

foolish It would be for a tractor company to guarantee its tractors to pull the same number of plows "anywhere."

What the tractor buyer should do always is to match up his soil conditions with the drawbar pull of the tractors he has under consideration and calculate definitely how many plows he can expect the tractor to pull in his soil, and at the depth he wishes to plow.

To figure the number of plow bottoms with the above table is simple. Suppose a man is considering the purchase of an 8-16 tractor, which has a drawbar rating of 1,500 pounds at a two-mile speed. Suppose the most difficult plowing this man would ever have upon his farm is in clover sod, which requires a draft of 7 pounds per square inch in furrow cross section. Plowing 6 inches deep, a 14-inch plow bottom has a total of 84 square inches, and at 7 pounds per square inch, the total pull required for a plow bottom is 588 pounds. Dividing the drawbar pull of the tractor, or 1,500 pounds, by 588 pounds, we find that this tractor will pull approximately 2.5 plow bottoms. Thus

$$\frac{1,500 \text{ (Tractor drawbar pull)}}{\frac{14 \text{ (size of plow)} \times \frac{6 \text{ (depth of plowing)}}{12} \times \frac{7 \text{ (draft per square in.)}}{12}} = 2.5 \text{ (the number of plows to be pulled)}$$

According to the above calculations, this 8-16 tractor can safely be depended upon to pull two 14-inch plows in clover sod of average soil texture.

If every tractor buyer will take these various factors into consideration when he goes to market for a tractor, he will be safeguarding himself against dissatisfaction later.

Removing Carbon From Motor.

1. Will coal oil remove the carbon from a motor, the motor being turned over by hand several times after the oil is introduced?

2. What is the best way to remove the carbon?

J. S. E.

Ans.—1. No. Coal oil will not remove carbon, at least I have never been able to make it do so, although I have tried it often and carefully.

2. The best way to remove carbon from a motor! During three years' experience I have tried every way that I know of. Let me tell you about them before answering your question.

The first time the carbon became bad I took the motor all apart (it had no removable head), and scraped the pistons, the tops of the cylinders, the valves, and the firing chambers, and then put the engine together again. It took all day to do it, and required an assistant or two when returning the cylinders to place on the bed. I have never made that mistake since.

I next made a set of scrapers to use through the holes in which the valve caps are screwed. I have learned since that scrapers better than homemade ones can be bought for a small amount, three in a set, all of different shapes, enabling one to scrape all parts. With these the carbon can be thoroughly loosened and then by removing the exhaust valve, having the piston at the top of the compression stroke, inserting the nozzle of the foot pump in the top of the cylinder and then working the pump, the loose carbon can be blown out through the exhaust port into the exhaust manifold, whence it is driven out through the muffler when the engine is started. By doing this carefully I have obtained just as good results as when I tore the engine down. The whole operation on a four-cylinder engine can be done in from one to two hours. Some motors do not lend themselves to this method because of smallness or absence of valve caps.

But even this method is laborious and wearying, particularly in hot weather, and more especially if the engine be a little warm. To avoid this I tried having the carbon burned out by oxygen at some of the garages. The results were not as good as by either of the preceding methods.

Next time I began trying "carbon removers" (?), beginning with coal oil. The results with this were nil. I then tried several different kinds of "removers" obtained from supply houses, following the directions very carefully and faithfully in all cases, but to no avail for some time. At last I hit upon one which actually does remove carbon, and it makes a better job than any of the former methods, and with practically no work. After using it I have taken the valve caps out and examined the firing chambers, valves, valve seats, valvestems, pistons and cylinders, finding them just as clean as when the engine was new. Before starting to use this, the tappets were frequently noisy and required adjusting, and sometimes the valves needed grinding. The remover has not only taken out the carbon, but has averted any further noises or adjusting of tappets or grinding of valves, and the car has run 4,000 miles since beginning to use it, which indicates that one cause of noisy tappets is the deposit of carbon on the valve, valve seat or valve stem. I now use a little of the remover every 500 to 1,000 miles, not only to remove any carbon that may have formed, but to tone up the engine. The name of this elixir is Johnson's Carbon Remover. I have never paid sufficient attention to the label to remember where it is manufactured, but it may be obtained through most dealers.

Best results are attained by treating one cylinder at a time, and that when the piston is at the top of the compression stroke, for at that time both valves are closed tight and the liquid is not wasted by running out through them. It may be either poured in through the priming cup (if any) or through the valve cap port. The method I like best is to use an oil gun with crooked nozzle so that the liquid can be sprayed over all the

parts that may be carbonized. If it is poured in, then after the engine has stood for a while with piston at top it should be turned over a few times by the crank or starter so as to wet any carbonized surfaces not already wet. Then the motor should stand two hours or more before using. Another advantage of treating one cylinder at a time is that the engine is easily started, whereas if the four are treated at once it is hard to start.

If the valve cap be taken out a couple of hours after the use of the remover the carbon on the lower surface will be found loosened up in large scales. To look at them one would fear that they would be injurious to the engine, but on touching them he discovers that they are soft and break down almost as velvety as soot. When the engine is started the carbon is blown out through the muffler in a black powder.

Now to answer query No. 2: Judging by my experience, the best way to remove carbon is to use Johnson's Carbon Remover.

While working on the carbon question I was also striving to improve the mileage. The car was a four cylinder weighing 3,000 pounds, and in a test over 1,500 miles on dry roads in warm weather gave only 12.9 miles per gallon. A slight alteration of the carburetor, followed by fine adjustment, which could not be made before the alteration, brought the mileage up to an average of 17.6 miles per gallon. This was the best average that could be obtained from manipulating the carburetor. I next installed an independent air feed in the intake manifold above the carburetor, being a valve controlled by a lever fastened to the steering post, and by using which freely the mileage was again raised, this time up to an average of 21.2 miles per gallon on the same kind of roads in the same kind of weather. Incidentally, the perfect combustion thus obtained has reduced the carbon trouble to a minimum.

A recent issue of the Advocate contained an article by "Auto" on the saving of gasoline in the present crisis of the fuel situation. The above experience indicates how easy it is to waste gasoline by improper mixture. On my original adjustment it took 77.5 gallons to run 1,000 miles, now it takes only 47.2, showing a clear saving of slightly over 30 gallons per 1,000 miles. And this again illustrates the importance of keeping a record of every tankful of gasoline and the mileage obtained from it. By doing so one is able to tell whether his car is giving the results it should, and if not, to overcome the difficulty.

W. H. DAY.

THE DAIRY.

Characteristics of Feeds Used in Rations for Dairy Cows.

A good deal of investigation work has been done by the various experiment stations in an endeavor to secure facts relative to the actual feeding value of the various feeds which are ordinarily fed to the dairy herd. The price of the feeds, together with their digestibility, palatability and nutritive value must necessarily be considered when making up a ration. The proteins of the feeds enter largely into the formation of lean flesh, muscle, blood and the composition of milk. They are absolutely essential to life itself in the animal, and their place cannot be taken by the other constituents of the feeds. The carbohydrates are the starches, sugars and fibres which supply heat and energy to the body and are the source of fat. The fats in the various feeds play the same part in the process of nutrition as the carbohydrates. The ash is necessary to the formation of bone and a considerable quantity is found in milk. The various constituents must be combined in definite proportions in order that the animal may make best use of them and thrive. There are a number of feeding standards which serve as guides in making up a ration. In Bulletin 253 on "Dairy Cattle," by Messrs. Leitch, King and Sackville, of the Animal Husbandry Department, Ontario Agricultural College, a good deal of valuable information is compiled relative to feeding standards, characteristics of feeds, preparation of feeds, and the care and management of the herd. In formulating a ration it is pointed out that a cow should have approximately one

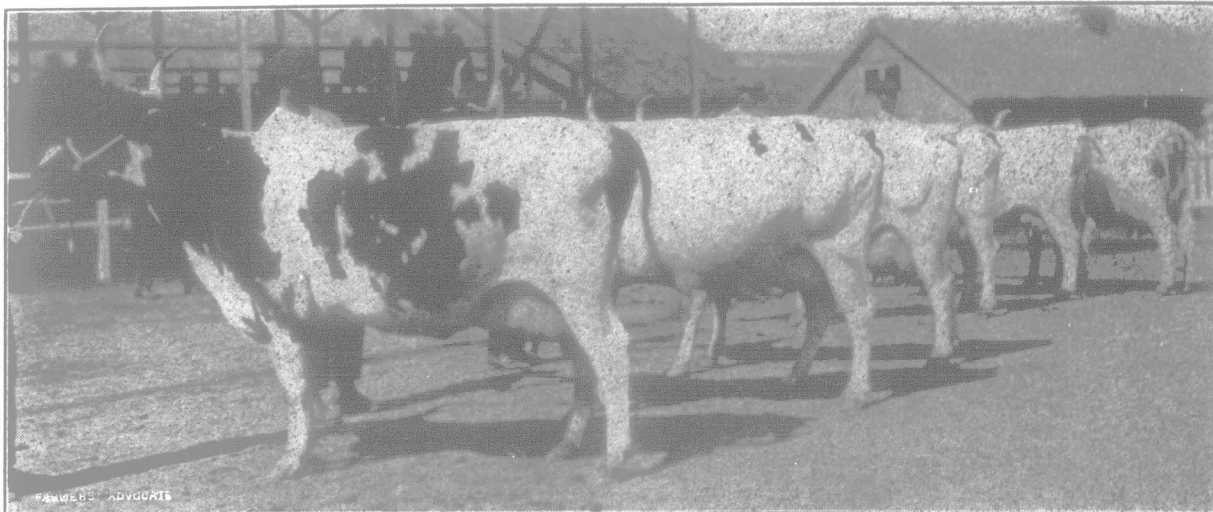
pound of dry roughage, as hay, straw, etc., and three pounds of silage for each one hundred pounds of live weight. Where silage and roots are not available the roughage should be increased to two pounds, and then to bring the ration up to standard the concentrates or grain should be fed at the rate of about one pound for each three to five pounds of milk produced, depending on the quality; the richer the milk the more grain. In order to formulate a ration with the various feeds on hand, it is necessary to know the composition and the digestible nutrients in the various feeds. The following table is a ration made up of corn silage, clover hay, oat straw, bran, oats and oil meal, which comes very close to the standard for a 1,100-pound cow giving around twenty-five pounds of four per cent. milk per day:

Feed	Lbs. dry matter	Dig. protein	Dig. fat & carbohydrates	Nutritive ratio
Silage, 35 lbs.....	9.21	.39	5.18	
Clover hay, 12 lbs.....	10.45	.91	5.21	
Bran, 3 lbs.....	2.70	.38	1.45	
Oats, 3 lbs.....	2.72	.28	1.82	
Oil meal, 1½ lbs.....	1.36	.45	.72	
Total.....	26.44	2.41	15.01	1:6:2
Standard.....	25.40	2.35	15	1:6:3

These common feeds used in the proportions above mentioned come about as near to the standard as it is possible to combine that number of feeds.

The individuality of cows must be considered, and considerable judgment must be exercised when applying feeding standards to actual practice. The authors of the bulletin state that it is possible to figure rations that are mathematically correct, but the ability of the individual cows to make the best use of their feed cannot be mathematically figured. This must be determined by the observations and judgment of the feeder. It is, also, not practicable to figure out rations for each individual cow in the herd according to the standard. The proper way to use the standard is to make up mixtures of the different concentrates according to standard for an average cow of the herd and feed this mixture in proportion to the daily milk yield of the individual cows, and then give each cow all she will eat of the different roughages, in about the proportions the standards recommend. Some feeds which contain a fairly high percentage of digestible nutrients use up more of the animal's energy in digestion work than others of like analysis. The energy used must come from the food, so that a pound of carbohydrates in straw is not as valuable as the same weight in concentrates. The palatability and digestibility must be taken into consideration. Another point is variety. Better results are usually obtained on a variety of feeds than on a ration made up of one or two.

Certain home-grown feeds as well as purchased concentrates vary considerably in their value as feeds for dairy cows. Information given in the bulletin relative to the characteristics of a number of the feeds is to the effect that corn, while comparatively low in protein, is extremely rich in easily-digestible carbohydrates and fat. However, on account of its low protein content and heavy nature it cannot advisedly be used to form more than one-half the grain ration. It should be combined with a coarser concentrate and it has a higher value for milk production when fed with clover hay and silage than if the clover is displaced by timothy. Barley is a grain grown on many farms, and it is claimed that it will give equally good results as oats when fed as half the grain ration with bran. It is somewhat of a heavy nature when ground and has a tendency to produce heat in the animal body; consequently, it is not wise to feed it previous to or immediately after freshening. Wheat is usually too high priced to feed in any quantity for milk production. However, it has feeding value equal to corn for the production of milk and fat. Oats occupy a commanding position as a feed for dairy cattle of all ages. They contain a larger proportion of protein than any other farm-grown grain except peas. The large proportion of hull adds lightness and bulk, so desirable in rations for producing milk, and they



Class of Ayrshire Cows in Milk at Canadian National.