

and the stud flocks are carefully culled, and the tendency of the sheep to vary is closely watched, so as to prevent the type swaying too far to the one side or the other.

Cross-breeding for raising lambs for market is a profitable business, where the sheep farmer realises for what type of sheep his country is adapted. Here the Downs come in most advantageously, and there is great variety in the crossing with them.

In Britain there is a great diversity in the crossbreeding of sheep. Besides the breeds already named, the black-faced Highland sheep is making its way southward. The Cheviot ewe is much fancied for crossbreeding particularly for raising lambs. Notwithstanding the amount of crossbreeding that is being done, the established breeds are being maintained with greater care than ever, and this care is manifested by the existence of flock-books for all the leading varieties of British sheep.

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## The Dairy.

### PASTEURIZATION AND STERILIZATION OF MILK.

It does not seem to be generally known that but a comparatively low temperature is required for the destruction of the more important kinds of pathogenic germs, but it is nevertheless a fact, and is of great importance in treating milk which is contaminated with this type of germ.

Germs of this type such as those causing tuberculosis, typhus, and cholera, form no lasting spores, and succumb therefore to very low temperatures. Of course the life of bacteria is to a great extent dependent on temperature. Every bacterium has a maximum and a minimum, and also an optimum degree of temperature at which it flourishes, and further, a point below or above which, it dies. The influence of cold, especially repeated freezing and thawing, is able to destroy many kinds of bacteria. The temperature above which death ensues, lies, for the vegetative cells of the majority of bacteria, between 125° F. and 150° F., while their spores are able to withstand a much higher temperature. Most spores are capable of germination even after being subjected, for a short time, in liquids to a temperature of 212° F., and many resist for a comparatively short time a dry heat far beyond this.

It will be seen, therefore, that the vegetative cells of many germs can be destroyed by a continuous heating for fifteen or twenty minutes at a temperature of 165° F. This treatment is known as Pasteurizing.

It will be seen, further, that milk can be obtained and preserved comparatively free from germs causing tuberculosis etc., simply by bringing it to as low a temperature as possible, immediately on its being drawn from the cow, and by maintaining this low temperature until made use of.

Neither this latter treatment or Pasteurization, however, will prolong the keeping qualities of the milk beyond a limited time. This can only be insured by a comparatively high temperature, which alone has been found to effectually destroy the spores of many kinds of saprophytic bacteria, which impair to a very large extent the keeping qualities of milk. This treatment may be simple or intermittent sterilization.

Milk is sterilized in the full sense of the term only when it has been rendered entirely free from germ life by sufficient heating, that is to say, when all the lower forms of life, which it contains, vegetative forms as well as lasting forms, are entirely killed, and any enzymes formed by bacteria are destroyed.

Perfect sterilization can only be effected by submitting the milk to the action of continuous heating for two hours at a temperature of 250° F., or when it is submitted to intermittent heating at different high temperatures. The latter method of treatment, so-called intermittent sterilization, avoids the heating of milk at temperatures over 212° F., and consists in heating the milk two hours at a time at a temperature of from 160° F. to 165° F., then keeping it for several days at a temperature most suitable for germ development, about 100°