

and finally for use in building up new tissues, repairing body waste, supplying energy for digestion and for work. Thus, the growing colt and work horse require more feed than does the mature idle horse. Crude protein, carbohydrates and fat are the generally recognized nutrients or feed constituents which aid in the support of life. If the best results would be obtained it is necessary that these nutrients bear a certain relationship to each other. A growing animal requires a feed containing a higher percentage of protein, the substance which builds and repairs tissue, than does the mature horse. Likewise a horse performing heavy work must receive more energy producing nutrients than an idle horse. To meet these requirements, feeds can be combined in certain proportions so as to constitute what is known as a balanced ration, or the amount of each nutrient necessary to nourish the animal properly without excess of any one. The idle horse can be wintered on approximately a maintenance ration, but the work horse requires feeding in accordance with the extent of work he performs.

Horses require exercise during the winter, and on many farms this is given in the form of work. One team is taken to town to-day, the other team is used for drawing manure the next day, etc. This gives irregular exercise but necessitates that both teams be more or less hardened to endure the strain put upon them. In reality the four horses must be fed a production ration when doing a minimum amount of work. Under this system it is more difficult and much more expensive wintering horses than if one team is working regularly and the other allowed to run in the yard for exercise. Regular work, or exercise, and regular feeding are essential in keeping horses healthy and in proper condition. It is the spasmodic work without proper preparation that keeps many horses thin and their coats harsh during the winter, when the feed is sufficient to fatten them. If there is not work enough to keep all the horses busy, then feed one team for work and use them all the time. The other team can be kept in good condition very cheaply, and for exercise turn them in the yard for several hours every day. It will be greater kindness to both teams than working them irregularly, and the feed bill will be greatly reduced.

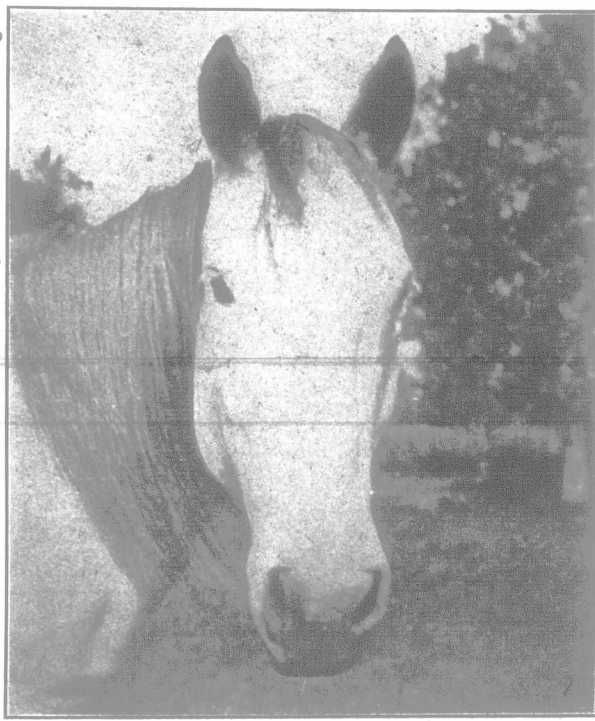
When feeding horses the capacity of the digestive organs must be considered. The stomach of a horse holds about nineteen quarts, whereas the four stomachs of a mature cattle beast have a capacity for about 266 quarts. The ruminant can digest roughage to much better advantage than can the horse. It is in the stomach where feed is softened and prepared for further digestion and absorption in the intestines. The horse is so constituted that it cannot digest properly a large quantity of roughage at once. Many feeders fail to realize this and pile the manger full of hay three times a day. In fact, we have been in stables where it was considered that horses should always have something to pick at. Some horses continue to eat if feed is before them, but sooner or later they are subject to disorders of the system. Heavy feeders of hay are literally killing their horses with kindness. It is much better for the horse not to be continually eating when in the stable. It has been estimated that one pound of hay to each 100 pounds weight is sufficient for a work horse. A rule followed by some is to feed what will be cleaned up in one and one-half hours. For heavy work less roughage and more concentrates should be fed than for light work.

Idle horses will maintain their weight on hay and straw, but there is a limit to the amount of hay necessary. Seven pounds of digestible nutrients per 1,000 pounds weight with exercise by walking or running in the yard, will maintain the horse. About one pound of this material must be digestible proteins, the remainder carbohydrates and fat.

Fibrous feed is more difficult for the horse to digest than it is for the ruminant. Nevertheless, a certain amount of it must enter into the ration. It seems necessary to the health of the animal. Oats are the most satisfactory grain for horses, but they will not live and thrive on oats alone as satisfactorily as on good meadow hay alone. Fifteen pounds of clover and timothy hay per day, mixed, give 13.1 pounds dry matter; .6 pounds protein; 5.9 pounds carbohydrates, and .16 pounds fat, or sufficient protein for maintenance but barely enough carbohydrates. An addition of 5 pounds of oat straw or a couple of pounds of hay would give a ration on which an idle horse could winter. Hay was a bountiful crop this year, while grain was light. Hay will suffice for idle mature horses, and the grain can be diverted into other channels. The point to remember is that it is possible to over feed on hay. If desirous of feeding more straw and a few roots, the following ration has been tried and proven satisfactory, the horse gaining a little during the winter. For a 1,200-pound horse 12 pounds each of turnips, oat straw and mixed hay were fed. Last winter hay was scarce but grain was more plentiful. One man wintered a number of horses and kept them healthy on a daily ration of four quarts of oats, six pounds of silage and what cut straw they required. During the day they had the run of a yard and a sod field. If ten pounds of cut straw were eaten each horse would consume 13.48 pounds of dry matter, of which 8.03 pounds were digestible, .52 pound being protein. Thus it will be seen that, theoretically, the horses should gain a little although the protein required to maintain the system was just on the margin. If the horses had been subjected to work occasionally, they could not have been wintered so

cheaply. Bearing in mind that an idle horse requires 7 pounds of digestible nutrients per 1,000 pounds of weight, and that from one-half to one pound must be protein, rations can be figured out, using other feeds, by consulting the table on another page of this issue.

The horses that are required to do all the winter teaming must be fed a quantity of concentrates. The standard for a horse doing medium work is 24 pounds dry matter containing about 2 pounds of digestible protein; 11 pounds carbohydrates, and .6 pounds of fat. The dry matter and carbohydrates can be secured in 10 pounds of oats, 2½ pounds bran and 15 pounds straw. However, it is one-half pound short in protein, and a trifle lacking in fat. By adding two pounds of linseed meal to the ration, the protein and fat would be brought up to standard. A number of horses have done the ordinary farm work during winter on the feeds mentioned and looked well in the spring. Hay was scarce, which necessitated feeding straw and bran. A standard serves as a guide and few feeders follow it to the letter, but where any one nutrient surpasses or falls short of it to any appreciable extent, some part of the feed is wasted. A good ration for a partly idle horse, weighing



Here to Stay.

ing 1,500 lbs., is clover hay 10 lbs.; cut straw, 15 lbs.; bran, 5 or 6 lbs.; oats, 3 lbs. A few roots could profitably be added to this.

Oats are the best all-round grain and the safest for horses, and timothy has been the recognized hay, although of recent years clover and alfalfa are being more generally used with satisfactory results. Corn is used considerably, and of the various grains comes second to oats for horses. When fed, some nitrogenous substance, as bran, linseed meal, or legume hay should also be given. Corn and timothy hay make a poor combination. Barley may be fed in small quantities. The price of wheat generally prohibits its use as horse feed, but even if it were low in price it is not a good grain for horses, as it has a tendency to cause digestive troubles and skin eruptions. Bran is a splendid feed to combine in the ration, and linseed meal is an excellent nitrogenous feed which can be profitably used to increase the protein content. Bran is particularly useful to feed prior to and on a holiday. It is bulky, slightly laxative, and appears to keep the system right. Very often some feed grown on the farm can be used in small quantities to substitute the usual ration. The horse subjected to hard work requires a ration heavy in concentrates. Trotting the horse increases the demand on his system, consequently more grain and less roughage are necessary. It is believed that more horses are injured by overfeeding on roughages than by underfeeding. A saving in the feed bill can be made this winter by keeping only the necessary number of horses in condition for work and allowing the remainder of the mature horses to rough it.

Growing colts are different from idle mature horses. They require heavier feeding, as the system must be maintained and an increase in size made. Bone and muscle are of great importance, and feeds which tend to produce these should be chosen. Oats, legume hay, bran, and linseed meal are good. In Henry's "Feeds and Feeding," the results of several feeding experiments are given. The first winter heavy draft colts were fed 5.8 lbs. daily of a mixture of 5 or 6 lbs. shelled corn, 3 of oats, 2 of bran, and one of linseed meal, and 10½ lbs. hay; the daily gain for the winter was 1.45 lbs. The second winter 9 pounds of grain and 17 of hay were fed, and the gain was 1.3 lbs. Some feed silage to colts and mature horses and find they do very well on it. However, there is a certain risk as mould in corn has a tendency to cause disease in horses. The death of a number of horses has been attributed to this cause. Good, sweet silage, free from mould, may be all right if carefully fed. By use of the table giving the digestible nutrients, figure out a ration, using the feeds on hand,

that comes somewhere near the standard. The standard is merely a guide, common sense must also be used in feeding stock.

Great Britain's Horse Supplies.

Col. H. H. Mulliner, writing in *The Field*, gives some very interesting data and forecasts regarding the horse supplies necessary for the British Army. He goes into some details of the method of bonusing keepers of army horses before the war, showing it to be inadequate. The horse was gradually disappearing from the streets of Old London previous to the conflict. Germany's long-headed agents had purchased 60,000 of these horses. At the same time many army units whose requirements averaged officially 200 to 300 horses were "obliged to content themselves with the occasional use of ten or a dozen. Of the requisite peace establishment of 51,303 horses, 1,275 was the sum total possessed by the Territorials at the outbreak of the war."

At the outbreak of the war Army horses possessed by the War Office numbered only 25,000 in Great Britain. It has been necessary to buy over three-quarters of a million.

Readers will be especially interested in what Colonel Mulliner says of horse prospects and the Army after the war. Remember he is speaking of Britain and from his article we quote.

"As regards what may be termed civilian requirements, horses are a necessity for farming and other purposes where there are few or no roads. Hunting and polo must also be remembered, but with such exceptions, there is hardly a purpose for which horses have been used in the past which is not capable of being fulfilled by motor traction. Until recently a considerable number of people in this country not only preferred horses, but were hostile to the mechanical element. Such prejudices, however, are now fast disappearing. Since the war, many business firms have had perforce to introduce motor traction. It may prove also that the ever-increasing number of those working in the various munition factories will have a marked effect in developing an enhanced taste for mechanics. That similar competition between horse and motor traction is also taking place in other countries is obvious; but the comparatively small area of Great Britain and the good roads which will soon exist in almost every district make it probable, unless steps are taken to counteract the tendency, that our horses will be superseded sooner and to a larger extent than in any other country.

"As regards military requirements, the enormous demand in every zone of our operations is an all-sufficient proof that the horse still remains an absolute necessity in modern warfare. It must also be remembered that in those parts of France and Belgium which are the principal scenes of our present activities, more roads exist than in perhaps any other part of the world. It has been possible, therefore, to utilise motor traction there to its utmost limits. In a future war these conditions may be different and our armies consequently might demand horses in even greater numbers.

"Again, Cavalry in this war has not so far played such an important part as it may be called upon to do in the future. The already fabulous amount of field ammunition utilised in actual warfare will probably continue to increase, and horse or mule traction must remain virtually the only means of supply to the front lines. Everything, in fact, points to the belief that, although it is obvious in the event of a future war that any shortage in the immediate supply of horses would seriously handicap us as compared with other nations, even if it did not prove disastrous, it is equally clear unless adequate steps are taken to retain horses in this country that such a result must inevitably occur.

From the point of view of the civilian, at all events for business purposes, the competition between horse and motor traction is chiefly a question of finance. When speed is the object, for long distances and on good roads, the horse cannot compete with mechanical traction. But, after all, the greater part of trade requirements is to be found in towns. With short distances and long waits, the position is at once changed and the comparative cost, both of running and working, becomes an increasingly important factor. For such purposes the horse may prove the cheaper, and the greater the difference in cost becomes the less inducement there is to adopt motor traction. The initial cost of a motor car is considerable, and the capital thus absorbed could doubtless be put to good use by business firms in other directions. A scheme providing horses both for trades and farming which involved no preliminary outlay to the user would obviously go very far to insure the retention of the horse for many ordinary purposes.

Army Requirements.

"The minimum number of horses which must be kept with the standing Army in time of peace depends entirely upon the speed with which the balance, fit for immediate use, can be obtained on mobilization. For example, if a large proportion of the balance could be obtained, say, in forty-eight hours, then the number to be kept could be reduced to a minimum, namely, the comparatively few required merely for training and drilling. If, however, three months had to elapse before any considerable additional number could be obtained, far more must of necessity be kept permanently with the Army, the