

ON THE DETERMINATION OF THE MELTING-POINTS OF BUTTER AND OTHER FATS.

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IN a discussion which followed the reading of papers by Dr. Tripe, Mr. Angell, and Mr. Heisch, in May of last year, on methods for determining the fusing points of fats, I alluded to a method which I have long adopted for effecting that object. The purport of what I said is briefly reported in the "proceedings" of this society, at page 137, but the description of the process, which I gave in general terms, omits some points of detail which I wish now to add. I have found the process a very convenient one, which appears to afford accurate results, and to be well suited for the determination of the melting points of fats, especially where several have to be operated upon.

The apparatus in the form best suited for general use, consists of a basin, two small beakers and a thermometer. I use an enamelled iron basin, about six inches in diameter and three and a-half inches deep. In this I place a beaker four and a-half inches deep and three inches in diameter, and within this beaker is placed another much smaller one, supported by its projecting rim on a disc of tin-plate or copper, the outer edge of which rests on the mouth of the larger beaker. Some mercury is put into the smaller beaker to a depth of about an inch, and cold water into the larger beaker so that its surface shall be half an inch or an inch higher than that of the mercury. A small drop of the fat, which has been previously melted and heated to several degrees above its melting point, but has been allowed to cool again to near its setting point, is put on to the surface of the cold mercury. This is best done by means of a thin glass rod, about one-eighth of an inch in diameter, the end of which has been rounded off in the blow-pipe flame. It is important that the drop should be very small, and its temperature when placed on the mercury not much above its melting point, for if it be too hot it will spread over the surface of the mercury, which is not desirable. If the rounded end of the rod be slightly dipped into the melted fat and then brought to the surface of the mercury, a small hemispherical particle will attach itself there and speedily congeal, becoming more or less opaque in doing so. The weight of one of these hemispherical masses, which should not be more than the eighth of an inch in diameter, will be from $\frac{1}{16}$ to $\frac{1}{10}$ of a grain. Having placed the drop of fat on to the mercury, the bulb of a thermometer with sufficiently minute graduations is introduced into the mercury, and hot water poured into the basin. The heat is thus communicated to the contents of the small beaker slowly through the water in the larger beaker, and the rise of temperature in the mercury may be easily regulated and should take place at the rate of about one degree per minute. The mercury by virtue of its comparatively good conducting power, acquires a uniform temperature throughout, which is indicated by the thermometer and at the same time communicated to the fat. The fat, when the temperature approaches its melting point, becomes partially transparent, and if the stem or elongated bulb of the thermometer be now brought up against it, the moment fusion takes place the liquid fat will run into the channel formed by the repulsion of the mercury and the outside of the thermometer tube.* This process presents the following advantages:—

* Two samples of what I believe to have been genuine fresh butter, tested by this process, after having been purified by solution in ether, gave respectively 80.5° and 81.5° F. as their lowest, and 83.5° and 84.5° as their highest melting points.

1. The heat-conducting power of the mercury, on which the fat is placed, ensures the equalisation of the temperature as indicated by the thermometer and at the same time communicated to the fat.

2. The direct contact of the fat with the mercury, without the intervention of a bad conducting medium, such as glass, ensures a more immediate and correct indication of the temperature at which liquefaction takes place than would otherwise occur.

3. The minuteness of the quantity of fat operated upon reduces to a minimum the time occupied in its melting, and thus facilitates the determination with exactness of its melting point.

4. The time occupied in preparing small tubes and charging them with the fat is saved, and several experiments in succession may be easily and rapidly made with the same apparatus.

In the discussion which followed Dr. Dupré enquired whether the author had made any accurate experiments on the influence of previous fusion on the melting point of butter fat, or as to the time which should be allowed to pass between the fusion of the fat and the taking of the melting point, as he, Dr. Dupré, had found the melting point vary as much as 10° F., and even more from the correct point, when taken immediately after a previous fusion.

Mr. Wigner pointed out that the old plan of coating the bulb of the thermometer with the fat to be tested, and slowly heating in a water bath seemed to give results as accurate as any other process. He then made a few remarks on the relation between the temperature at which the specific gravity bubbles rise in melted fats, and the actual densities of the fats.

In reply, Dr. Redwood said, he did not attach much importance to the melting-point of butter as a characteristic by which to judge of its genuineness or otherwise, but he adopted what he found to be the most convenient and accurate method of making the determination. He did not find that there was any marked difference in the results obtained by his process as compared with those obtained by melting the fat in thin capillary tubes, but there was a material difference as compared with the sinking of glass bulbs by Mr. Angell's method. What he had observed and found it important to pay particular attention to was, that in butter, as well as other fats, such as tallows, there were at least two melting points dependent upon, the way in which the fat had been previously subjected to the action of heat, and they may differ in butter, to the extent of 3 or 4° F., the lower melting point being that of the fat after it has been heated, to several degrees above its first melting point, and the higher melting point being that of fat which has been previously melted at the lowest possible temperature, and then immediately allowed to congeal.