

of hard fat can be easily recognized under the microscope. But this uniform quality can only be obtained when churning is carried on during neither too long nor too short a time, and when the concussion is neither too fast nor too slow. Experience proves that best results are obtained when churning occupies from thirty to forty minutes, a period which is only directly limited by the exact violence of the movement and the exact temperature of the liquid which is being churned. Thus, within certain narrow limits the violence of the motion is in inverse proportion to the height of the temperature, so that with a more or less violent concussion the same effect can be produced as can be effected by a corresponding increase or decrease of temperature. The art of making good butter from good ripe cream consists chiefly, for the reasons I have given above, in so regulating the temperature of the liquid for each individual churn and quality of cream, and for quality of cream and churns of different kinds, that the production of the raw butter is effected in the prescribed time. Butter almost entirely receives its texture and its consistence in the churn during churning, and defects which are produced during churning, are most difficult to get rid of afterwards.

The obstacles which retard the union or the coalescence of the butter globules to form the lumps of fat are decreased with an increase in the temperature of the cream; and the more violent the concussion, even to such a degree that heat is produced, the more easily are they overcome.

Where churning is done too quickly, either through too high a temperature or too violent a concussion, the little grains of raw butter do not separate easily, but include, besides the solidified fat, fatty globules which are in the liquid condition, and I feel sure, that the little grains of fat take up more butter-milk, in the form of tiny microscopic drops, the quicker they are formed. It is evident, too, that if the little lumps of butter contain liquid fat, which is only solidified by the subsequent

treatment of the raw butter, and which becomes smeared between the previously solidified fat, the granulation of the texture is partly injured, and the finished butter must show a soft salve condition. In the same way, butter, which has taken up too much liquid in the churning, will be soft, and will contain an unusually high percentage of water, since, even after successive workings, only a small quantity of this water can be driven out, because it is present in the butter in such a fine state of division.

If butter does not "come" satisfactorily within the prescribed time, it is an indication that the temperature is not sufficiently high, or that the concussion is not sufficiently violent.

If the temperature is found to be more than two or three degrees higher at the conclusion of the churning, it cannot be expected that the little grains of butter will be of uniform nature. It is more probable that, in such a case, the limit of time is considerably exceeded, and owing to the weak motion in churning the raw butter will include much liquid fat, and that owing to the final quick churning at the raised temperature they will contain unusually large quantities of butter-milk. My experience shows that oily butter is obtained by too quick as well as by too slow churning, and not only does the quality of the butter suffer in such a case, but the yield of butter is also diminished. The motion of the cream in the churn is always closely connected with the development of temperature, the quicker the motion, the more does the temperature, which the cream originally had, rise, a fact which we have to reckon with in churning. The rise of temperature should not exceed 3 deg. F.

The following rules or points might be observed to advantage in churning.

In the first place, bring your ripened cream exactly to the temperature which, from experience, you know will effect churning in from thirty to forty five minutes. This temperature is by no means the same for similar cream in each place