

boy a chance is not a mere experiment, but has repeatedly proven a success throughout the Dominion. Let us earnestly co-operate with the County Boy's Clubs and the School Fairs, and thus ensure the further development and expansion of the industry, and the success of the agriculturist of to-morrow.

Wellington Co.

K. REGINALD DOUGLAS.

AUTOMOBILES, FARM MACHINERY AND FARM MOTORS.

Electric Motor.

Could you tell me through the columns of your paper the difference between an electric motor and a dynamo or generator, and how each works? It is the difference in mechanical construction of the two that is required.

C. R. F.

Ans.—An electric generator is a machine which when driven from some source of mechanical energy, such as a steam engine or a gas engine, is capable of delivering an electric current. An electric motor is a machine which, having electric energy supplied to it in the form of an electric current from a source of supply, will deliver mechanical energy which may be used for doing mechanical work. To be brief, a motor takes in electrical energy, a generator delivers it.

Speaking of direct-current machines, the same machine may be used as either motor or generator. The word dynamo is usually applied to such a machine when no definite name plate is attached to it signifying for which of the two duties it is intended to be used.

In alternating-current machines the mechanical construction of motors and generators is sometimes quite different, and there are so many different makes of machines on the market, that to describe even in general the difference in mechanical construction of these would take many pages of printed matter.

Empty Cisterns.

EDITOR "THE FARMER'S ADVOCATE":

The shortage of water in our cisterns following the long period of cold weather this winter prompts me to suggest the following plan as a simple means of overcoming this difficulty for all who have windmills or other power for pumping from their hard water wells. Make a connection from the pipe that supplies the hard water to the house, to the pipe by which the soft water is drawn from the cistern. This latter connection must be made below any check valve and may be either a fixed pipe, or by having attachments to which you can fix an ordinary garden hose from one to the other, with proper stop cocks on each. You can then from time to time pump some hard water into your cistern as necessity calls for it. This has another advantage from the addition of some hard water to your cistern keeping the water in the cistern free from any taint or smell.

My plan with a windmill is quite frequently to turn the windmill on to the cistern the first thing in the morning, and after it has been running for some time to turn it on to my hard water tank. Then when the tell-tale shows that the tank is full, a signal is given to have the windmill turned off. By keeping a fair amount of water in the cistern there always will be a sufficient proportion of soft water so that the hot water front to your kitchen stove will not become choked with lime, and you are equipped to meet such conditions as have arisen this winter or through any period of protracted drought.

York Co.

L. H. BALDWIN.

THE DAIRY.

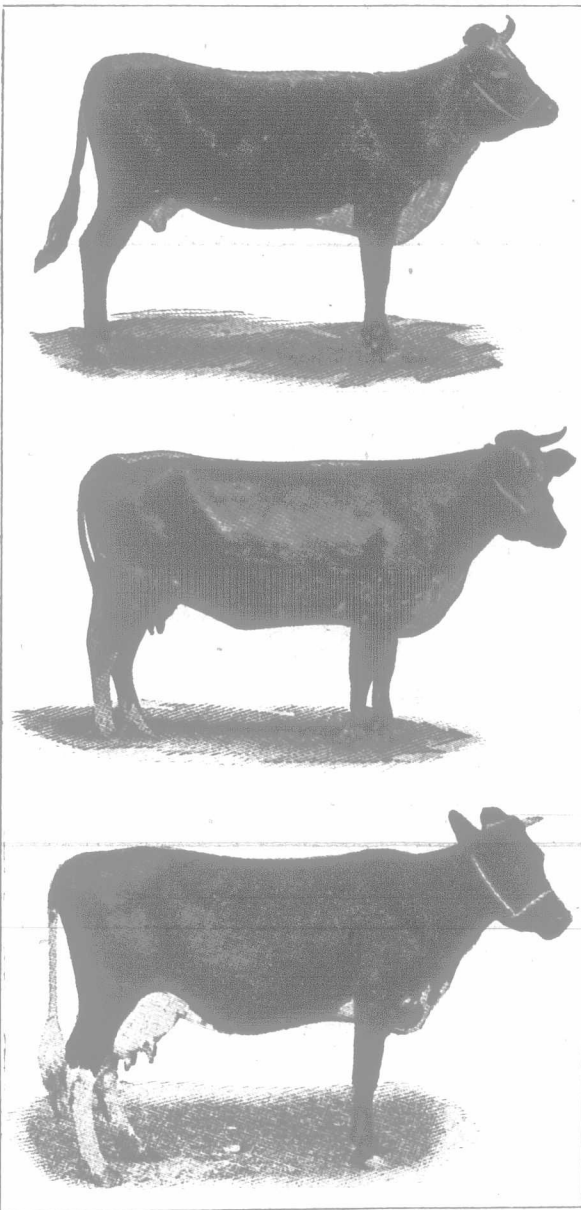
Ten Years' Improvement by Grading Up.

Federal statistics indicate that in July, 1919, there were in Canada slightly more than 3,500,000 milch cows. The most reliable estimates that can be obtained indicate also, that the average yearly production of these cows is about 4,000 pounds. Of course there are many, many cows that do much better than this and, in fact, most of the cows in the more prominent dairy districts will go 6,000 pounds or better, but there are comparatively few herds that will average over 8,000 pounds. Occasionally one runs across a commercial dairy herd where the average is close to 10,000 pounds, but this is rare unless the herd is practically all made up of pure-breds.

There are two outstanding reasons for this deplorably low average production the country over. The first and fundamental reason is undoubtedly the preponderance of cows of inferior or scrub breeding and the second is the prevalence of poor feeding methods and the use of insufficient or poor feeds. It has been pretty well proven that breeding is of more importance in determining the profit secured from the average dairy herd than feeding. This is shown by studies of the cost of producing milk in Western Ontario, the results of which have been recently published in these columns. It is shown first that by increasing the production per cow from below 4,000 pounds yearly to more than 7,000 pounds the cost of producing 100 pounds of milk was reduced in actual practice from \$3.96 to \$2.05. This indicates that the yield of milk per cow is undoubtedly the most important factor determining the cost of

production of milk. It is even shown that well-bred, poorly-fed animals will produce milk at a cost considerably less than it can be secured from poorly-bred, well-fed animals, the difference, in actual results having amounted to over 75 cents per 100 pounds. The following sentence from the report of the farm survey is also shocking, namely, "With milk selling at an average price of \$2.36 per 100 pounds the cow which produced less than 5,000 pounds within the year could be classed as a 'boarder'."

But we do not want our readers to believe that it does not make much difference how a cow is fed so long as she is well-bred. This is far from being the case. In fact, we believe that by better feeding alone it would be easily possible to raise the average production per cow by from 1,000 to 2,000 pounds yearly without increasing the cost of production. This would increase the milk receipts per cow from \$25 to \$50 per year. Some herds are already overfed for profitability, but they are nearly all high producers by breeding. The studies of the cost of milk production referred to, show that it does not pay to feed cows at a cost of much over \$100 per year, but it is well known that two men may feed equally good cows at the same cost and yet get wonderfully different results both in milk yield and cost of production. Cows seem to differ also in the persistency with which they will milk, but we are



From Scrub to a Three-quarter Blood Cow.

The cow at the top is a scrub; the centre cow is a half-blood Holstein, and the bottom cow is a three-quarter blood.

convinced that the reason many cows fall down towards the latter end of the lactation period is because they are either being improperly or insufficiently fed or because they have not been fitted for a long period of milking. There is a common saying to the effect that a bag of meal before calving is worth two bags after calving, and in the case of an animal that is capable of producing well if properly handled, neglect of proper fitting is bound to result in a lower production than the cow is capable of. Many cows are qualified by breeding and milking ability to perform much better than they are ever made to do because their possibilities are not developing by the necessary feeding.

The influence of environment and breeding in increasing dairy production has been studied for ten years at the Iowa Experiment Station. These investigations were based on the fact that owing to the large amount of capital necessary to secure a herd of pure-breds, only a small percentage of farmers will have herds of this kind, notwithstanding a common desire for improvement. Most of the dairy products of the country come from grade herds and in improving such herds the problem is to decide whether to grade-up from the cattle already in the herd or to buy in better cattle from time to time. Commenting on this situation the authors of the bulletin in which these results are published say: "Everyone knows that a good dairy herd can be bought, but many have found that this method is not only

expensive, if really good cows are secured, but also hazardous, due to the liability of introducing disease. Many also buy up a herd before they learn from experience that proper feed and management must be given to the animals. The question of greatest importance and one frequently asked is 'Can such a herd be produced from a foundation of common cows where the initial expense is the price of a good pure-bred dairy sire?' It is important that this question be answered satisfactorily and with assurance of final success and also of a reasonable income from the heifers resulting from the mating with the first pure-bred sire, before many farmers will attempt to build up efficient and economical herds, using as the foundation, the cows they already own."

The work in Iowa was begun in 1907 and while still in progress has been reported on up to August, 1918. The scrub cattle used as a beginning "were very inferior individuals, being small, of exceptionally limited abdominal, udder and mammary vein development and exceedingly unprepossessing as far as quality and top lines were concerned. Available records showed that no pure-bred bulls had previously been used in the section of Arizona from which they were secured. The environment was not suited to the stimulation of heavy milk production as the cattle received little if any, grain or concentrates, being forced to subsist on the rather scanty supply of grass and hay available." At Iowa, pure-bred Guernsey Holstein and Jersey sires were used on these scrubs and all were given the same care and attention as was received by the pure-bred dairy herd. Moreover, it should be noted that the records throughout the experiment used in comparing scrubs, half-blood and three-quarter bred cows were all calculated on the mature basis, taking the following percentages of mature production as applying to heifers of different ages:

Age	% Mature Production
Yearlings.....	70
Two-year-olds.....	80
Three-year-olds.....	85
Four-year-olds.....	95

The influence of environment, (feed, care and housing) referred to above, was quite marked. Five out of seven cows of producing age when purchased were mature and the other two were four years old. An increase of 10 per cent. in milk and 8 per cent. in fat was expected of the latter at maturity, but under improved conditions the increase actually secured was 59 per cent. in milk and 54 per cent. in fat, although at even this they only produced at seven years of age 4,907.7 pounds milk 229.91 pounds fat. After seven years of age the decrease in production was quite noticeable. The cows that were mature at the beginning decreased in production in spite of good care and feed. Four yearling scrub heifers had also been purchased and by comparing the production of those that came to the station mature, with the mature production of those that came at four years of age and with those that came before first freshening, it was found that the cows receiving good care and treatment from before first freshening produced 27 per cent. more milk and 24 per cent. more fat than those that did not get good treatment until they were mature, while those that got good treatment after they were four years old produced 14 per cent. more milk and 8 per cent. more fat than those that came to the station when mature. This shows clearly "that the younger an animal is when subjected to good treatment, the greater is its response."

This point is further brought out by the behavior of three scrub calves. Two of these were dropped by cows that were mature when purchased while the third was out of a four-year-old cow. The calf out of the four-year-old cow did not produce when mature any more than her dam, except an increase of 6 per cent. in fat, which was counterbalanced by a decrease of 4 per cent. in milk. The other two averaged 44 per cent. more milk and 26 per cent. more fat than their dams. This result can only be attributed to liberal feeding of the heifers before producing age was reached.

INFLUENCE OF PURE-BRED SIRE.

A notable tribute to the influence of a pure-bred sire is developed by the result of ten years work in grading up from these scrub cows. As mentioned before, pure-bred Holstein, Guernsey and Jersey sires were used. With regard to these and the results secured through two generations of improvement, we read:

"The pure-bred sires used were with one exception the herd bulls in use at the college dairy farm where pure-bred herds of the different breeds are maintained. None of these sires were purchased at high prices, although they were well bred for type and yearly production. Young bulls of equal breeding are available for nominal prices, prices so reasonable that the man who milks cannot afford to use a scrub bull, however, cheaply he may be purchased. All the first generation grades sired by pure-bred Holstein bulls showed an increase over their dams in production. On the average it was an increase of 90 per cent. in milk and 59 per cent. in fat production. In the case of the first generation Guernsey grades, an even wider variation was found, but on the average the increase was 13 per cent. in milk and 39 per cent. in fat production. The Jersey grades showed an increase in fat over their dams in every case and an increase in milk in every case but one, while the average increase was 24 per cent. in milk and 39 per cent. in fat production. The grades of the first generation when taken as a group showed an increase of 39 per cent. in milk and 35 per cent. in fat production.