

the loss of its fat, the skim milk has undergone no change to hurt it; indeed it is doubtless somewhat improved for some uses by having been purified by aeration and removal of sediment and dirt. It is, of course, somewhat poorer from the loss of so large a proportion of its fat. (1)

A fourth advantage is in its use in factories. It will allow of the transportation once daily of milk to the factory; and possibly the carrying back of the skim milk, by the farmers, on the return trip. There are other minor advantages.

As for the disadvantages of the system of centrifugal separation, they may be summed up, briefly, in these three: the higher cost of the machine; the necessity for employing power of some sort; and the risk of accidents. As for the first, the extra amount of butter made from the milk settles that question; the new hand-power centrifuge disposes of the second; and as for the third, nothing but carelessness in the daily inspection of the machine, or the running of it at too high a rate of speed, can cause accidents, if the centrifuge, or any other power-worked implement about the farm—the threshing mill for instance—is put up under the supervision of a competent mechanic.

Many years ago, when rapid refrigeration were first introduced into the brewery, an old practitioner of the art of making malt-liquor told me that I was wrong to run my worts boiling hot out of the copper over the refrigerator; you ought, said he, to allow them to come down to 100° F., on the coolers, first: the worts won't stand such a sudden shock. Being a thoroughly "rule of thumb" man, he could give no reason for this peculiar sensitiveness on the part of the worts, and of course I paid no attention to his remonstrance. And so, were I purposing to use the separator, I, like Mr. Lynch, should pay no attention to Major Alvord, who gives preference to the "old, quiet, gravity method," because of the "lesser disturbance and change of the fat globules of the milk."

The following may be taken as the points of merits in a centrifuge:

*First.* Strong and simple in construction; safe and easy in working.

*Second.* A good strong foundation, and a steady motion. The danger in the machine lies in the chance of the breakage of the skimming vessel, or drum, which revolves with greater or less speed. This should revolve within a strong metal armor, or shell, which will serve as a protection.

*Third.* The minimum need of power.

*Fourth.* Thorough skimming. It should be capable of separating the maximum quantity of fat from the milk, the cream yet containing the minimum quantity of milk. This is required because it would be a proof of merit in the machine, not because the skim milk in the cream is in itself necessarily objectionable. It should have merit in the special quality of thoroughly creaming the *first* and *last* milk of the skimming.

*Fifth.* Easy means of regulating the flow of milk and cream, obtaining thin cream or thick cream at will.

*Sixth.* Easy cleaning.

*Seventh.* Freedom from defects in its mechanical construction, running, motion, inflow and outflow, oiling, heating, loss of speed, starting, &c., &c.

*Eighth.* General conveniences of detail.

*Ninth.* Cheapness and durability.

*Churning.*—The temperature of the cream at the time of churning is a matter of great importance. It is impossible to lay down any absolute rule, but, in general, it may be said that the higher the temperature the more quickly the butter will come, but the poorer will be the quality; and the lower the temperature the longer will it take to bring the butter, but the better will be its quality. This will hold good, at

least, within the usual range of churning temperatures, i. e., between 55° F. and 65° F. The true rule, adopted by the author, is to churn at as low a temperature as will bring the butter in a reasonable time. My own favourite degree is 58° F.; but as I always practise after the Devonshire fashion that may be no guide to the churning of separated cream.

Mr. Lynch wisely remarks that various causes will render a variety of temperature necessary: the cream of some breeds of cows and of some individual cows will come quicker than that of others; the distance from calving, and the quality of the food, will cause variations; but these are considerations that a by no means lengthy experience in the dairy will make clear to any one. I said enough about the case in which butter will not come at all in the May number of the Journal, vol. 1886, p. 67.

Where the churning is done at too high a temperature, the butter as we have just seen, comes very rapidly, and will probably exceed in weight that produced from the same bulk of cream churned at a lower degree. But this increased product is not advantage, as it consists of the inferior constituents of the cream, the casein, albumen, &c. And herein lies the reason why butter made after the Devonshire manner is less in weight—quantity and quality of the milk being equal—than that made after the ordinary manner. (1) In the former, the milk being raised to a temperature of about 170° F., the albumen is coagulated, and in the after process of washing, the flakes of that matter may be seen floating over the side of the vessel used for that purpose. The loss is somewhere about 3%, but the butter is all the better, as, being deprived of such a very perishable article, it is all the more likely to keep: not by any means a trifling consideration in this climate.

*Granular butter.*—As every one knows, the old process of churning was to gather the butter in great lumps in the churn. Nowadays, this is entirely given up in all creameries, and the sooner it is abandoned in private dairies, the better will it be for both producers and consumers. Several of my friends at Sorel have been trying to manage their butter after this fashion, but they all seem to have failed; why, or on what account I do not know. I will try to condense Mr. Lynch's counsels into as small a compass as possible, hoping that thereby I may aid him in bringing before a large circle of readers this the most important of all the recent improvements in the art of making butter.

1st, It is clear that when butter in lumps is removed from the churn, they contain a considerable portion of buttermilk charged with caseous and albuminous matters, and must be pressed to remove this buttermilk. But the act of pressing or kneading can only squeeze out the water of the buttermilk and those particles which are chemically held in solution by it. The very process of kneading must incorporate with the butter the very impurities we wish to get rid of; for, by it part of the liquid is squeezed out, and the butter is solidified, but the strainings, so to speak, are incorporated with it, and left behind.

2nd, The churn should be stopped when the butter has formed into pellets about the size of a grain of wheat, or, for beginners, between a grain of wheat and a small pea. This may be known by examining the contents of the churn after removing the cover, when the indication of finish is the appearance of the butter floating on the milk, in a pebbled mass. Or, partially taking out the stopple, allow the milk to flow through a sieve, when if the milk is thickish and full of specks of butter, the finish is not yet arrived at. If, on the

(1) Strange to say, at the dairy-trials at Dorchester of the Bath and W. of England association, the Devonshire plau turned out the greatest amount of butter and was *all but* first in quality!

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(1) Which can be easily and profitably replaced by an ounce or two of crushed linseed.