Forage for Military Purposes: Lecture II

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GENERAL SIR C. P. BEAUCHAMP WALKER, K.C.B., Vice-President, in the Chair.

FORAGE FOR MILITARY PURPOSES.

LECTURE II.

By GEORGE FLEMING, C.B., LL.D., F.R.C.V.S., Principal Veterinary Surgeon of the Army.

In the last lecture which I had the honour and the privilege of delivering before you on "Forage for Military Purposes," I dealt more especially with the different kinds of forage in use in the various armies abroad, the concentrated foods which have been proposed or used from time to time, and the forage which, after all, has been found best adapted for active service, *i.e.*, that which has been compressed. I dwelt strongly on the necessity for the forage used in the field being that to which the horses have been accustomed, and pointed out the inconvenience, oftentimes danger, in suddenly changing from one kind to another, particularly when horses are undergoing severe exertion, and are exposed to the weather. I showed that concentrated, or specially prepared, and what might be termed "artificial food," was not suitable for horses during war, and that quantity as well as quality was necessary in order to meet physiological demands. Much experimental investigation, no less than every day's practical experience, has demonstrated that concentrations and essences, though useful in the hospital stables, are of little value in sustaining the energies of healthy, hard-working horses; and that bulk is an important factor in allaying the pangs of hunger, and producing that contentment and satisfaction which leads to good digestion, and restoration to the system of that which has been expended in exertion.

The natural food of the horse, in Western countries at least, and which is oats and hay, appears to be sufficiently concentrated; and as it forms the staple aliment all the year round, it is that which should, whenever possible, be allowed on active service. The only preparation it needs—always premising, of course, that the quality is good—is that which best adapts it for conveyance, keeping, and ready issue, without waste either in transport or during consumption. And I ventured to insist upon this preparation being limited to crushing the grain, so as to render it easier of mastication (a great benefit to a

tired horse), and more readily and completely digested (a *desideratum* when the organism is fatigued, and assimilation is consequently weakened); while its being firmly compressed into cakes of a certain weight renders its transport an easy and economical matter, its preservation for long periods, even when exposed to the weather, certain, and its distribution very simple.

The same was said with regard to the hay, which, next to the grain, is so necessary as an article of food. In the field, long hay, even when compressed into compact trusses, is troublesome, and not economical. It is easily damaged by the weather, there is much waste in distribution, and still more in feeding it to the horses when they are on picket lines, and especially when the weather is wet or windy; as then it is either trodden into the mud or blown away. In order to economize space in transport, render it capable of being kept for an indefinite period, readily issued, and easily consumed by the horses without waste, I remarked that it might be "chopped" or cut into short pieces, firmly compressed into cakes of a given weight, and—as with the grain cakes—a certain number of these packed into bales. The grain and hay could be given to the horses, mixed, in a convenient-sized nosebag, and thus all waste would be avoided; while mastication being made so much easier and quicker, the horses would have more time for rest.

Other advantages attending the provision of this kind of portable forage I alluded to, and among them I included that of a smaller quantity of this food being equivalent to the ration of ordinary forage, *i.e.*, uncrushed grain eaten out of the present pattern of nosebag, and long hay eaten off the ground. The diminution might be fixed at a pound, or at least half a pound, per ration. But this matter of ration leads to the consideration of the lecture of to-day, which is intended to deal with the allowance of forage necessary to maintain troop horses in a fit state of health and vigour, so as to meet the requirements of service, either in garrison or the field. On active service, more especially, is this an important matter, as it is absolutely necessary that horses should be kept in the highest state of efficiency, and ready for the severest and most prolonged trials, or the most sudden emergencies; while, at the same time, there may be grave difficulties to be contended with in procuring an adequate supply of forage for this purpose.

The question as to what amount of forage should constitute a suitable ration for military horses is not so easily dealt with as might be imagined, for in discussing it several circumstances have to be taken into account—such as the size of the horses; the season of the year and the climate; the work the horses have to undergo; whether they are protected from, or exposed to the weather; whether they are accustomed to privations; or have been regularly and well fed, &c.

Of course, a certain amount of food must be allowed horses to maintain them in health, even when they do not perform any work; but beyond this allowance there must be an increase in proportion to the energy expended in exertion, though this can only be up to a certain point; for if, this expenditure becomes greater than the

system can sustain, then an unlimited quantity of food, even though it be of the most nutritious kind, will not enable them to withstand the strain upon the vital functions.

It might, therefore, be laid down as an axiom, and, indeed, it is generally so recognized, that the quantity of food beyond a certain allowance for what has been well termed "internal" work, and which should be proportionate to the size of the animals, should be sufficient to meet the demands of "external" work and the special circumstances in which troop horses may be placed. In our army, there is a uniformity in this matter which reduces the question of feeding to the greatest simplicity, though it must be confessed that it is scarcely in harmony with reason or experience. The forage ration is never varied all the year round, no matter how young or how old the animals are, how heavy or how light the work may be (with one or two exceptions to be presently mentioned); and large horses weighing 1,200 or 1,400 lbs. receive the same quantity as those weighing 800 lbs. This ration is, as you are aware:—

If in quarters, oats 10 lbs., hay 12 lbs., straw 8 lbs.

If in encampments, oats 12 lbs., hay 12 lbs.

If employed on draught work, 2 lbs. oats extra.

The extra issue is allowed to horses of the Army Service Corps drawing wagons at a trot; and during the winter months only, for all other draught horses when employed on continuous draught work for a period of at least five hours a day.

An extra issue of 2 lbs. of oats, in addition to the ordinary ration in quarters or in encampments, is allowed to draught horses of the Army Service Corps when these are 16 hands high and upwards.

In Continental Armies, the allowance of forage is systematically adjusted to the size of all the horses and the nature of their work.

In the German Army, for instance, there are four scales of forage rations, the difference between them consisting chiefly in the amount of oats. There is, first, the heavy ration, which consists of 11 lbs. 7½ ozs. of oats; second, the ration for Light Cavalry of the Guard, which is 10 lbs. 15 ozs.; third, the medium ration, which is 10 lbs. 11½ ozs.; and fourth, the light ration, which is only 9 lbs. 13½ ozs.

The allowance of hay is 5 lbs. 7½ ozs., and of straw 7 lbs. 10½ ozs.

These rations are issued as follows:—

The heavy ration is allowed to horses of General Officers, the General Staff, Adjutants, Officers of the War Ministry, Cuirassier and Guard Lancer Regiments, Military Riding School, Guard Horse Artillery and Field Officers of Guard Field Artillery, all Artillery draught horses, those of the Gendarmerie and Intendance, and Transport draught horses. Troop horses of the Gardes du Corps Regiment receive at all times 1 lb. 1½ ozs. of oats, and 3 lbs. 4½ ozs. of hay extra.

The second scale is given to the Light Cavalry of the Guard, Guard Dragoons, and Guard Hussars.

The medium ration is for the lancer regiments of the line.

The light ration is for all other troops and the horses of Officers not specified.

The above are termed the "Garrison Rations," and are only drawn for horses on the strength; the three or four extra horses in each squadron, battery, and company of Transport have to be fed on what can be saved from the forage of the others. It is not compulsory to give the horses their full rations daily, but a portion may be reserved for times when work is heavier than usual.

On the line of march the ration is increased as follows:—

Heavy ration to 13 lbs. $3\frac{3}{4}$ ozs. oats.

Light Guard Cavalry ration to 11 lbs. $7\frac{3}{4}$ ozs. oats.

Medium ration to 11 lbs. $4\frac{1}{4}$ ozs. oats.

Light ration to 10 lbs. $6\frac{1}{4}$ ozs. oats.

The heavy ration of oats is accompanied by 3 lbs. $4\frac{9}{16}$ ozs. each of hay and straw for feeding; the other rations having 3 lbs. 4 ozs. of hay, and 3 lbs. $13\frac{1}{4}$ ozs. of straw for the same purposes, as litter is provided in the billets.

In the field this ration is increased all round by $8\frac{3}{4}$ ozs. of oats, each horse then carrying what is called "the iron ration of oats"—nearly 14 lbs. the heavy ration, over 12 lbs. the second, 11 lbs. 13 ozs. the third, and 11 lbs. 1 oz. the light ration.

During railway transport, each horse is allowed 3 lbs. $4\frac{1}{2}$ ozs. of hay, and 2 lbs. 3 ozs. of straw to lay on the floor and ramp of the wagon. If the journey lasts longer than eight hours, 6 lbs. 9 ozs. of hay is allowed extra for every twenty-four hours.

During Army Corps manœuvres and Cavalry Division exercises for a period of four weeks, the following rations are allowed:—

For Cuirassiers or Horse Artillery draught horses, 12 lbs. $14\frac{1}{2}$ ozs. oats.

For other line cavalry regiments and horse artillery riding horses, 11 lbs. $7\frac{3}{4}$ ozs. oats.

As on the march, 3 lbs. 4 ozs. of hay and 3 lbs. $13\frac{1}{4}$ ozs. of straw are allowed.

Three-year-old remounts at the Remount Dépôts receive:—

Oats, 6 lbs. 9 ozs.

Hay, 10 lbs. 15 ozs.

Straw, 13 lbs. 2 ozs.

For three or four months of the year they are put on green food, but the transition to and from this is gradual.

In the French Army there is a similar gradation in the scale of forage ration, according to the arm of the Service and the kind of work performed. The light cavalry (infantry Officers' horses are included in this category) allowance per horse per diem is—oats about $8\frac{3}{4}$ lbs., hay $8\frac{3}{4}$ lbs., straw $5\frac{3}{4}$ lbs. in garrison; on the march it is 10 lbs. oats, with the same quantity of hay and straw as in garrison; at manœuvres, if the horses are in barracks they receive the same ration of oats as in garrison, with $6\frac{3}{4}$ lbs. hay and about 9 lbs. straw, but if in bivouac then the ration is the same as for the march; while

on a war footing it is $10\frac{3}{4}$ lbs. oats, $6\frac{3}{4}$ lbs. hay, and $4\frac{3}{4}$ lbs. straw. The line cavalry (the horses of engineer and infantry Officers are on this scale) receive in garrison 10 lbs. oats, $6\frac{3}{4}$ lbs. of hay, and 9 lbs. straw; on the march $11\frac{3}{4}$ lbs. oats, and 11 lbs. hay and straw; at manœuvres, if in barracks the ration is the same as in garrison, if in bivouac it is as on the line of march; while on a war footing it is nearly 11 lbs. oats, 9 lbs. hay, and $4\frac{1}{2}$ lbs. straw. The reserve cavalry includes the horses of the Staff, Intendance, Staff of Artillery, and of Engineers, and Auxiliary Transport. The ration in garrison is—oats $11\frac{1}{4}$ lbs., hay 9 lbs., straw 9 lbs.; on the march it is—oats 12 lbs., hay and straw 11 lbs.; on manœuvres, if in barracks it is the same as in garrison, and if in bivouac the same as on the march; on a war footing the allowance of oats is 13 lbs., hay 9 lbs., straw $4\frac{1}{4}$ lbs. For artillery horses—draught and saddle—the garrison ration is $10\frac{3}{4}$ lbs. oats, hay 9 lbs., straw 9 lbs.; on the march it is 12 lbs. oats, 11 lbs. hay, and the same of straw; on manœuvres, if in barracks it is the same as in garrison, if in bivouac, the marching allowance is given; the war ration is nearly 13 lbs. oats, 9 lbs. hay, $4\frac{1}{2}$ lbs. straw.

In the Russian Army the daily ration during peace is as follows:—

Guard Cavalry and Artillery, 12 lbs. $7\frac{1}{10}$ ozs. oats, 9 lbs. 1 oz. hay, 3 lbs. 10 ozs. straw.

Line cavalry, artillery, and engineers, 9 lbs. $5\frac{1}{2}$ ozs. oats, and the same hay and straw as above.

Transport draught horses, 7 lbs. $12\frac{1}{10}$ ozs. oats, 18 lbs. 2 ozs. hay.¹

In the regiments and batteries of the Guard, this allowance is given all the year round, but in other corps it is only issued for eleven months, the horses being turned out to grass, and receive no more than 13 lbs. $9\frac{1}{2}$ ozs. of hay for one month after the manœuvres.

If necessary, barley may be substituted for oats, weight for weight, and hay can replace oats in the proportion of 4 lbs. $8\frac{1}{2}$ ozs. of hay for 3 lbs. $1\frac{1}{2}$ ozs. oats. In war, the above rations are issued, with the addition of 3 lbs. 10 ozs. of oats; and in lieu of straw 4 lbs. $8\frac{1}{2}$ ozs. of hay are given. Thus, the forage ration of a line cavalry regiment during war is 12 lbs. $15\frac{1}{2}$ ozs. of oats, and 13 lbs. $9\frac{1}{2}$ ozs. of hay.

From this statement, you will see that in the great armies of the Continent, close attention has been paid to the quantity of forage required in each arm of the Service, to ensure physical fitness in peace and in war; and you will also gather that in our Army this subject has evidently not received the notice it deserves. Our horses are either underfed while they are performing hard work, or they are overfed when this is light; and if the ration is sufficient for large horses, it must be more than sufficient for small ones. I am certainly of opinion that the whole subject of forage for our troop horses needs investigation; and in view of the fact that the allowance is not

¹ Since this lecture was delivered, Major J. Wolfe Murray, Intelligence Branch, War Office, has had the goodness to inform me that the ration of forage for the Train horses of the Russian Army has been considerably modified, as he had already pointed out in this Journal for 1886, p. 1033. Instead of the daily ration being as above, it is now $13\frac{1}{2}$ lbs. oats and $13\frac{1}{2}$ lbs. hay—a greatly improved ration certainly.—F. G.

properly apportioned between light and heavy horses, or with reference to the work done, and that it is generally inferior to that of other European armies, especially that of Germany, I think the time has arrived when this inquiry should be made. In this inquiry the quality of the forage should not be overlooked; the present contract weight of oats is too low, and should be altered. No oats for army horses should be less than 40 lbs. per bushel.

We must recognize the fact that to feed horses well may be expensive, but to feed them badly, even in peace-time, is much more so; while to nourish them insufficiently during war may mean heavy loss or disaster.

It is not always easy to combine economy, or rather cheapness, with efficiency of a permanent kind. With armies which must always be prepared for war at short notice, and must be rapidly mobilized, the mounted corps should require little, if any preparation, so far as their horses are concerned; for unless they are kept always in a fit state for the field by good feeding and training, there may not be time to prepare them—and some time is needed to do this—when the urgent moment arrives. This necessity must be recognized as applying more especially to the cavalry, as it has to encounter the first strain in warfare; and the army which has its horses in the fittest state will, probably, be that which will gain successes at first, and early victories often decide campaigns.

I would not have it inferred that horses should be rationed to the same extent when performing light work—as is often the case at out-quarters in winter—as during the summer manœuvres; they should be fed to a degree equal to the labour exacted from them. If a horse is not fed in proportion to the work imposed upon him, compensation has to be made from his muscles; so that he partially consumes them, and consequently loses weight. If a sufficiency of food is not supplied in time, with this loss of weight there is diminution of energy as the muscular tissue disappears, and at last exhaustion ensues.

On the contrary, if the allowance of food is greater than is required, some of it will not be consumed, and a portion will be expended in laying on useless fat—while the state of plethora so engendered will be accompanied by a tendency to disease, and an excitability and restlessness which will lead to a large increase in the list of casualties.

The weight of horses is, to some extent, a *criterion* by which a conclusion may be arrived at as to whether they are sufficiently fed. Loss of weight accompanies an insufficient supply of food, and this loss is all the more marked and rapid as the deficiency is great and prolonged; it is all the greater if the food at the same time be of inferior quality.

We are all familiar with the change wrought in the appearance of horses which have undergone the fatigues of a severe drill season, without any increase in their forage ration; and if their weight were to be compared with that which it was before the season commenced, there would be found a considerable diminution. I do not know if this has ever been accurately tested in our Army, but it appears that

it has been ascertained on, at least, one occasion in one of the Continental armies—that of Austria. In a military journal of that country (*Oesterreich-Ungarische Wehr-Zeitung*), published in October, 1887, there is a report upon the condition of artillery horses belonging to a Division, during the annual manœuvres. The artillery Commandant had the horses weighed before they marched on August 20th, and again on their return to quarters on September 7th—a period of eighteen days. Before marching, the average weight of the horses was:—

In the first battery	974 lbs.
In the second battery	967 lbs.

On their return, the average weight was:—

In the first battery	945 lbs.
In the second battery	943 lbs.

The average loss of weight was therefore 29 lbs. and 24 lbs. The work performed during the eighteen days was on an average from 18 to 22 miles *per diem*.

But we must not forget that the weight test is not altogether a reliable one, unless we take into our consideration, at the same time, the condition of the horses—that is, their energy and endurance. Horses idle and fat, and therefore not well-fitted for hard work, will weigh heavier than the same horses in good hard condition, and capable of undergoing severe toil. A race-horse, in training, loses weight, but gains in vigour.

I do not consider our cavalry horses, in peace-time, badly fed, nor yet overfed; though it would be an advantage if the ration could be so amended as to allow of more grain being given during the hard work period, and less during the easy work period. For the heavy horses of artillery, Royal Engineers, and Army Service Corps, the allowance certainly appears insufficient, if size and weight are to be estimated in alimentation. And in these this insufficiency is more noticeable than in cavalry during heavy marches in the drill season. It should be the aim of those who have to arrange for the feeding of horses, and more especially during active service, that the ration should be such as to maintain undiminished weight, and increased energy, if possible, under all circumstances. No economy can be more pernicious than underfeeding either soldiers or horses on a campaign. The better they are fed, the better they will perform.

As I have already stated, a certain amount of good food is necessary to keep horses in health and condition, and if work is heavier than usual, or they are exposed to bad weather, or have to undergo severe hardships, then additional forage should be given, and in proportion to the increase in waste of the body through these exactions.

Horses for war should always be in a fit condition for the field, and therefore there ought not to be much variation in the forage ration during peace, except an increase to a small extent when the drills are heavy, and a decrease when the work is light. What the peace ration should be is shown in that laid down for each of the principal European armies. For our own Army, I have pointed out that size,

work, and season are scarcely taken into consideration in fixing the ration. I think it would be advantageous to modify it to meet the requirements of these. If 10 lbs. of oats and 12 lbs. of hay are only sufficient for horses when in barracks at out-quarters, surely this allowance is insufficient when on the line of march or during the drill season!

Compared with the horses of civilians, it cannot be said that, when undergoing a like amount of work, army horses receive too much food. For the largest-sized draught horses which perform steady hard work for a number of hours during five or six days in the week, the daily allowance of food for each horse is about 18 lbs. hay and a small proportion of straw, cut into chaff, with 18 lbs. of oats, and a pound or two of peas or beans. The usual weight of dry food absolutely consumed by an average-sized, well-conditioned cart-horse moderately worked, regularly fed, well stabled, is from 29 lbs. to 34 lbs. daily, of which the hay and straw should constitute about two-fifths; and it is generally recognized that, no matter how nutritious it may be, less than 29 lbs. will not suffice to maintain the body in a fit state for work. In a stud of cart-horses in Liverpool, the following was the daily allowance:—Maize, 10 lbs.; Egyptian beans or Canadian peas, 5 lbs.; oats, 2 lbs.; oatmeal and linseed, 1·3 lbs.; bran, 2·1 lbs.; hay, 10·6 lbs.; roots and grass, 3 lbs. The maize, and beans or peas, with the bran and chopped hay, formed the basis of the usual food allowance. The oats and linseed were only used for sick or delicate-feeding horses. The oatmeal was made into gruel, of which each horse was allowed a drink on returning to his stable when the day's work was done. The roots and grass were given during the months it was considered advisable to use them. In autumn and winter the grain was crushed and given uncooked, except a night feed of steamed food two or three times a week. In spring and summer the grain was steamed, but an occasional meal of dry food was allowed as a change. A further change, both in the quantity and proportion of the grain given, was also frequently made, as conditions of weather or work appeared to require, but the autumn allowance was always considered the most invigorating. The bulk of the hay was given in the form of chop or chaff with the grain, 2 or 3 lbs. of long hay being reserved for night consumption. The best clover hay was always used; and a small quantity of straw was sometimes chopped with the hay. The horses were of average size, moderately worked for six days, and one-fourth of their number for about three hours on the seventh day; their condition was good.

A company employing a large number of horses which draw heavily laden carriages, allows the following ration for each horse per diem:—Hay, 16 lbs.; oats, 10 lbs.; beans, 5 lbs.; maize, 4 lbs.; bran, 2 lbs.; total, 37 lbs. of food for every day. The hay is all chopped, and the grain crushed separately, then both are mixed before being given to the horses.

Every Saturday night each horse is allowed a mash of linseed, mixed with a small proportion of bran, boiled altogether, and given warm. When the work is less, then less grain is given. This, I

believe, is about the usual quantity of food allowed for the larger, slow-paced, and steadily worked horses of civilians. For those of smaller size, but performing work at a faster pace—such as omnibus or tram-car horses—a smaller allowance of food is generally given. The following was the daily ration of the principal tramway companies in the United Kingdom not long ago. It may be observed, however, that this allowance varies in the proportions, according to the price of forage in the market, and also sometimes according to the season:—

<i>North Metropolitan.</i>	
	lbs.
Maize	13
Oats	3
Beans	1
Peas	1
Hay, chopped	7
Straw „	3
Total	28

<i>London.</i>	
	lbs.
Maize	7
Oats	3
Peas	3
Hay, chopped	12
Straw „	1
Total	26

<i>London Street.</i>	
	lbs.
Maize	12
Oats	3
Beans	1
Bran	1
Hay	11
Total	28

<i>South London.</i>	
	lbs.
Maize	7
Oats	7
Beans	1
Hay, chopped	11
Straw „	3
Total	29

<i>Birmingham.</i>	
	lbs.
Maize	6
Oats	10
Beans	4
Chaff	12
Total	32

<i>Liverpool.</i>	
	lbs.
Maize	12
Beans	4
Chopped hay	14
Bran	1
Total	31

<i>Manchester.</i>	
	lbs.
Beans }	15
Oats }	
Maize }	15
Hay	
Total	30

<i>Glasgow.</i>	
	lbs.
Oats	6
Maize	11
Hay	8½
Straw	1
Bran	0½
Total	27

<i>Edinburgh.</i>		<i>Dublin.</i>	
	lbs.		lbs.
Oats	8	Maize	14
Maize	4	Oats	3
Beans	4	Hay	12
Hay	14	Bran	0½
Marshlam	2		
	—		
Total	32	Total	29½

The work of these horses is performed at a trot of about 7 or 8 miles an hour, with very frequent stopping and starting, and the average distance travelled is probably about 13 or 14 miles a day. Omnibus horses receive a similar ration, but the work is not so heavy.

In the pre-railway days, the horses which drew the mail and stage coaches were most liberally fed, and this liberality was well rewarded by the manner in which their work was done and the appearance they presented. "Nimrod" (Mr. Apperley), in his work on "The Chase, the Turf, and the Road" (published in 1837), alluding to these horses, says: "No horse lives so high as a coach-horse. In the language of the stable, his stomach is the measure of his corn; he is fed *ad libitum*. The effect of this is visible in two ways: first, it is surprising to see how soon horses gather flesh in this severe work, for there is none, so far as muscular exertion goes, more severe while it lasts; and, secondly, proprietors find that good flesh is no obstacle to their speed, but, on the contrary, operates to their advantage."

It is scarcely possible to compare draught Army horses with those employed in this way in civil life, with respect to the amount of work they have to undergo, and especially when the former are in the field. The demands of active service are generally of the most exacting and harassing kind. Much of the traction may have to be done where there are no roads, and often in heavy ground; while with some corps—as the horse artillery, and even the field artillery—the pace may require to be fast, and over very difficult country. At the same time, the horses generally have to remain without shelter and exposed to the weather, and receive but little attention, so far as grooming is concerned. Civilians' horses labour under none of these disadvantages in performing their service. They work on well-made roads, have a definite amount of regular toil every day, are comfortably housed, cleaned, and regularly watered and fed by men who are themselves comfortable and exempt from danger, hunger, and exposure.

Army horses, therefore, employed in draught should be at least as well fed as those of civilians, more especially when the former are on active service. The grain ration should be high, as liberal, in fact, as that of the coach horses mentioned by "Nimrod." 16 or 18 lbs. a-day per horse would not be too much, particularly in long and rapid marches, and even more should be given if the weather is at the same time unfavourable. If the grain is crushed, so much the better; indeed, for tired horses especially, all grain should be so prepared. The

amount of hay in the field is a secondary consideration; as the grain is increased in quantity, the allowance of hay should be diminished.

With regard to cavalry horses the same remarks apply. The work of such horses is, in many respects, like that of hunters, though it is performed in very different circumstances, and under disadvantages such as hunters never experience. Carrying far heavier loads at all paces, cavalry horses may be required to exercise their energies for days together in bad as in good weather, and without being comfortably stabled or cared for after the day's toil is over: the food being often scanty, and of bad quality at the same time. The hunters, on the contrary, rarely have more than two days a week in the field, and they are seldom overweighted then. They are not troubled with dead hamper on their backs in the form of kit and equipment, as troop horses are, nor, like them, have they to carry from 18 to 20 stone, unless specially selected by their size and strength to move easily with such a load. Troop horses cost 40*l.* a-head to buy; hunters, to carry the weight they support, would fetch several hundreds of pounds each. The allowance of forage for a hunter of this size is probably not less than 16 *lbs.* of the best oats daily, to which probably 1 or 2 *lbs.* of beans and some carrots will be added, while 8 or 10 *lbs.* of excellent hay supplements the grain. Kept in a warm stable, clothed, bandaged, and groomed in a manner to which the trooper is an utter stranger, and with only two days' work in seven, at the end of the hunting season such horses, nevertheless, often show marked signs of fatigue and wear.

Need we wonder, then, that cavalry horses on a campaign should soon begin to break down, when taxed as hunters never are? One chief cause for breaking down is insufficient food, and, therefore, though serious obstacles may arise to hinder ample supplies of forage being obtained, everything possible should be done to keep the horses well fed. Cavalry must act with celerity and energy, in order to favourably influence the success of a campaign; and unless the horses are well attended to in the matter of forage, their action must be weak and slow, and losses among them will be heavy.

These remarks apply more particularly to the horses bred in this country, to which a plentiful supply of good forage is absolutely necessary. Whether it is because they are not inured to hardship, to which they are indeed rarely exposed at home, and seldom miss a meal, much less lose a day's ration, or that they are constitutionally delicate, and suffer to an extraordinary degree when their ordinary allowance of food is diminished, certain it is that, unless they receive particular attention in the matter of aliment on active service, they quickly give in. In this respect they differ much from the horses of other countries, and especially those bred in the East. More powerful and fleet than they when well supplied with pabulum, they offer less resistance to the effects of short rations, and become of little use when receiving an allowance upon which other races can undergo severe fatigue. It is true that our horses are never tested by experience of the hardships of war in their own climate, nor usually in a climate resembling their own; and this may afford a reason for their

being easily rendered inefficient when sent on active service out of this country, as climate at first affects horses more seriously than it does men. The fact remains, that unless very well fed and cared for, our horses, light and heavy, have a great tendency to become feeble—to lose heart on service; our recent campaigns in South Africa and in Egypt and the Soudan afford ample confirmation of this, while our experience with other races shows that they are not so susceptible.

Take, for instance, the small horses generally designated Arabs. It is wonderful the power of endurance they display when carrying heavy loads for long periods, and receiving at the same time a very scanty allowance of food. One of the most notable instances of this natural hardihood was afforded by the 19th Hussars in the Soudan, in 1884-85, and deserves mention here, as it is not only pertinent to the subject under discussion, but reflects great credit upon that excellent regiment, and especially upon its then chief—the lamented Colonel Barrow—surely one of the most promising and accomplished cavalry Officers our Army has produced.

The regiment was mounted on Syrian horses, whose average height was about 14 hands, and average age 8 to 9 years old, though about 15 per cent. were more than 12 years old. Some 50 per cent. had been through the campaign in the Eastern Soudan with the regiment in the early part of 1884, and returned in a very exhausted condition; and about 10 per cent. had been at Tel-el-Kebir. In June, 1884, they were taken to Assouan from Cairo in barges, and remained there three months. In September they were marched to Wady Halfa, a distance of 210 miles, and there 350 were, in November, handed over to the regiment; all except some 10 per cent. being in fair marching condition. The regiment marched from Wady Halfa to Korti, about 360 miles, the average daily march being about 16 miles, not including halts, which were for four days.

The ration was supposed to be 8 lbs. of grain—barley or dhourra, and 6 lbs. of dhourra stalk; but owing to scarcity, the horses generally received about 6 lbs. of grain and 10 lbs. of stalk. They arrived at Korti in good condition, remaining there for about a fortnight, and receiving about 8 lbs. of green dhourra stalk daily, instead of dry stalk, upon which they improved. At the end of December, 40 horses proceeded to Gakdul, 100 miles, and performed the reconnaissance duties of the column. The march was accomplished in 63 hours; 15 hours' rest was allowed, and then the return march was completed in the same time as the outward one, except that 6 horses did the journey in 46 hours, the last 50 miles occupying $7\frac{1}{2}$ hours. During the 141 hours of the march, the horses were ridden for 83 hours. On January 8th the 155 horses, and 127 men, with 8 Officers, crossed the desert with General Sir Herbert Stewart's column; there being an extra horse for each Officer, and 12 spare horses for the men. The average forage ration for the first 10 days was from 5 to 6 lbs. of grain, with 2 gallons of water; 31 miles were marched daily, not including one day's halt. When the first advance was made to Matammeh, the horses marched to the Nile without having received a drop of water for 55 hours, and only 1 lb. of grain. Some 15 or

20 horses received no water for 70 hours. Between January 20th and February 14th the horses received no grain, but received about 10 lbs. of dhourra stalk daily, or 12 lbs. of green dhourra or green beanstalk. Two days before marching they had 6 lbs. of grain each. They performed outpost and patrol duty, averaging about 8 miles daily, and under these conditions they recovered from the effects of the desert march, though many were in a weak state. For the first 75 miles, the horses had only 4 lbs. of grain and 3 gallons of water; for the remainder of the journey water was plentiful, and 8 lbs. of grain could be spared for each horse. Two marches of more than 40 miles each were made—evidence that the horses were still in a fit state. After two weeks' rest at Korti, the horses marched strong and well to Dongola and other stations, receiving plenty of food and water, and after two months' halt they were in quite as good condition as when they left Wady Halfa. The return march to the latter place—about 250 miles, was performed at the average rate of about 16 miles a day, with one halt for two days.

During this nine months of a hard campaign, in which more than 1,500 miles were marched, only twelve horses perished from disease, though from other casualties fifty-nine were lost. The weight carried by each of these ponies never averaged less than 14 stone, and during the last four months of the campaign the weather was very trying, and the scarcity of water was often severely felt. The management appears to have been excellent; the horses were spared as much as possible from unnecessary fatigue, the men never being allowed to remain in the saddle a moment longer than was needed; marches in column were avoided, extended line being adopted, and when picketed the horses had always plenty of room, and their heads to the breeze. They were allowed to graze, on every possible occasion, on the grass of the Bayuda Desert, though it was too dry to be swallowed.

I think it is pretty certain that English horses would not have survived such an ordeal as this.

In India somewhat similar incidents have been recorded, cavalry horses having successfully undergone long and severe marches on small rations; and Darwin, in his "Voyage of a Naturalist Round the World," mentions the great endurance of South American horses, particularly describing a journey he made, in which his horses had no food for five days.

Whether our horses could be trained to undergo such fatigue and fasting is a question which cannot be answered offhand; but it would be well not to depend upon their displaying much fortitude in the matter of short rations in the field, but rather to make provision for their wants being supplied in no stinted manner. If their powers of endurance are not so developed as in some other races, yet they far excel these in other important respects; like their masters, they possess exceptional qualities which are most conspicuous when food is plentiful, and, knowing this, our aim should be to provide it in sufficient quantity and of good quality—whether the horses are in quarters or the field. To succeed in doing this requires more than

ordinary care and attention on the part of those who are responsible for the efficiency of our mounted troops. Forago rations are as difficult to deal with, perhaps, as are the soldiers' rations—so far as quantity and quality are concerned.

Lieutenant-Colonel COLVILLE: As someone must make a start, with your permission I will make a few observations. The paper which has been read by Dr. Fleming is an extremely interesting one, but it is of a technical character, and, therefore, is probably interesting only to those who take more or less interest in horses. If you take the paper as a whole it consists in this, that horses used in civil life in the country and horses belonging to people not in the Army are fed according to the climate, according to the work they have to do, and according to the season of the year; but that in the Army this rule is not observed, and they are fed all the year round exactly in the same way. Whether the paper is intended to bring that particular feature prominently forward or not I do not know, but I should have thought that any man who was not blinded by innumerable rules of red tape would have acknowledged that that was common sense, and should be observed both in the Army and out of the Army. I should like, as a matter of information, to ask Dr. Fleming whether these Syrian ponies, to which he referred, were entire, or whether there were any mares, and if so, what proportion of mares there were? Dr. Fleming tells us that all horses in the Army, as they necessarily would be the first called upon for active service, should be kept well fed and in high condition, ready to take the field at a moment's notice. That, of course, is perfectly right as to foreign armies, where they have to move by land; but is not there this to consider, that in England before the active operations commence, the horses would probably have to travel some distance by sea, and if they were in too high a condition it would be more injurious to them than if they were in a lower condition, not so well fed, and softer? That is one of the great disadvantages that cavalry now have to undergo in the English Army—they have to travel by sea, and they lose their condition even if they have it, and if their condition is too high they are apt to die. I must confess to being a little disappointed at the lecture. I came in hopes of hearing some proposal from Dr. Fleming as to an improved method of obtaining the forage and of distributing it. I have always thought, and still think, that the system upon which our cavalry horses are fed is not either economical or judicious; that the forage should be purchased by the Army direct, without the intervention of any middleman; that there should be a store in a central position like Aldershot; that all ought to be chopped and mixed, and then should be distributed in bags, say of 90 lbs., sufficient for three horses or more—in the case of cavalry they do not get so much. The horses would then get all that they are supposed to get, and you would be certain that the quality of the hay and oats was really such as was paid for, in which case the taxpayer would benefit to the extent to which the contractors now unduly benefit.

Inspecting Veterinary Surgeon W. B. WALTERS: I should like to say a few words with reference to Dr. Fleming's interesting lecture. I can, perhaps, answer one of the questions asked by Colonel Colville, with reference to the purchasing of forage. For some time past forage has been purchased in Aldershot direct, by Officers of the Commissariat Department, and up to the present the system has answered admirably. With reference to horse feeding generally in the Army, I quite agree with the lecturer that it requires investigation and revision, because I am quite sure that the habit of feeding heavy horses with the same weight of grain and hay as light horses is wrong in principle. The heavy horses are generally the first to suffer in condition on a campaign, and, therefore, require more food in proportion to their bulk than the lighter ones. At the same time I think that if, say, three scales of forage were adopted—I, II, and III—I, for heavy cavalry and draught horses; II, for medium cavalry; III, for light cavalry, infantry, Officers' chargers, and so on—it would be quite sufficient, because I think the German system is very much too complicated. It is excellent in theory, but in practice it would hardly be found to be quite as perfect. Then also as to increasing the ration on the

line of march, mentioned as being adopted in the German Army, I do not quite see why horses should receive an addition to the ordinary scale of ration while actually on the line of march, because the result of this extra feeding—improved condition and increased powers of endurance—should be, I think, present at the time the horses are marching. The effect of giving extra food only during the period of increased exertion would be almost like giving a man a heavy meal just before he has to run a race. It is better to *prepare* horses for the line of march by commencing the extra rations some weeks before they are required to start. As regards the quality and weight of the oats supplied to Army horses, I certainly think that the grain should not weigh less than 40 lbs. the bushel, because in nearly all samples of foreign oats—and the grain purchased for the Army is principally of foreign growth—there is an admixture of seeds which are not only innutritious, but in many cases deleterious in their nature. I have always been an advocate for crushed oats. It has been observed by many Officers in the Army that the issue of crushed oats on a campaign would be a matter of difficulty if not an impossibility. I think, on the contrary, that there would not be the slightest trouble about it. Crushed oats are considerably more easily digested and assimilated than whole oats, and I am of opinion that 10 lbs. of grain in this form is equal in nutritive value to 11 or 12 lbs. of uncrushed oats. That form of forage known as "grain cake" is most excellent of its kind, and certainly is far easier of transport than the same weight of whole oats. With regard to the loss of condition of horses on service, my experience of campaigning has taught me that cavalry horses are generally the first to fall away, particularly those of heavy cavalry; therefore it is quite necessary that our cavalry horses should be kept up to the highest standard of condition at all times. Of course we know perfectly well that prior to embarking horses for a long sea voyage, it is very necessary to make an alteration in their diet, in fact to prepare them for a period of inactivity; but if animals are embarked in a high state of health and vigour, the loss of condition during the voyage will not be great, and will soon be recovered. With regard to the Egyptian horses mentioned by Dr. Fleming, I had some experience of this class of animal in the Soudan, and thoroughly agree with every word that he has said. They were principally stallions, and these hardy little animals certainly did their work wonderfully well without suffering from privation or climatic influences to anything like the extent experienced by the English horses, although often placed under less favourable conditions.

Colonel F. J. GRAVES, 20th Hussars: Colonel Colville expressed his regret that the lecturer had not made any proposition. Although there was no direct proposal made, I think it is evident that a useful proposition was made by inference, and I think it is very necessary that the whole question should be investigated with a view to the proper proportioning of forage to the horse's size, work, and to the season; and I am quite in agreement with such a proposal being carried out. It seems to me to be absolutely absurd that a horse at 15.2 carrying a hussar of my own regiment should be fed all the year round upon 10 lbs. of oats and 12 lbs. of hay in the same way as a horse of 16.2, and perhaps 300 lbs. heavier in total mass, carrying possibly from 21 to 22 stone; it seems ridiculous on the face of it. There is a very interesting comparison drawn in the lecture between two batches of artillery, both before and after eighteen days' hard work. In my own regiment at Norwich the other day, an experiment was carried out, not before and after hard work, but positively during a time of what one might call comparative idleness. We had some sixty odd horses, one squadron, put under experiment. I am sorry to say the instructions with reference to carrying out the experiment were so limited that I do not think the result of the experiment or the reports thereon will be helpful in any way, and for this reason: the instructions conveyed to us were simply to report as to the advisability, as I gathered, of a permanent reduction of 2 lbs. in the general ration of oats. This experiment was carried out in the furlough season when we probably had not enough men to groom the horses, let alone exercise them, and when there was very little or no drill done, for the simple reason that we are forbidden to go on the drill-field for fear of cutting it up; and under the further ridiculous condition that every day the horses did happen to go out on outpost duty on the roads, they were to have 2 lbs. of oats extra. The sum total was this: that

just as the horses, after their eighteen days' work in these two batteries of artillery, lost a certain amount of weight, so the whole of the squadrons, with the exception of six horses, lost on an average 35·5 lbs. after two months. They were weighed before the commencement of the experiment, after the first month, and also after the second month had concluded, and the result in the end was an average reduction, as I say, in the whole squadron, with the exception of six horses, of 35·5 lbs. The six horses had gained something under 6 lbs. apiece. What is to be learnt from that experiment? The horses had been doing comparatively little work; they were very fat; our stables at Norwich are dark, and that contributes towards the accumulation of fat, I think. They are also warm, and there is another inducement to fat. The simple lesson I learnt from that experiment was that I considered the horses had got rid of what was positively an incubus to them, and, if I may say so in the presence of the lecturer, what I consider, if they were going on service immediately, would be a danger to them, because horses grossly overloaded with fat are certainly, to my mind, more liable to inflammatory diseases than horses in fairly good working condition. Comparison has been made of the foraging of our Army horses with those of the German, French, and Russian armies, and, looking through the lecture yesterday I gathered that in those countries from which comparisons have been drawn, the nutritive value of the ration, as a whole, is considerably higher than ours. I began to think why it should be so. I think it is for this simple reason, which does not do us, as a sensible people, much credit, that with the exception of Aldershot, the Curragh, Dublin, and one or two other stations, it is impossible for our cavalry to carry out efficient cavalry instruction in the way in which it is possible for the German, French, and Russian armies to carry out their instruction, and for the simple reason that we have not the ground to do it on. Von Schmidt, the great cavalry instructor in Germany, insists on long advances of two or three miles. Where can we get that at Norwich, Brighton, Shorncliffe, Leeds, Manchester, or any other such place? We are put into a reformed turnip-field, and are supposed to do everything it is possible to do with cavalry, confined as we are in such a spot. Therefore it would be absolutely necessary that the nutritive value of rations in Germany and elsewhere should be greater than with us. Although we have a less quantity given, I am quite clear that in times of peace, and especially during the idle season, the winter season, when drill grounds are not available, our horses are over-fed. I am quite clear in my own mind from what I have seen that they are over-fed at that time, and possibly during the manœuvring season, of which we have had too little in this country, they are under-fed. If they were given the forage during the idle time at a reduced rate I am quite sure the Government would allow us to draw the balance during the hardworking season, and there would be no extra expense to the country. I do not think that there is anything which should prevent that being made a definite proposal. The cake that was referred to in the lecture is simply the horses' natural food under compression. 9 lbs. of that cake and 8 lbs. of hay produced an equal result at Aldershot to 12 lbs. of oats and 12 lbs. of hay, simply because it is crushed. Therefore, I think, if it could possibly be done, that the oats issued, especially at the out-stations, while they might be reduced in quantity, might with great advantage be crushed. We have gone a little way in that direction in my own regiment. We have now four chopping machines in the regiment at Norwich, and I suggested about a month ago that defaulters and the few men now and then in the cells, instead of having shot and pack-drill, should be told off in small parties under the orderly corporals of troops to cut the whole of the necessary chop for the troops in the morning. It is now done, and with very great advantage. One great advantage I would like to notice. The horses eat their food ever so much more slowly; there is no bolting of the food and scattering it about all over the stalls to be trodden down and spoiled; but the horses stick their heads into their mangers and munch away, quietly turning over the chopped hay, picking out the oats, and then finishing up with the chop that remains. It takes a horse one-third or half as long again to eat his food in the stable, with chopped hay under these conditions. I do not see, if we have hay-chopping machines, why we should not do something out of the canteen, or some other fund—the Government I do not suppose will pay for them—in getting some oat-crushers. I am quite sure it would be impossible to get crushed oats from

the contractors in a satisfactory way. There is no article of consumption for the horse which is so adulterated as oats *bought crushed*, but to buy oats in the ordinary way and crush them afterwards is quite feasible. There is another point I should like to touch upon. Dr. Fleming in suggesting by inference the changes indicated and the necessary inquiry—perhaps being in an official position in the matter—fought rather with the gloves, but I think there is one point upon which we ought to hit out pretty hard. There is no article paid for by the taxpayer, I believe, round which circumstances of corruption of the grossest form circle so much as the supplying of our horses with forage; I am quite clear of that. I could keep this meeting very much longer than the ten minutes which I am allowed by giving you the *ipsissima verba* of things which have come under my own personal knowledge, which I have run to earth, in the way of corruption in this matter. To take one very simple case, which unfortunately came to my cognizance too late to act upon. At a certain station and at a certain time every single Officer's groom in a regiment was in receipt of a shilling a month from a certain contractor. I should like to know where that shilling a month came from? It came out of the horses, it was saved out of the weight given to them. I know of another occasion where again through being unable to get evidence, we were foiled; in one day a thousand pounds weight of straw was issued short of what should have been issued. With regard to that very cake before you which I invented, I got a letter one day from my manufacturer, telling me that when His Royal Highness had ordered a certain number of horses at Hilsca, which were in very bad condition, to be put on that cake to see how they did on it, about a week after this cake was issued, two quartermaster-sergeants of the troops stationed there came into the office. They said "Good morning" to my manufacturer. He said, "What can I do for you; what is your business?" "Well," they said, "we have come in the ordinary way of business. You have just got the contract for the supply of our horses, and we thought we would just look in and see how things were going on;" and so on. "What do you mean?" he said. "Well," said the spokesman of the two, "it is usual that some sort of commission should be given in order that things may be made to go easy." My manufacturer had very special instructions from me on this point, and he replied, "I do not know whether you know it, but Captain Graves" (I was then Captain) "is the inventor, and we are bound to him under articles of agreement, and anything that is done in connection with this cake we must put before him first." My manufacturer wrote to me giving me the very words that had passed, and I wrote back, taking steps that I flattered myself put a stop to that business there and then. The corruption that goes on with reference to the supply, both as to quality and to quantity, is something surprising, and ought to be made public and investigated in the most thorough way. We know the difficulty of getting evidence on this point; men will give you a vague report, they will say something about so and so, but as to coming to the front and stating it before a court-martial on oath, it is quite another thing, and it is very hard to get such evidence, and I believe the authorities are heartily sick of the job. I have now, Sir, a definite proposal to make which has been on my mind for some considerable time. Shortly it is this. When a subaltern joins a cavalry regiment, he is supposed to have been positively born in a butcher's shop, in a baker's shop, in the middle of a hayfield, and of an outfield; he is supposed to know good meat, good bread, good potatoes, good oats, good hay, good straw, good everything. He goes on with the ordinary orderly Officer of the day to be taught his duty. After a very little time he is put on duty for himself; he has to go down and to pass the rations, and a lot he knows about them! He goes to the gate, and there you will see a boy of about four or five months' service, very often less,—when we are hard up for Officers for duty,—passing in hay, and if you were to ask him the name of one single grass, as I did one fellow of my regiment, handing him a small tuft of Italian rye grass, he does not know it a bit. They have to pass this stuff in, and they know no more about it than the woman in the moon, if there were such a person. I believe firmly if the thing is to be carried out satisfactorily in the way of supply as to quality and quantity, the proper men attached to the cavalry and artillery and mounted corps who should pass these articles, are the Officers of the Veterinary Department themselves. There are a good many members of the Veterinary Department here,

and I hope they won't think I am trying to urge the necessity of increasing their duties, but rather that they will take my proposition as a tribute to their greater knowledge and higher education in this matter. I admit myself that I do not know enough about forage now, and I would bow to the decision of a properly qualified veterinary practitioner in a matter which so urgently requires investigation as this does. I believe arrangements could be made in each regiment, at each station, so that the forage should be presented at a certain time when the veterinary Officers were on the spot without necessarily increasing their duty. After that was done it could be distributed to the stables in the ordinary course, but for young and inexperienced subaltern Officers to have the power of rejecting or passing that which constitutes the mainstay of the horse's vigour, and the mainstay of the horse's usefulness, is to my mind utterly absurd. It is an important subject, and I do hope and sincerely trust that the Government may be led to take some steps to put it on a better footing. I do not think any better service has been done of recent years in this direction than that of the lecturer in bringing it forward to-day.

Colonel JOHN FRYER, C.B.: This is a very interesting subject. There are one or two points on which, if you will allow me, I should like to make a remark. I think we are very much indebted to the Principal Veterinary Surgeon for having given us such a very lucid, interesting, and useful paper. He was called to account for not having produced some plan or proposal for service and other matters, but that is exactly what he wants to hear us talk about. I think we are all agreed on one thing, and that is, that we in the British Army have been moving for many years on what I may describe as the rule of thumb with regard to the horse rations. I am of opinion, and I think many others without the least braggadocio will say the same, that we have very little to learn from any Continental Army with regard to the feeding of horses. I had the pleasure of travelling last winter in a great many of the capitals of Europe, and I cannot conceive anything more superior than the horses in London to those that you see in other European capitals. That is not caused by the breeding of the horses only, but by the care with which they are attended to and fed. I cannot help thinking we should do very much better by taking a leaf out of the book of some of our own great carrying companies which the lecturer has very properly brought forward to-day. Our rule of thumb is this, that we give oats, hay, and water. The oats are mostly foreign, and chiefly Russian. You may get 40 lbs. to the bushel, but with this very often a very thick-skinned oat, which will weigh heavy, and I suggest with all humility that it would be far better to have a mixed food for cavalry and artillery horses, such as we see in some of the rations of the great metropolitan companies. I have had practical experience of some of these companies, being rather largely interested in them, and I can safely say that no horse working either in the London General Omnibus Company, or the Road Car Company, doing the work that they do, could possibly live on oats and hay alone. Give him as much oats of the class we feed our troops on as you like, without other grain, and he will fall away in condition. Bulk also is necessary for condition, but I say we require to vary the ration by giving other grain with oats, and I should like to see that done very much. The next point we should inquire into is this. Does our present ration fulfil the requirements of our mounted branches in quality and quantity, or do we get as much out of the present ration as these great companies do out of theirs? My opinion is we do not, and for this reason, that we do not, as they do, chop and crush our food. By chopping you get the very essence of the hay and the essence of the oats; you get, in my opinion, quite 30 per cent. more out of chopped hay and oats than you do by giving it to them whole. There is one little matter which has not yet been mentioned, it is very cheap, and that is water. Water is the very essence of condition, no horse in the world will keep in condition unless you continually water him. "Water frequently" ought to be written up over every troop stable door—water, water, water. That is the one great secret of condition on a line of march or campaign, that the horse should be watered as often as possible. That may be outside the present question, but it is so. The lecturer said that the first action very often decides a campaign, but I think he will also agree with me that that army whose cavalry and transport stay the longest usually wins the campaign. Therefore the stayers are those which we hope to see in our cavalry, and cannot be attained without con-

tinuous care and attention in the feeding of the horse. I repeat, the two things we require are: 1st, that the ration should be varied when practicable; 2nd, that we should chop and crush everything if possible by steam power. I believe those two points to be mainly necessary for the maintenance of condition in our horses.

The CHAIRMAN (Sir Beauchamp Walker): I have little to say excepting that I very much agree with the Principal Veterinary Surgeon in what he has told us to-day. I should like to ask Colonel Graves what 2 lbs. of ration did you take off—2 lbs. off the hay or off the oats?

Colonel GRAVES: Off the oats.

The CHAIRMAN: And still gave the same amount of hay. There is no doubt that horses require a certain amount of forage in bulk, at least our English horses do; but one cannot help observing—knocking about the world as I have done for a great many years—how totally differently the various races of horses require to be fed. In the German Army, to which Dr. Fleming has alluded, with the exception of the very big horses which are allotted to the cuirassier and lancer regiments, nearly the whole of the horses of the old Prussian Army came from East Prussia, where they have breeding establishments of their own, and the only horses bought were the bigger horses, which are bred chiefly in North Germany and Mecklenburg. But there is a very strong infusion of Arab blood in the horses bred in East Prussia, and I had no doubt, during the long time I was in that country, that a great deal of their hardihood and endurance arose from that circumstance, because it reminded me very much of the horses with a more Eastern blood than our own which I had seen in other countries. It was extraordinary in Spain on how little horses did very hard work indeed: barley and chopped straw were the only forage we ever gave the horses there; and I believe in Arabia the horses do an enormous amount of work on a quantum of forage which people in England would hardly believe in—positively mere handfuls. You cannot in the Arabian desert, of course, have anything in the shape of hay; it really is nearly all grain, and a very small amount; I do not know whether Dr. Fleming can tell us.

Dr. FLEMING: 4 or 5 lbs. of barley.

The CHAIRMAN: There is a question I should like to ask Dr. Fleming—it reminded me of olden times—and that is what he thinks of sheaf barley as forage for horses, I believe any grain may be given, I believe even wheat on an emergency may be given to horses, if it is given with the sheaf straw. I had a remarkable experience of what sheaf barley can do while we were lying opposite Varna, preparatory to crossing for the Crimea. My then chief probably knew more about feeding beasts than any man in England. He had for a great many years looked after his own property in Ireland, and I believe had fed very largely himself for the Irish markets. One day he announced that the Commissary-General had informed him that we had no more forage for the cavalry. What on earth was to be done? He said: "It is no use putting the horses on too small an allowance. Horses must have a certain amount of bulk. If you do not give beasts a certain amount of bulk they are sure to go down." He said: "There surely must be something in the country." Now I had had a habit on the days I was not on duty of riding all over the country south of that part of Bulgaria towards the Balkans; and I had seen that the whole country was covered with ripe crops. I told Lord Lucan this. He said, "What have you seen?" I said, "I have seen quantities of barley, and they are just beginning to cut, in fact." I said, "If you will only look outside the tent you will see one field quite close to our camp." He said, "You come down with me to-morrow morning and we will see the Commissary-General." We went. The conversation was rather a curious one, and at last Lord Lucan said, "My Aide-de-Camp tells me that there is plenty of forage in the country, there is plenty of forage that can be bought. Now I know forage given in the sheaf can be used, even if it is barley, which is otherwise a very heating grain." "Oh!" said the Commissary-General, "that gentleman says there is forage in the country, does he?" Lord Lucan, with the sharp temper which he generally showed when he was being opposed, said, "Yes, if I buy the forage will you pay for it?" "Oh yes," said the Commissary-General, "I will pay for it." I bought 4,000 rations of barley before I sat down to dinner that day, and for nearly three weeks I rode all over the country with money in my pocket and bought

barley for our horses, for that portion of the force which had not gone up the country, and as far as my recollection goes—I was not doing regimental duty at the time, therefore I could hardly speak to it as well as some others—the horses did extremely well and thrive on that forage. Whether it would have answered for a continuance is another question, but I was particularly anxious to elicit a remark on the subject from Dr. Fleming. Water, as he says, does not form part of the horse's ration, but I wish he had said something about water, because I look upon it as nearly as important as the food. There has, I believe, a very good custom been introduced in all new stable fittings, and that is of having a receptacle for water which can be kept permanently filled. It was not so in my day, and I am afraid it is not very much the case in our barracks, but I hope as we are building new barracks occasionally that it may be introduced, because I am convinced it is a very great point. I also believe running water to be about the best water we can give a horse. I remember being with my troop a good many years ago during an election in Ireland, and I observed that the horses fell off after the first two days. In consultation with my sergeant-major, as I believe every Captain ought to be as much as he possibly can, he said, "I think if we watered at the river you would find a very considerable improvement." We went down and watered at the river and I took the horses back to Waterford looking very much better than when we left, which I very much attributed to watering them at running water every morning. I am afraid that altogether our stable fittings are much in the old style. Of all bad ways of feeding the hay, that of the high rack is perhaps the most hurtful: there is a great deal of waste and the horse's forelocks and eyes get filled with dust. I think in private stables now-a-days they are nearly all low feeding. I always crushed my own oats. I was a very poor man and very fond of hunting, and had very few horses. I tried to get as much work out of them as I could, and I always crushed the oats from the first day it was brought to my notice. I hope we may elicit from Dr. Fleming some opinion as to how he would modify our ration, because I always felt the reason why we had 12 lbs. of hay was that there was so much waste and it was for the purpose of giving the horse from 8 to 10 lbs. really to eat. I had one very good rule in my troop during the years I commanded one, which was that if I did not go and look in on the afternoon, my subaltern or some non-commissioned officers did and stirred up the stablemen to going round and picking up the hay that was pulled down and put it back again, because there is no doubt that in feeding from high racks there is an enormous waste of hay.

Colonel FRYER: One-third.

The CHAIRMAN: That reduces it to 8 lbs. The rest gets trodden into the litter, and entirely spoilt for consumption. Certainly 10 lbs. of oats is little enough for the big horses we have in our Service, if they are to do hard work. My hunters had 16 lbs. always, beside it being crushed, and beside a handful of beans in each feed. I think we are all very much indebted to Dr. Fleming for having given us these two lectures. I only wish there had been more Officers of my old branch of the Service and of the artillery to listen to them, and to give us the advantage of their experience, and by so doing to elicit replies from Dr. Fleming, which are sure to supplement the information he has given us.

Colonel COLVILLE: In the omnibus companies' stables the horses all have a receptacle in front of them for water, which is always full, and they drink how and when they like.

Dr. FLEMING: Mr. Chairman and gentlemen, I am very pleased indeed with the reception you have given my lecture. The paper itself is rather disjointed; the materials had to be collected from various sources, and some of them were derived from my own experience. Notwithstanding, the subject is a dry one, if you leave out the water, and it is a difficult thing to make it interesting to people who are not very enthusiastic in the matter of horses and horse feeding. I am only sorry we have not had a larger discussion on the subject, because from my peculiar position it is a difficult thing for me to make any proposals, and I was hopeful that the discussion which we might have had to-day would have informed me, to some extent at least, as to how to proceed in the matter of having an investigation into the foraging of our horses. Nevertheless, so far as the thing has gone, I am satisfied. I am extremely satisfied indeed with the remarks which have been made, and I

shall try to reply to the questions put to me to the best of my ability. The first question asked was as to the Syrian horses. The horses were entire. I do not think it makes much difference with regard to endurance: we have proved in India that the opposite conditions are just as good. It has been proved by the experience of cavalry Officers in India that horses which were not entire worked just as well as those which were, and did not fight so much with each other. My experience, in China especially, of a number of Japanese animals we had, was that they were perfect brutes, and, I think, it is the experience pretty well of everyone who has to do with horses, that they are much better when they are not entire, that their fighting and injuries are very few; and not only that, but in reconnoitring, especially at night, entire horses will neigh, and if the enemy is within 2 or 3 miles he is sure to hear them. With regard to horses on shipboard, it is a matter for regret that our country is an insular country, so far as cavalry is concerned; because it is absolutely necessary that cavalry horses should be in first-rate condition. If we have to put horses on shipboard, of course we run the risk of their good condition rather deteriorating on a voyage; nevertheless, I contend that a horse in good condition is in a better state to withstand the voyage than if he were not in good condition. A horse sent on shipboard requires all the resisting power of good muscles and heart to endure bad weather at sea, and the horses which suffer most are those which are not in condition—that is, fat horses which have not had sufficient exercise before being embarked. The cavalry horse should always be in a fit state for a voyage, and the horse in the fittest state for the voyage is in the fittest state for active service. The rations, of course, differ from those which the horse gets on shore: they are adapted for the horse being kept in one position without exercise. With regard to the contract system for forage which now prevails to a large extent in this country, that was discussed in my last lecture. I know the system is a most obnoxious one, and all who have paid attention to it know that there is no part of the contract system in the British Army more exposed to cheating or robbery in every form than that which pertains to foraging, but the problem is how to get rid of it. At out-stations and small detachment stations it would perhaps not be expedient to send Officers to purchase the forage. I think permission ought to be given to the Officers who command regiments and detachments to buy the forage at first hand; but that again would entail special knowledge, and that knowledge every Officer does not possess, though there is no reason why he should not. Every Officer who has to do with horses ought to know good forage from bad, and be able to estimate the value of forage in the market. If the system of contract could be abolished, and Government could buy direct from the producer, I think it would be much cheaper for the country and very much better for the horses. With regard to the reduction of the ordinary ration, this has been tried. I myself made the proposition, seeing the amount of damage our horses often sustain in the stables during the winter season, and especially at out-quarters. In one of the cavalry regiments in which I served, it was our custom to diminish the allowance of oats in winter, and to give what was saved to the horses during the summer drills. Of course that was not always easily done; large barrels had to be provided, and sometimes we got the order to march before the summer drills began. But I was moved more particularly to make the suggestion from the fact that the casualties in winter in stables are very often much greater than in summer, from the fact that the horses are fed in winter as in summer, and not getting the same amount of work in winter, they amuse themselves by breaking each other's legs. It was proposed that during the winter season 2 lbs. of hay should be substituted for 2 lbs. of oats; that, instead of 10 lbs. of oats, 8 lbs. of oats should be given, and instead of 12 lbs. of hay 14 lbs. of hay. The reports as to the result were of the most contradictory kind. One regiment had not been put on this altered ration long, before it was noticed that all the horses were starved-looking and weak, and a very great sensation was caused. At other stations at the end of a certain period the reports were favourable so far as the horses were concerned; they were in good health, and the casualties fewer than usual. From other stations, again, it was reported that the horses had lost condition, and were altogether unfit for the spring drills. So that the reports would tend to prove that it is not safe to reduce the present ration, either in summer or winter. This I do

not agree with. I have already said that the horses should be fed according to their work: beyond a certain amount they should receive forage in proportion to the amount of exertion they undergo. I think if horses are standing in stables, doing little work, they ought to have fewer oats; more hay should be allowed if necessary, but some of the stimulating food should be withheld. Oats should be given in largest quantity during hard work. I think the present ration might be improved, so far as the materials are concerned. To keep horses upon oats and hay all the year round must be unsatisfactory for them. Some variation might well be made, and we have the example of large companies which employ heavy and light draught horses to show that a mixed ration is necessary and beneficial. If these horses were fed all the year round as our troop horses are fed, I do not think they would perform the same amount of work they now do. We all know that a mixed diet is necessary for ourselves, and it must be the same with the horse. I think if the oats were mixed at intervals with beans or maize so as to make a variation, it would be all the better; but, nevertheless, I do hold that horses should be fed in peace-time as you intend to feed them in war-time: therefore, if you gave them a mixed ration in peace-time they should also have it while on active service. With regard to sheaf wheat or barley, there is no doubt when the grain is pretty well ripe and the straw dry it may be used as food; but if the head is green and the stalk contains much sap, so that there is too much moisture, it will damage the horses. Of course wheat or barley given to horses unaccustomed to it is not the same as oats. We have the fact that in South Africa English horses, when they first arrived there from England, were fed upon "oat-hay" and did well, and there is no doubt that the unripe grain given in the straw is much safer than the grain itself. With regard to water, of course that is only part of the horse's ration on shipboard; it is not taken into consideration in connection with forage, either at home or in the field. It is most important, as has been said, that horses should have as much water as they can drink, and they ought to have water always before them whenever possible. If horses are kept from water a long time, they take an inordinate quantity, which is likely to do them harm, and I am extremely sorry that even in our new barracks the water trough, which is now so common in the stables of civilians, is not present as a part of the manger fittings. We have one improvement, however, the rack is on a level with the manger: the overhead racks are abolished; still I should be very glad indeed to see the water trough alongside the rack and manger. The modification of ration which we might hope for should be something on the scale of the German Army. As already stated, horses should be fed according to their size and the amount of work they do. I think there ought to be a peace ration and a war ration. A light cavalry horse weighing 700 lbs. cannot require, and therefore should not receive, the same amount of forage as a horse weighing 1,200 or 1,400 lbs. A horse standing in a stable, well groomed and kept warm, does not need so much food as a horse standing out in the open, exposed to the weather. I think there ought also to be a garrison ration and a manœuvring or field ration; when the work is inordinately severe, let the ration be still more increased. The German scale of rations is, I consider, a good one, and it is well proportioned to the horses and their work. You will see a great divergency between the German and French rations. The French mounted corps for some years have been complaining about the underfeeding of their horses, and some experienced Officers of cavalry in the French Army say that their defeats by the Germans were largely due to the French horses being underfed and the German horses so well fed. This point is noteworthy, because if you compare the two scales of rations you will find a very great difference. I do not think I have anything more to say on the matter. The discussion has been satisfactory, but I am sorry we have not had a larger attendance of experienced Officers, so that we might arrive at some definite conclusion as to really what the forage rations should be.

The CHAIRMAN: It only remains for me to ask you to empower me to give Dr. Fleming a vote of thanks for his excellent lecture.