

The Dairy.

Valuation of Milk According to its Percentage of Fat.

On various occasions we have pointed out the gross injustice of the existing system of disposing of milk and cream to the creameries, paying the same price for all grades, although it is well known that the milk or cream from one cow may have double the value of that from another cow, pound for pound. We have shown that private creameries would be a great improvement on this system; but in justice to those who still adhere to co-operative creameries, we take this opportunity of pointing out how they can be conducted in such a manner that ample justice can be secured to all the patrons.

In a recent issue of the *Milch Zeitung*, a dairy journal published in Germany, there appears an able article on the question from the pen of Prof. Fleischmann. If the injustice is so greatly felt in Germany, where the breeds of cows are of great uniformity, there is much greater necessity for a change in Canada, where there is so much diversity in the breeds as well as in the individual characteristics of our dairy cows. Having pointed out the injustice of paying the same price for all qualities of milk, the writer says that the percentage of fat is the true standard, providing the milk is to be devoted to the production of butter, but he does not discuss what the standard should be for other purposes. He asserts that the practice of regulating the price of milk according to the percentage of fat and the price of butter has existed in Schleswig-Holstein for a long time.

From the remainder of the article we make the following translation, but as the metrical system is used in Germany, it is necessary for us to convert the weights and measures into English expressions, and also to express the money in equivalents of our coin: 1 kilogram (kg.) = 2.2 lbs; 1 litre = 1.76 pints; 1 mark (M.) = 24 cents; 1 mark = 100 pfennige (d). The writer proceeds:

The payment of a kilogram of milk according to its percentage of fat implies a knowledge of this percentage yielded by the cows of each patron, and a uniform system of analysis, as well as analyses made at uniform periods of time. Soxhlet's method of determining the percentage of fat is the most accurate, and the contingent injustice becomes less the oftener the analysis is repeated. In most cases each patron does not have his milk analyzed oftener than four times a month. The determination of the percentage of fat is best made at approachingly near intervals, but the patrons are not to know anything about the time. According to an understanding, the analysis may be made of the morning or the evening milk, or both. In the last case, the milk should be thoroughly mixed in certain proportions, for example: From each kilogram let a cubic centimetre (.06125 cub. inches) be taken and be placed in ice, doing the same in the evening with the evening milk, and the following morning let both tests be mixed together and warmed to 40° C., at the same time stirring constantly and thoroughly, cooled again, and then submitted to analysis. Now suppose one patron, whose milk is to be examined, delivers 210 kg. of milk in the morning and 236 kg. in the evening, then 210 cubic centimetres would be taken from the former to be tested, and 236 c c m from the latter. By accurate manipulation care must now be taken that the milk has uniform warmth. Let it now be supposed that monthly statements are rendered, that the milk of the patrons is analyzed four

times monthly, and that one of the patrons is represented by the following statement:

By the I. analysis 350 kg. milk with 3.15% fat.
 " II. " 310 " " 3.25 "
 " III. " 290 " " 3.35 "
 " IV. " 240 " " 3.55 "

And now the average percentage of fat will be found as follows:

$$\frac{350 \times 3.15 + 310 \times 3.25 + 290 \times 3.35 + 240 \times 3.55}{350 + 310 + 290 + 240} = \frac{3933.5}{1190} = 3.305 \text{ per cent.}$$

This is the exact method of reckoning, but the percentage of fat can be more simply calculated as follows:

$$\frac{3.15 + 3.25 + 3.35 + 3.55}{4} = \frac{13.30}{4} = 3.325$$

percent,—therefore only 0.02 percent more than the accurate average. This difference is so small that the simple arithmetical mean is sufficiently correct for all practical purposes.

The calculation of the price for a kilogram of milk takes various shapes, according to the bargains made between makers and patrons.

1. How to ascertain the price of a kilogram of milk according to its percentage of fat in creameries which operate on their own account.

In this method many proposals have been made. In my method monthly settlements are made; it is quite simple, free from all technical objections. It may be explained by the following example:

Suppose the company consists of four members, and let the net realization of a kilogram of milk for a given month be 9.81 pfennige. Suppose the percentage of fat be ascertained four times for each member, and the averages as well as the quantities delivered, be as follows:

I. 25,000 kg. milk with average fat 3.15%
 II. 20,000 " " " 3.25 "
 III. 15,000 " " " 3.35 "
 IV. 8,000 " " " 3.55 "

Total, 68,000 kg. milk.

The average percentage of fat may now be accurately ascertained as follows:

$$\frac{25000 \times 3.15 + 20000 \times 3.25 + 15000 \times 3.35 + 8000 \times 3.55}{68000} = \frac{222400}{68000} = 3.27 \text{ percent.}$$

As the net realization of one kilogram of milk having 3.27 percent of fat is, according to the price stated, 9.81 d, the price realized for one percent of fat is

$$\frac{9.81}{3.27} = 3 \text{ pfennige,}$$

and the proceeds may therefore be divided amongst the four members as follows:

I. $3.15 \times 3 = 9.45$ d | III. $3.25 \times 3 = 9.75$ d
 II. $3.25 \times 3 = 9.75$ d | IV. $3.55 \times 3 = 10.65$ d

In point of simplicity and ease of comprehension, no objection can be raised against this method of meeting out justice to the patrons. In point of practice, however, I have been told that monthly calculations would be too cumbersome for large creameries, where there is a large number of patrons. Nobody will dispute that the net realization of a kilogram of milk, if not exact to the last pfennig, is yet so near that no difficulty can be presented. But by striking the balances once a year, the division of the proceeds will be still more accurate, as the errors which are apt to creep into small accounts often balanced will then be avoided.

II.—How to determine the price of a kilogram of milk according to its percentage of fat in rented creameries.

The methods of calculation in this case are not so clearly defined as in the other. There is a dearth somewhere in all the propositions heretofore made, as the following will show.

At any rate the ruling price of butter must not be lost sight of, nor the percentage of fat either. This method consists in striking monthly balances in such a manner that the average price of butter is taken into consideration, this price being taken either directly into the calculation, or reduced by the amount of the expenses attending the sales, and the division is then made according to the

quantity of milk required for a pound of butter in conjunction with the established price per pound. For example, if the lessors and lessees have determined that the standard for a pound of butter is 14 kg. of milk, the expenses being 6 D, and if the market price of a pound of butter, according to the highest quotation in the monthly average, be 132 pfennige, then

$$\frac{132 - 6}{14} = 9$$

pfennige will be the sum to be paid for a kilogram of milk. This price for milk is in reality nothing else than the price of the quantity of butter which can be obtained from a kilogram of milk. If 14 kg. of milk are required for a pound of butter, then out of 100 kg. of milk will be obtained 3.572, and 1 kg. of milk will give

$$\frac{100}{14} = 7.14$$

kg. of butter. But if a kilogram of milk costs 2 × 126 252 pfennige, then the quantity of butter obtained from a kilogram of milk will be worth $3.572 \times 2.52 = 9$ pfennige. Hence, according to the method of calculation adopted in Schleswig-Holstein, the price of milk is simply obtained by calculating the quantity of butter made from a kilogram of milk.

This method of calculating the price of milk includes the concession on the part of the lessors that the lessees be placed in a position to cover the full amount to be paid for the milk out of the butter and other proceeds. There is another condition in the calculation, viz., that 14 kg. of milk will produce a pound of butter, and justice can only be obtained when the milk delivered produces a certain average percentage of fat. It will here be seen that, as no analyses are made, estimates as to the average percentage of fat must be obtained by a mutual understanding, according to the butter-producing capacities of the milk.

If 14 kg. of milk produce a pound of butter, then, as before remarked, 3.572 kg. of butter will be made from 100 kg. of milk. Now, let the percentage of fat be indicated by f , the cream and the butter respectively by A and A' , and the percentage of fat in the worked, but not yet salted, butter by F , then the following formula will give the quantity of butter obtainable from 100 kg. of milk:

$$x = f \cdot \frac{A \cdot A'}{F \cdot 100}$$

Or, suppose $A = 90$ percent, $A' = 97$ percent, and $F = 82$ percent, then $x = f \times 1.0649$ percent, and, further, we obtain $f = x \times 0.939$ percent. From this the percentage of fat from the milk can be obtained by multiplying the percentage of butter from the milk by 0.939. As the butter in the above case is taken as 3.572 percent, then this corresponds to a fat percentage of $3.572 \times 0.939 = 3.3535$.

To find the price of milk it is now proposed to pay contract prices for a certain quantity of milk say the fourteenth part of the highest quotations for a pound of butter, connecting the price with the litre measure of milk; also the sum of money with the whole quantity of milk delivered, and then this sum with the litre percentages delivered by the individual lessors, i. e., divided in proportion to the respective volumes of milk and the corresponding average percentages of fat. If it is guaranteed that the yield of butter from the milk is rightly adjusted, and this exactly corresponds to the average fat percentage of the entire volume of milk, then no objection can be raised against this method of calculation. But injustice and contradictions in the operations must take place so long as this correspondence is not complete.

Perhaps the following propositions are worthy of consideration:

It will again be established what was observed in the first case relating to the average percentage of milk fats from the individual patrons. Here the percentages of butter which correspond to different grades of milk can be calculated, the same multiplied by the hundredth part of the average price for a kilogram of butter, the price for a kilogram of