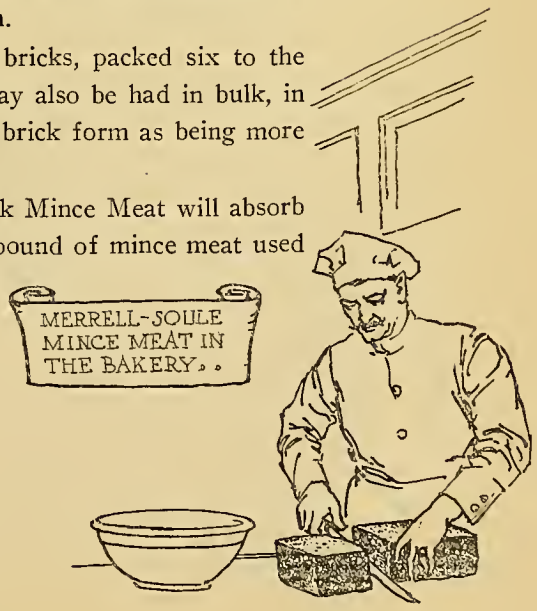
Steam from three to four hours, according to size of puddings.

Use of Bakers' Brick Mince Meat in the Bakery

Many bakers have proved by years of continuous use that Merrell-Soule Bakers' Brick Condensed Mince Meat is in every respect the most satisfactory mince meat they can obtain.

Nearly all bakers prefer the five-pound bricks, packed six to the case, though this Condensed Mince Meat may also be had in bulk, in 50 or 100-pound kegs. We recommend the brick form as being more convenient, cleanly and economical.

The fact that Merrell-Soule Bakers' Brick Mince Meat will absorb one quart of water (two pounds) for each pound of mince meat used



makes it the most economical mince meat on the market to-day, as well as the highest-quality.

For those who make a point of special and individual features in their goods, Merrell-Soule Bakers' Brick Mince Meat offers an ideal base, to which special ingredients may be added.

A baker does not need to change his recipe for any of the baked products mentioned above, except that he recalculates the fruit and sugar ingredients of any mix containing fruit.

For example:

Old Mix, Black Fruit Cake

4 lb. Butter and Lard
5 lb. Sugar
30 Eggs
1 pt. Molasses
1 pt. Water, in which is dissolved
2 oz. Merrell-Soule Powdered Skimmed Milk
6½ lb. Flour
1 oz. Baking Powder
10 lb. Seeded Raisins
3 lb. Seedless Raisins
2 lb. Citron
Spices

Method: Rub sugar and butter, add eggs slowly in small quantities, sift in baking powder and flour, pour in molasses, milk and spices, mix, and then incorporate fruit, which has been dusted with a little flour. Bake in a very slow oven, in paper lined pans, timed according to size of the cake, figuring not less than an hour for the smallest cake.

Readjusted to use Merrell-Soule Confectioners' Mince as the fruit ingredient, this recipe is recalculated as follows:

20 lb. Merrell-Soule Confectioners' Mince
4 lb. Butter and Lard
30 Eggs
½ pt. Molasses
2 oz. Merrell-Soule Powdered Skimmed Milk dissolved in
1 pt. Water
6½ lb. Flour and Cereal according to FFB. 20%
1 oz. Baking Powder
Spices

The method is simplified as follows:

Rub butter, Confectioners' Mince and spices, add eggs slowly in small quantities, sift on flour and baking powder, pour on molasses and milk dissolved together, and mix. Lay out and bake the same as foregoing example.

An Interesting Comparison

Comparison of the two recipes shows that although the weights of the finished products will be the same, the comparative volume obtained will be greater in the recipe in which the Confectioners' Mince is used, as it replaces 5 pounds of sugar, which cannot show as great a volume in the finished baked goods as the Confectioners' Mince. Besides this advantage, there is the saving of labor accomplished by the use of Confectioners' Mince. It takes a good deal of time and work to prepare 15 pounds of fruit for fruit cake, weigh it, dust it with flour and, especially, to cut the citron, lemon or orange peel.

Also, the cost of production is not increased. Twenty pounds of confectioners' mince does not cost any more than the five pounds of cane sugar, 10 lbs. of muscat raisins, 3 lbs. of seedless raisins and 2 lbs. of citron, which formed the ingredients of the old recipe. There is also the important consideration of the extra cubic volume of baked goods obtainable, which because it is not sucrose, is not lost in the process of baking.

This example clearly points out the merits and possibilities of Confectioners' Mince.

Confectioners' Mince

Merrell-Soule Confectioners' Mince is a blend of all the ingredients used in None Such and Bakers' Brick Mince Meat, with the exception of the beef, suet and spices. It is an ideal product for use by bakers and confectioners, for any purpose where fruit is required.

Confectioners' Mince, like the Bakers' Brick, is put up in five-pound bricks, six to a case, each brick wrapped in paraffin paper.

For Candy Making

Candy manufacturers find that Merrell-Soule Confectioners' Mince possesses many advantages for the making of all candies in which a fruit mixture is used.

It offers a fruit combination that cannot be excelled, noted particularly for its pleasing, natural fruit flavor. It assures both higher quality and greater economy than if the confectioner were to make up his own fruit mixture.

The use of a fruit center in candy making not only produces an attractive and popular line of goods, but also adds weight to the batch, and therefore makes possible a big saving in sugar.

Among the goods in which Merrell-Soule Confectioners' Mince can be used to advantage are fruit centers, fruit bars, fruit chocolate bars, crystallized fruit confections, fruit bon bons, cream fruit centers, fruit caramel, nougat, fruit brittle and cut creams. Owing to the fact that it contains a sufficient amount of moisture so that it will take hold of the crystal, it makes a very pretty piece of crystallized goods.

There is nothing to be compared with Confectioners' Mince for the making of fruit bars and milk chocolate fruit bars. It is also good for cut fruit squares to be used for iced goods.

The candy manufacturer who keeps Confectioners' Mince in stock always has something to work with, and need never be idle on account of sugar conditions, as Confectioners' Mince can be used in connection with chocolate, cocoanut, nuts, corn syrup, etc., to make a variety of delicious specialties which require no sugar.

Merrell-Soule Confectioners' Mince is easily and quickly handled, owing to the convenient manner in which it is put up, enabling the candy maker to get quick action in turning out the day's batch.

We shall be glad to hear from confectioners who desire further information regarding the use of Confectioners' Mince. Letters will be promptly and fully answered, or, if desired, we will send an expert candy-maker to give advice and instruction. Recipes will be furnished upon request.

Spice Cakes and Fruit Biscuits

Merrell-Soule National Advertising and Educational Work

THE name of Merrell-Soule is known to-day to nearly every grocer in the country, to the great majority of bakers, to most dairymen, confectioners and ice cream makers, and to millions of housewives.

Two food products, noted alike for quality, economy and convenience, have earned for the Merrell-Soule label nation-wide fame and popularity. One is NONE SUCH MINCE MEAT, the other MERRELL-SOULE POWDERED MILK.

For thirty-three years NONE SUCH MINCE MEAT has been prominent among nationally-advertised food products. Indeed, it may fairly lay claim to having been one of the pioneers in this field. The pages of the leading magazines and of many newspapers have been employed to tell the story of NONE SUCH to the millions of American housewives. The result is that to-day the NONE SUCH package is a staple article on the counter of every grocer, and "a package of NONE SUCH" appears on the housewife's order to her grocer, whenever mince pie is on the menu.

Merrell-Soule Quality and Merrell-Soule National Advertising have together built up the manufacture and sale of NONE SUCH MINCE MEAT to a point where enough NONE SUCH is sold each year to make 2,000 miles of pies, each nine inches in diameter, which if laid edge to edge would stretch across the continent from Boston to Omaha.

It was in 1885 that the manufacture of NONE SUCH MINCE MEAT was begun. Just twenty years later, in 1905, the first Merrell-Soule Powdered Milk was produced. It at once found great favor among bakers, confectioners, ice cream makers, dairymen and others who were looking for a form of milk more convenient, cleaner and more economical to use, and of higher uniform quality than fresh milk or the condensed product.

Rapid as has been the increase in the output of Merrell-Soule Powdered Milk, the increase in the demand has more than kept pace. Here, too, Merrell-Soule advertising has stood with Merrell-Soule

quality in increasing the fame and popularity of the product. In the leading journals published for the baker, dairyman, confectioner, and ice cream manufacturer, Merrell-Soule advertising has been not only conspicuous but dominant. Just as Merrell-Soule publicity has made the name NONE SUCH represent the highest quality, the standard brand, of condensed mince meat, so has Merrell-Soule publicity given the same standing, the same undisputed leadership to Merrell-Soule Powdered Milk.

There are few people who need to be told the wisdom of selling, buying or using an advertised product. The man who hasn't a satisfactory product cannot afford to advertise it; the man who has a satisfactory product can't afford not to advertise it. The manufacturer who believes he has a good product, and gives it national advertising, knows he must stand back of his goods. The customer who reads his advertisement, and buys, must find quality always up to standard, if he is to remain a customer.

This means, to every national advertiser, the necessity of maintaining unfailing and uniform excellence in his product. To Merrell-Soule Company it has meant this, and far more. We have not stopped at knowing the Powdered Milk we were sending out was the highest quality that could be bought, and was always the same high quality. We have also made it our business to see that the users of our Powdered Milk products were satisfied with them because they were able to use them with perfect satisfaction. Advertising would not do this. Letters would not entirely accomplish what we desired. Only one means was certain—personal contact, advice and assistance.

Here, for some fifteen years, has been one of our most important departments. Our sales staff includes expert bakers, expert dairymen, expert confectioners and ice cream makers. These men attend trade conventions, talk with the delegates, learn their needs, their problems, their difficulties and give needed advice.

Nor is this all. These experts are at the service of the consumer of Merrell-Soule Powdered Milk who has any trouble in the use of it.

Our representative will visit his place of business, work with him, find out what is wrong in his method, and show him how the trouble is to be corrected.

The best proof that users of Merrell-Soule Powdered Milk products appreciate Merrell-Soule service lies in the ever-increasing demand which our products enjoy. And we shall see to it that our service keeps full pace with the need for service.

At Your Service

In the foregoing pages we have attempted to set forth, as clearly and fully as possible, the nature, uses and advantages of the food products we manufacture. We feel sure that every consumer of these products, indeed everyone concerned in the distribution or use of them, will find in this volume much that is of interest and of value.

If there is anything not fully understood, or if there is some subject upon which any user of our products would like further information and explanation, we shall be glad to hear from him. We will write fully in answer to his inquiry, or we will be glad to place at his disposal one of our service representatives—experts, whose business it is to visit the baker, the ice cream maker, the confectioner, or any consumer of Merrell-Soule products who may desire a personal demonstration of the best methods of use.

Also, each day brings to light new uses for Merrell-Soule Powdered Milk products, and new advantages which attend their use. Therefore we cannot hope to include, in this book, all that Merrell-Soule Powdered Milk must eventually mean to the industries with which we have dealt, nor all the fields of activity into which it will some day enter. This is a story which is writing itself, chapter by chapter, and day by day.

We can only say that as these fore-shadowed developments in the uses of our products go beyond the contents of this volume, we shall hope to keep all our friends fully advised through other avenues of contact which will always be open.

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