

THE DAIRY.

VALUE OF THE LACTOMETER.

There has been much discussion as to the degree of reliance to be placed on the lactometer as a means of testing the quality of milk. Several Canadian correspondents having written to Hon. X. A. Willard on this subject, he has replied through the *Weekly Mail*; and as the article is one of great practical value, we gladly reproduce it for the benefit of our readers who may be engaged in dairying. It will be seen that Mr. Willard takes the same ground as Prof. Arnold and other dairy experts, viz.: that the lactometer, while not absolutely infallible, is a very valuable agent in detecting the dishonest practice of milk-watering:—

GENUINE COWS' MILK

of average good quality contains from 12 to 18 per cent. of solid matter, together with about 87 per cent. of water. It is heavier than water—the proportion as generally stated by the chemists being as 1,000 to 1,082; that is to say, if we take a glass vessel that will hold just exactly 1,000 grains of pure water, and fill it with milk of average quality, it will weigh 1,082 grains. The lactometer is based upon the principle of showing the specific gravity of milk, and when correctly graduated, and properly used, it does this with certainty. The instrument, however, does not tell the causes of variation in any two samples of milk. Genuine milk, as is well known, varies in specific gravity. Dr. Fleischman, of Germany, personally inspected the milk of thirteen different dairies in the vicinity of Linden, containing in the aggregate 128 cows. He noted the specific gravity of the milk of each cow separately, and upon each day in bulk, with the following results:—

“The mean specific gravity from the 128 cows is 1.031.6908.” “The maximum specific gravity of any one of the 128 cows is 1.084900, and the minimum specific gravity from any one of the 128 cows is 1.029500.” “The milk of 9 per cent. of the cows exceeds 1.089 in specific gravity.” “The milk of 89 per cent. of the cows ranged from 1.038 to 1.030 in specific gravity, and the milk of 2 per cent. of the cows was below 1.030 in specific gravity.” “The mean specific gravity of the milk from the 13 dairies ranged between 1.03065, and 1.03285, or in round numbers between 1.031 and 1.030.”

Simon places the specific gravity of cows' milk at from 1.030 to 1.039; Sherer from 1.026 to 1.032; Mott, of New York, from 1.029 to 1.040, with an average of 1.032; Prof. Chandler, of New York, from 1.02958 to 1.0348. It will be seen, then, that genuine cows' milk varies in specific gravity from 1.026 to 1.040, water being 1.000, though in genuine good milk the specific gravity seldom falls below 1.028. But the question may occur, why this variation of specific gravity in genuine milk? It is due not only to the variable proportion of water it contains, but especially to the amount of butter-fat in its composition; for the other constituents of normal milk are tolerably constant in their proportions. Now, cream is lighter than milk, and of nearly the same specific gravity as water; hence it will be seen when milk is very rich in butter-fat, its specific gravity is less than the ordinary standard, and when tested by the lactometer alone might create the suspicion of its being watered. But the lactometer does not tell you the milk is rich in butter-fat; it only gives you warning that the specimen under examination differs in specific gravity from the ordinary or average sample of good milk, and its quality therefore must be tested by other means. This is usually determined by the cream gauge and per cent. glass, which should always be used in connection with the lactometer.

THE PERCENTAGE OF BUTTER.

Somewhat recently, Prof. Fessor, of Germany, has brought out an instrument for determining the percentage of butter-fat in milk, and from my experiments with it I find it exceedingly handy, and more reliable than the cream gauge and per cent. glass. It is operated very easily and expeditiously. If, however, the specific gravity of milk from a certain cow or herd (milk known to be pure) be taken from time to time as a standard of the milk from that particular cow or herd, then any considerable variation from that standard may justify strong suspicion that the milk has been watered, or skimmed, or in some way tampered with, for it has been found that cows treated in a uniform manner as to feed, water, and other circumstances, yield milk that is not liable to show any sudden or large variation in its specific gravity.

It is to be regretted that many of the cheap instruments in use among the factories for testing milk are imperfect, or do not agree in graduation. This is especially so with cheap thermometers, which often vary several degrees when applied to fluids of the same temperature. Now, in constructing the lactometer for factory use, the usual method for graduating the scale is to place the instrument in distilled water at a certain temperature—generally 80° Fahr.—and the point at which the stem sinks to or meets the surface of the water is marked W, for water. The instrument is then placed in milk of the same temperature, and the point where the surface of the milk touches the stem is marked at 100 for pure milk, and for skimmed milk it is marked S. The space now between the W and the 100 is graduated into 100 equal parts on a slip of paper enclosed in the stem, which is then hermetically sealed and the instrument is ready for use. Now, suppose this instrument has been carefully made and graduated correctly, and is used in connection with a thermometer that varies 10 degrees in its graduation from the true standard, we shall have a false record of the specific gravity. Prof. Chandler, of New York, who constructed a lactometer to be used as a standard by the Board of Health of that city, places the milk mark at 100, the specific gravity of pure milk being assumed at 1.029, and water mark 0, the instrument being graduated for a temperature of 60° Fahr. A sample of milk tested by him which stood at 100 by the lactometer at 80° Fahr., was found to stand 106 at 44° Fahr., and 98 at 66° Fahr., and 90 at 80° Fahr., and 74 at 100° Fahr. Now, milk tested with a lactometer constructed with milk mark of 100 on basis of specific gravity of pure milk at 1.034 would require 16.27 per cent. of water to bring it down to Chandler's standard of 1.029 specific gravity. Flint gives

THE RESULT OF A TEST

of different specimens of milk, the lactometer being used on the morning's milk at a temperature of 60° Fahr., and the lactometer scale graduated for pure milk at 100. The first pint drawn from a native cow stood at 101—strippings of same cow, 86; milk from pure bred Jersey, 95; Ayrshire, 100; Hereford, 108; and Devon, 111. These facts are not given for the purpose of undervaluing the lactometer as an instrument useful to the factory man in aiding to detect frauds in watering milk, but, on the other hand, to guard him against hasty conclusions from a careless or improper manner of using the instrument. In making tests with the lactometer, the milk should be well stirred or mingled together; for if taken from the top, the sample might contain a larger percentage of cream, and therefore show less specific gravity than if the top and bottom had been well mixed. The temperature of the milk should be carefully taken, and the lactometer allowed to sink gently

and slowly into the fluid. The sample under examination should be examined as to its opacity and colour, its taste and odour, while the amount of cream or butter-fat must also in some way be determined either by cream gauge and per cent. glass, or by other instruments like that to which I have referred.

ALLOWANCES TO BE MADE.

It will be seen that certain allowances must be made for the variation of specific gravity in milk, for if it has a very high specific gravity, or a gravity considerably above that at which the lactometer is graduated for pure milk, a certain amount of water can be added to the milk, and the fraud cannot be detected. But whatever discrepancies of this sort are to be found, the lactometer must be regarded as an exceedingly useful instrument in the hands of an expert, or in those of the factory man who understands its construction and the use for which it is intended. It is a *faithful sentinel* that gives warning of any considerable change in the condition of milk. Cases are constantly occurring where the lactometer has pointed to men who are guilty of fraud in watering milk, and they have been watched and evidence obtained which convicted such parties in the courts. If, for instance, the milk (from a herd of cows) delivered at a factory should always show by lactometer 100 when the owner was from home, and only 80 when he was at home and milked, there would be good reason to believe that the milk showing such discrepancy was watered, and unless the dairyman could explain this variation, there would be reasonable ground for setting a watch upon his operations or excluding his milk from the factory. But in all cases of variation in milk from the mark set up as a standard, the utmost care should be taken by those who make the tests to have them accurate and reliable.

TO GET A FULL MILK-PAIL.

We assume that the cow is properly fed. Lacking this condition, no cow can milk as she ought, says the *London Live Stock Journal*. But careful feeding seems to have but little influence on the milking properties of some cows; they lay on flesh instead. Yet as they have, first of all, to live before they can think of giving much milk, or in fact any milk at all worth speaking of, and as about two-thirds of the food they have an appetite for goes to sustain the offices of life, it is clear that under-feeding will not lead to a profit. This is a proposition well enough established, and it appeals alike to our judgment and interest. Yet, after all, breed is of the first importance, because without it good feeding is of small effect on the milk-pail; but if we have both breed and feed, the pail will overflow—if we let it. Breed, then, is first; food next; then good milking by hand, kind treatment, shelter from the storm, and all that.

For raising good dairy animals, there is hardly any food so good for calves as warm skim-milk, with a mixture of moderate quantities of ground oats scalded. The milk and oats contain a large amount of muscle and bone material, and contribute greatly to the development of constitutional vigour and good frame.

The German custom of having the cows milked by men is highly commended by a French agricultural paper. It declares that milking is hard work, and better done by men than women; these, on becoming fatigued, as they are apt to do, become also impatient, and their impatience affects the cow. It urges that women are as much out of place in the stable as men are in the dairy.