

### The Practicability of the Milking Machine

[Address delivered by H. H. Dean, Professor of Dairy Husbandry, O. A. C., Guelph, in the lecture-room of the Ontario Winter Fair, December, 1906.]

To show you the interest that has been taken in this question, it is said that over 130 patents have been taken out in the United States since 1872.

Before we can understand this question we must know something about the physiological processes that go on in the secretion of milk. The secretion of milk is a mystery, so far as we know. We believe the milk is partly made in the breaking up of the cells which make up the cow's udder, partly by filtration. Some scientists say there is a fermentation going on in the cow's udder, producing milk. It is altogether likely it is the result of these two combined processes—the breaking up of the cells of the udder and the filtration from the blood of the material required for the milk.

So far as I can see, there is no reason why cows might not be milked satisfactorily by machinery.

In the mechanical problem, three questions have presented themselves: Shall we milk cows by sucking, as the calf does, or shall we do it by pressure, the hand method of milking—or combine these two?

If I were to offer a personal opinion, my judgment would lead me to conclude that the successful milking machine will be one which imitates hand milking. Why do I think so? Because all the best dairy cows that the world has seen produced have been developed by hand milking and not by calf sucking, and the tendency is that, in every case where the calf sucks the cow, she dries up much quicker than when she is milked by hand. Therefore, I say look for the development of the milking machine that imitates the hand milking of the cow.

A milking machine, to be of service, must be simple, cheap, durable, easily cleaned, require the minimum amount of power, time and labor of operating it, and a person must be able to milk from four to six cows at once. These are what I consider essential things in the mechanical milking machine. At the College we have had practical experience with three or four different kinds of milking machines. I have, personally, taken a great interest in this question. Any man who approaches a subject of this kind, should approach it free from bias as far as possible. He ought not to have any set opinions. If I have had any set opinions at all, they have been in favor of the milking machine. The first machine which we had any experience with was called the Murchland. We experimented with this machine until we were satisfied it was not a practicable machine for milking cows, and we threw it to one side. I had the pleasure of meeting Mr. Murchland last year at Glasgow, at the Highland Show. I had met him ten years ago, and at that time he was very enthusiastic about the machine, but when I saw him at Glasgow he was not quite so enthusiastic.

The next machine we had a practical experience with was the Thistle. I have here the milk cup of that machine. You will notice that inside the cup it is like a calf's mouth. There are two lips and a piece like the tongue of a calf, and it is supposed to imitate both hand milking and calf sucking, so that the cow would think she was being milked by hand and sucked by a calf. The difficulty was with the cleaning of that machine, and, after spending a good deal of time and money, we laid that to one side.

The next machine we had experience with was a sort of roller, rather four rolls and a rubber flange, and you set this up under the cow and turned the crank, and these rollers press against the cow's teat and squeeze the milk out. That would be all right if our cows' teats were exactly the same size and hung exactly the same length from the cow's udder, but as they do not, the machine was not a success.

The next machine was the B. L. K. Milker—I have one of them here—for milking two cows at once. First the air is exhausted from the pipes above the cows, and then these cups are put on the cow's teats. As soon as the cow's teat is inserted in there, the pressure of the atmosphere being taken off, the milk at once begins to flow. There is a sight-glass which enables you to see the milk as it passes into the machine. On top of the machine there is a regulating valve which gives an alternating pressure; that is, the pressure is not constant, as it was in the case of the Murchland. You have a pressure equal to about half the atmosphere coming on the cow's teat, and, by means of this valve, a certain amount of air is allowed to come in. The milk comes down into the teat, and from there into the cup and down into the pail. We have tried to give every consideration to the machine, and I would like to mention, at this time, my personal indebtedness to Mr. Wood, our herdsman, for the large amount of time and the care and patience he has exercised in the operation of the machine. Personally, I have not had time to watch all the details, and I am not mechanically inclined, and I would not go to the bother of fussing with the machine in the way that he has done. We put the machine in our stable at a cost of \$250, or about half the regular price of the machine. The manufacturer gave us a cut rate on the machine. We began operating it on the 1st of January, 1906, and we have had 11½ months' experience with the machine. During the month of December, 1905, fifteen cows were milked by hand, and in January the same cows were milked with the machine. They gave in January 1,351 pounds less milk when milked with the machine than they did in the month of December when milked by hand. They gave 47.22 pounds less milk-fat, equal to about 55 pounds of butter, or 3½ pounds less butter per cow during that month, when milked with the machine, than they did in the month of December, when milked by hand. We expected that. After milking them during the month of January with the machine, on the first of February we selected four cows to make a special test, and they were milked from the first of February to the 14th with the machine, and Feb. 15th to 28th by hand. For the period from February 1st to the 14th, and from March 1st to 14th, when they were milked by the machine, we found that the average fortnightly production was 483.7 pounds; and when they were milked by hand, from February 15th to the 28th, the average production in the two weeks was 503.5 pounds per cow. Three out of four cows gave more milk when milked by hand than they did when milked with the machine. In nearly every group we had certain cows that seemed to milk as well with the machine as by hand. The four cows, during the two weeks, gave 79 pounds more milk and 6.89 more fat when milked by hand than they did when milked with the machine.

From March 30th to May 10th three cows were selected, and these cows gave 80 pounds more milk when milked with the machine than they did in the two weeks when milked by hand, and we were quite well satisfied at that time that the machine was giving us fairly good results, and for a long time we allowed the machine to milk practically all our cows. I was, personally, very much pleased with the results, but, about the 1st of July, we found that a number of our cows were dropping rapidly in the milk, and we were obliged to take several cows off the machine and milk them by hand, because they would have dried up altogether. I am not going to make any positive statements, because the man who makes the most positive statements about things is the man who knows least about them. The man who goes to study a question of this kind needs to be very careful. When the cows were on pasture we made a similar experiment to the experiment made in the winter. Seven cows gave 7½ gallons more milk in two weeks when milked by hand than they did, averaging two periods, when milked with the machine. Five cows gave more milk when milked by hand, and two cows gave less milk than they did when milked by the machine. There were four cows in the herd that were being milked by hand during all this time, in order to compare the results as to the effect of advancing lactation. These four cows had been milked all summer by hand, and gave 154 pounds less milk during the hand-milking period, as compared with the previous two weeks when the seven cows were milked with the machine, showing that, in all probability, the machines were not doing as good work as hand milking in maintaining the milk flow. When we average the periods before and after hand milking, these four gave 29 pounds more milk in the middle period; the seven machine-milked cows gave 75½ pounds less milk in the same period.

In the middle of October we wrote for an expert to come and tell us how we could get any better results from our machine. We were not satisfied. He recommended manipulating the cows' udders. I am satisfied there is little or nothing in the manipulation of the cow's udder, although we followed directions on this point to meet the manufacturers' views, and you will notice that in the majority of cases where you begin that the cows will at once begin to contract the muscles of the abdomen. Some say that the muscles of the abdomen have no connection whatever with the ducts from the lobules where the milk is secreted. My own impression is that the cow can close these ducts and usually does it by contracting the muscles of the abdomen. We made some experiments to see whether we could produce better results by manipulation of the udder, and, in order to do that, we milked some of the cows with the machine and some by hand, and we came to the conclusion that there was little or nothing in the manipulation of the udder, except it seemed to prevent your getting the stripplings after you stopped milking with the machine. On the 1st of November ten cows were again put on an experiment for two weeks. Eight out of the ten gave more milk by hand, and one gave the same amount by hand as with the machine, and one gave less milk when milked by hand. Certain cows in every group seem to give as good results with the machine as by hand.

Summing up the whole question of the experiment in November, we find that the cows gave 384 pounds less milk on the machine than they did in the same time by hand milking. We find, also, that, comparing inexperienced milkers with the machine, there was not very much difference. Our herdsman is an expert milker, and he can always get from two to five pounds more milk out of a cow by hand than with the machine, and usually from one to three pounds more than an inexperienced milker can get, and this would lead us to believe that with some cows it is possible you might get as good results from the machine as you would get from a person inexperienced as a milker.

My conclusions are:

First.—In the four comparative tests which we have made, in three out of four the cows gave more milk when milked by hand than they did with the machine. In one test they gave more with the machine than they did by hand.

Second.—Inexperienced milkers may get no more milk from certain cows for a short period than is got with the machine, but a good hand milker will always get more milk than will the machine.

Third.—Cows tend to dry more quickly when milked with the machine. No. 15, in 1905, milked for 320 days; in 1906, 230 days, or nearly 100 days less when milked with the machine. No. 17 milked 361 days in 1905, and 217 days in 1906. No. 26 milked 287 days in 1905, and 233 days in 1906. We estimated that these three cows in our herd gave 10,118 pounds less milk when milked by the machine than by hand, and that amount of milk was worth at least \$100.

We had certain young cows—heifers—that had hardly ever been milked by hand, and they gave us very good results. We have one two-year-old heifer that has milked this whole year with the machine that has given us over 8,000 pounds of milk. This leads us to believe that it might be possible that young cows, if they were milked with the machine from the start, might give satisfactory results. Our experience leads us to believe that the most satisfactory results are likely to be got from young cows that have never been milked by hand.

Special care is needed in the cleaning of the machine. We followed the directions of the manufacturer as closely as we could, and I have no hesitation in saying that the directions given by the manufacturer will not clean the machine. They have to have more care than is recommended by the manufacturer to get them ordinarily clean; and to keep them satisfactorily clean, most of the parts that come in contact with the milk must be boiled once a week, and they ought to be boiled every day.

So far as I can see, at the present time, it will not pay a man having from ten to twenty-five cows to invest \$500 in a milking machine. The man who is milking from fifty to seventy-five cows may very well consider the milking-machine question, especially if he finds it difficult to get suitable hand labor.

I assume full responsibility for what I say. There has been a tendency to throw discredit upon the work which we have done, and there has been an effort to try and frighten us with regard to this question. I want to say to the people here that we care not for any man. We give what we believe to be the truth, and when the dairymen of this country do not want the truth, there will be a vacancy upon the staff at the College. We care not for any manufacturer, or any dairy paper, or anyone else; we stand straight on that question. (Applause.)

Sam Jones said what the United States needed, more than anything else, was an unbulldozable, unbribable, unpurchasable standard of manhood, and the man who has not got courage to stand up and defend his work, is a man who should not be put in a responsible position in this country. We have tried to give what we believe to be the truth in reference to this matter. It is one of the most difficult questions we ever tried to get full light upon, because the question is so complicated. You have the question of milk secretion, which is more or less of a mystery, and then you have to take into account that the cow might have done differently or she might not have given you the same results if you went at it in a different way.

So far as I can see, at the present time, the manufacturers have to improve, to a large extent, the milking machine before we can say that it is practicable on the average Ontario dairy farm.

The following additional points were brought out by Prof. Dean in the discussion following his address:

Why some cows gave more milk when milked with the machine than by hand, is a question it is impossible to answer satisfactorily.

In reply to a question whether experiment in Wisconsin had not indicated an advantage in manipulation of udders, Prof. Dean said: So far as I remember, the results got at Wisconsin and Cornell were slightly in favor of manipulation. In talking over this matter with Prof. Woll, he was not enthusiastic about manipulation, and I understand the practice is not followed at the