



Royal United Services Institution. Journal

Publication details, including instructions for
authors and subscription information:

<http://www.tandfonline.com/loi/rusi19>

The Draught of Military Carriages

Colonel G. B. Hobart R.A.

Published online: 11 Sep 2009.

To cite this article: Colonel G. B. Hobart R.A. (1890) The Draught of Military
Carriages, Royal United Services Institution. Journal, 34:153, 779-803, DOI:
[10.1080/03071849009417923](https://doi.org/10.1080/03071849009417923)

To link to this article: <http://dx.doi.org/10.1080/03071849009417923>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the
information (the "Content") contained in the publications on our platform.
However, Taylor & Francis, our agents, and our licensors make no
representations or warranties whatsoever as to the accuracy, completeness,
or suitability for any purpose of the Content. Any opinions and views
expressed in this publication are the opinions and views of the authors, and
are not the views of or endorsed by Taylor & Francis. The accuracy of the
Content should not be relied upon and should be independently verified with
primary sources of information. Taylor and Francis shall not be liable for any
losses, actions, claims, proceedings, demands, costs, expenses, damages,
and other liabilities whatsoever or howsoever caused arising directly or
indirectly in connection with, in relation to or arising out of the use of the
Content.

This article may be used for research, teaching, and private study purposes.
Any substantial or systematic reproduction, redistribution, reselling, loan,

sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

Friday, May 16, 1890.

MAJOR-GENERAL SIR REDVERS H. BULLER, D.C., K.C.B.,
K.C.M.G., Quartermaster-General to the Forces, in the Chair.

THE DRAUGHT OF MILITARY CARRIAGES.

BY COLONEL G. B. HOBART, R.A.

Introduction.

I FEEL that I ought to apologize for not having made the subject pictorially attractive, but graphic representations of modern warfare, such as I should have liked to exhibit, for the support of my arguments, by means of lime-light photographs, do not, to my knowledge, exist. Pictures of batteries in the throes of a hot action; Engineer troops working under a galling fire; Transport columns attacked or delayed and broken down, shivering in bitter weather, and on tempestuous nights, have not been painted to illustrate the difficulties of draught from the point of view on which I would ask you for the moment to stand with me.

I have not even diagrams to exhibit—as I do not desire to lead you among technical details. I am not an inventor or a patentee. I only seek to elicit your verdict on general principles.

I.

THE subject of this paper is brought forward for ventilation and discussion. I hope that it may suggest an enquiry into the question of draught for Field Artillery and all Ordnance carriages, and that it may be taken up as an important feature of progress by the Army at large.

I propose to advocate the adoption of POLE DRAUGHT instead of shaft draught, not on the grounds of superiority in marching, since the advantages and disadvantages are then very evenly balanced; nor in manœuvring, when the advantages are with the shafts; but because of the facility of replacing disabled wheel horses, especially when under fire, and because of the ability to utilize any available remounts.

The advocacy of the pole for military draught has hitherto been as difficult to get a hearing for, as questions of general policy for which public opinion is not yet ripe, but I contend that this is a

question of great public importance, and that it is ripe—in fact, over-ripe—for discussion. It is a question of freeing the whole Service from an antiquated and cumbrous form of equipment, and thereby inducing an economy into the military expenditure of the Nation.

I ought to say in parenthesis before proceeding, that since I commenced to draw up this paper, I have become aware that the question of pole draught under certain circumstances is now being considered, and that improvements in harness are under trial.

Such points may, perhaps, be touched upon by those in this theatre who are conversant with the details, but I still think a general Army discussion may evoke an increased and wider interest in the subject.

In drawing up the following paper the interest which every part of the Army has in the question has been kept in view. It has been impossible, however, to avoid speaking particularly of Field Artillery usages, as this arm comes prominently under fire in action, and the draught of battery carriages is one of its special functions; but as it is a complete and permanent organization, it is probable that other services requiring wheel transport will follow its example.

The question of replacing horses in action is, I apprehend, one of the most momentous we shall have to deal with in modern campaigning. It is a question primarily affecting Field Artillery, but it has a bearing on the freedom of all Arms of the Service, since a breakdown in the mobility of our guns, might detain for a time the advance of the Line in a critical phase of a battle, or it would at least hinder mutual co-operation.

The maximum facility for replacing casualties among draught horses, and the independence of the Army generally and of the Field Artillery in particular, as to requiring special remounts for wheelers, can only be obtained by the adoption of poles.

The question of Shaft Draught *versus* Pole Draught has been brought forward in short papers from time to time in the "Proceedings of the Royal Artillery Institution," and has been incidentally advocated therein in able prize essays by regimental Officers, but the "Journal of the Royal United Service Institution," as the principal professional record for all Arms of the Service, does not contain any lectures or papers on the subject. Hence it appears, as is natural, that the arrangements for the draught of Field Artillery carriages have been left to those who use them. Each generation of the Royal Artillery, since England took a leading position in perfecting the material of their arm, has maintained a conservatism on the question of shafts, and the merits of pole draught have never been seriously discussed at home, though the subject was threshed out in former days in India, when each Presidency had its own system of equipment.

It seems strange in an age when every method of the past is being brought under review and tested by the light of to-day's necessities, that this detail of Field Artillery organization has not been comprehensively dealt with at the same time as improvements in guns, whose very appearance on successive battlefields in a campaign

depends on the facility with which their loss of horses can be supplied in action, and on their not being too dainty as to remounts.

The general features of shafts and poles are, of course, well known to us in every-day life, but there is a difference in their adaptation to military purposes. Gun carriages and wagons of the manœuvring class are composed of two portions, the body and the limber, in order, among other reasons, that they may be sufficiently flexible in moving over uneven ground; and in consequence of this construction, the wheel horses in each system of draught have work to do which is not required in a rigidly connected four-wheeled vehicle.

In ordinary wagons and carriages, pole horses have nothing to support, and in heavy wagons, with double or single shafts binged to the splinter bar, there is only the weight of these to carry, so that in all cases the horses have merely to draw and steer the load. A limber, however, is only a two-wheeled carriage, and in the British plan of construction, the shafts or pole have to be supported whether the rear carriage is coupled to it or not.

In a well-balanced dog-cart the horse has comparatively little of his strength deducted from his haulage powers by carrying weight on his back, and he can "bowl along" unencumbered on a good road; but in a military carriage, on the other hand, a shaft horse has to support a considerable weight, and has besides increased fatigue from the jolting caused by the instability of the limber and the absence of springs.

The preponderance of the pole of a limber or a cart can be supported in two ways—either (1) on the horses' backs by a curriole bar, or (2) on the horses' necks through pole straps to their collars with a collar-bar or a pole-yoke. The first method is unsuitable for manœuvring, as a mounted driver is impossible; but the second, though it has its drawbacks, can be made practically effective for all purposes. In the last method the weight, by hanging on the horses' collars, bears down their necks, whereas with shafts it is carried in the most advantageous manner, viz., on the horse's back, and that, undoubtedly, is best for having full control over the carriage. The horse, however, is fixed as in a vice, and having a heavy breeching, and perhaps a kicking strap as well, must be a specially strong animal to start with, and then has discomfort enough not only to impede his freedom but to break him down, so that he may finally have to be dragged along at the expense of the other horses of the team.

II.

The origin of each form of draught for civilian uses sprang no doubt from certain local necessities arising from the quality of the available cattle, and from the nature of the different countries. Pole draught was probably the more ancient mode, having its origin in the yoked bullocks of the primitive plough, and having a higher exemplification for horses in the curriole of the war chariot. The

pole has been adopted or retained for agricultural wagons in many parts of the European continent, whereas in England shafts are almost universally used in the country. This may be in a measure from our possessing exceptionally fine horses adapted for shafts, and also from the fact that a great deal of our agricultural land is in hilly districts, necessitating much holding back in going down hill with heavy loads.

It appears from histories of early Artillery Trains that the cannon which accompanied mediæval armies as a somewhat doubtful auxiliary, and, in the opinion of knights and men-at-arms, a despised incumbrance, were usually dragged by single horse teams in front of a "thill" horse, who bore the preponderance of the trail by shafts attached to the end of it, after the manner still used under some circumstances with mountain guns.

When limbers came into use about the beginning of the 17th century, pole draught was adopted by Continental armies, but the British still retained a horse in shafts, and added another horse to pull on the splinter bar, like a gipsy van, so that the two horses eventually became the wheel pair of a regular team with mounted drivers.

To English Artillerists were due the great improvements in guns and carriages that were introduced in the early part of this century. These were largely copied by the French, though they declined to adopt shaft draught. The advantage of the solidity of carriages with shafts was admitted, but one reason for not adopting that system was that it was not used in the countries where France most often carried on campaigns. This may be taken as a useful suggestion that we should be prepared to use any animals that a theatre of war can provide.

The pole draught used in the Bengal and Madras Artilleries till the amalgamation after the Mutiny, grew out of the custom of the country. Buckle, in his "Memoir of the Bengal Artillery," relates that in the early days of warfare in India, and up to the end of the last century, bullocks were the only draught cattle employed for Artillery purposes, being attached to the carriages by poles and yokes, such as are still used in hackeries and bandies. This mode of draught was afterwards adapted to suit horses with the various patterns of carriages that were evolved from campaigning experiences, and altered from English and French models.

III.

The general advantages and disadvantages of pole draught as compared with shaft draught are known to all students of military organization, but for the purposes of this paper I propose to enlarge on them.

The advantages of the pole contrasted with shafts may be stated categorically as follows, in what appears to be their relative order of importance.

CHIEFLY.—There is the advantage of much greater facility in extricating a disabled wheel horse.

In the case of a shaft horse down there is an inevitable amount of struggling with straps and traces in order to get him clear and on his legs again, if possible. Artillery Officers well know the work that ensues when the horse is entangled in the traces and the shafts are jammed in the harness. If this causes delay and some unavoidable confusion in peace manœuvres with plenty of men available, how much will the difficulty be accentuated under fire with continually occurring casualties among the men, and perhaps among the horses of the very team that we are trying to reorganize?

Then when the disabled horse is clear, another has to be got into his place. If the new horse is frightened, which is not improbable in action, much care will be required, and, therefore, time occupied in backing him into the shafts, whereas the most difficult horse, the "real brute" or the kicker fresh from the remount dépôt, may be strapped up to a pole by main force.

It is a subject that presents a most disagreeable picture of losses that might be appreciably lessened by the saving of invaluable moments in having only a pole horse to deal with, which is already half free, instead of a shaft horse which is entirely confined.

For hooking in and changing horses at any time, a pole is much the easiest arrangement. We have always before us the ease and quickness with which coach and omnibus horses are changed, and the almost instantaneous process of turning out fire-engines, and unhooking, too, as examples of what can be done with poles, but could never be accomplished in the same time with shafts.

Hooking in shaft horses in the dark is liable to be a difficulty, and even in daylight an unhandy horse may delay a parade being ready, or it may be necessary to have him sent to the park before the others in order to save time.

These are very real inconveniences, but are sufficiently ordinary occurrences not to be known beyond those immediately concerned.

AGAIN.—There is the advantage that special shaft horses are not required.

By report we know of the difficulty that Remount Officers often have in securing the right class of horse suitable for shaft work, one which combines weight with activity, and by experience in batteries we know of the difficulty of supplying the places of posted wheelers that become casualties from one cause or another. The big sizeable horse for the shafts necessitates another equal in appearance, if not quite so heavy, in order to make a pair, and thus a double number of exceptional horses are required, and the difficulty and expense are enhanced accordingly. Further, if horses taller than an average height which will suffice for wheelers are introduced into the Service, the standard for all the other horses of a team is necessarily raised in order to preserve the upward line of draught. The Remount Department on field service may find it impossible to keep up a supply of the stamp of horses that we have been accustomed to, and though it is to be hoped that we shall always have a nucleus of such horses, we must

be prepared to receive small animals as a campaign proceeds, and then pole draught would put us in a position to utilize them without difficulty.

AGAIN.—There is the advantage of the easy interchangeability of the horses in a pole team.

This is one of its paramount advantages, for although the initial order on parade as to sizing and teaming would still be arranged on the principle of the strongest horses in the wheel, and the tallest and most active in the lead, yet the capability of the centre and lead horses to change with the wheelers, and their being equally trained to pole work must be kept in view.

In action, the gun teams have to be reorganized after losses in the best available manner. If wagon teams are present, the gun teams are made up from them, when the spare horses have been disposed of. Hence every horse in a battery has to be utilized wherever required, and lead horses, and possibly riding horses also, will have to do wheel horses' work. How necessary, therefore, it is to have a general uniformity among draught horses, so that the teams may be more easily re-formed in action. The best horses will naturally always be allotted to the guns of a battery, but the smart teams of peace time will, I fear, and regret to think, soon be broken up on service, and the wagons, on account of the importance of the ammunition supply, will have to be horsed nearly as well as the guns.

Another advantage, which may be here noted, is that when a wheeler is disabled and time is an object, a carriage may be dragged by one pole horse with a leader for a short distance, whereas if a shaft horse is disabled he must be replaced before the carriage can be moved.

AGAIN.—There is the advantage of having the strength of two horses to stop or keep back, and to steer a carriage.

In the case of shafts, one horse has to do all the work of pulling up or backing and of easing a carriage down a descent, with only slight assistance from another. One strong animal is certainly equal to all these requirements, and can exert his whole strength directly and evenly through the tug and breeching, whilst the riding-horse pulls back on one side only. A good and fresh well-conditioned shaft horse is undoubtedly best on a stiff hill, but the supply of good shaft horses cannot be depended on during active service, and they cannot be always fresh or kept in good condition.

The modern adaptation of brakes for manœuvring carriages, by lessening the strain on the wheel horses, admits of their being less powerful animals, and this helps in the economical aspect of the question.

The further advantage in having two horses to steer a gun is of immense importance, as a shaft horse may soon get weary in rough country and in hot weather, and become practically useless.

AGAIN.—There is the advantage of more uniformity and simplicity in the wheel harness.

Both pole horses have breechings of the same pattern, and the off horse can carry the same saddle as the other horses, so that two

totally different breechings, near and off, and a luggage pad with clumsy tugs, as required in shaft draught, are done away with.

It has been proposed that the tugs should be open hooks, as in improved single harness of private carriages, but this plan would obviously only partially meet the difficulty of having to put an unhandy horse into the shafts, or of dealing with a fallen one.

IV.

The disadvantages of the pole may be enumerated in the following order. They are usually said to be :—

1. Galling and wringing of the pole horses' withers, and the objectionable weight on their necks.
2. The chance of its breaking.
3. The carriage not being so well under control.
4. The loss of parade smartness in appearance.

(1) The chief and undeniable objection is the great strain on the withers of the wheel horses. A pole has necessarily some play, and thus the horses' necks are continually jarred in going over rough ground, and the weight is liable to make them stumble and cause falls. It would be unusual, however, for both horses to fall together, and so the pole would be kept in its normal position by the horse left on his legs, whereas, when a shaft horse falls, the level of the limber is at once upset, and the limber gunners are chucked off. This difficulty has, nevertheless, been accepted by all the Artilleries of the world except our own, and it is evident that it can be minimized, if not entirely obviated, by the ordinary precautions of interior economy, and that the matter of keeping their teams efficient may be left to the experience and forethought of Battery Officers.

There was a most liberal allowance of spare horses under the organization of the old Bengal Horse Artillery, in order, it would appear, especially to meet marching casualties. By the Bengal Regulations of 1812, in which year the Horse Artillery was first permanently established, each gun of a battery had two teams of six horses. This was doubtless in consequence of the off-rider system which they had adopted, necessitating a constant change of horses, since the Arabs and country-breds, though hardy and enduring, were not equal to the continual strain of both draught and riding combined for every horse under heavy European gunners in a fatiguing climate.

In the last edition issued of the Bengal Drill Book, dated 1854, nothing is said about replacing horses in action, but under the head of orders for the march it is laid down as follows: "In general it is not desirable to change horses on the march. With double sets, working them on alternate days, affords the best relief to the horses, and is more convenient. A portion of spare horses will always be at hand to replace any that may become lame or overtaken."

On the above instruction it may be remarked that hard work in a hot country will, certainly render pole horses more susceptible of

having their withers wrung, but, on the other hand, a shaft horse will sooner be overtaken than one attached to a pole.

The luxury of having a complete spare gun team cannot be expected, and is not now required even in India, as the horses used there are of a more suitable size for draught, and the off-rider system is not practised.

Some spare horses must, however, necessarily be always at hand when marching on field service, and failing them (as might happen on a peace establishment at drill or manœuvres), the first change to relieve the pole horses can be made with the centre horses.

(2) The risk that a pole will break at awkward moments is doubtless more likely to occur than with shafts, but it is obvious that a spare one is more easily carried than a pair of spare shafts, and also that a broken pole can be more easily repaired, or a fresh one improvised from rough material.

A pole cannot be prevented from sometimes digging into banks which have to be cleared by guns in their advance, and into the ascents out of deep nullahs, but shafts, or at all events an overtaxed shaft horse, may bring about the same results under similar circumstances.

(3) The disadvantage of not being able to ensure such sharp pulling up and wheeling, would be a loss of smartness at field-days to be deplored from a picturesque point of view, but as this smartness is entirely dependent on having strong well-trained shaft horses, and as pole draught is known to be amply sufficient in these respects for practical work, the parade effect is of secondary importance.

(4) The loss of appearance in turn-out can be borne with equanimity, and even hailed with professional enthusiasm, if there be a sufficient practical compensation. The sight of a long pole with perhaps a set of swingletrees or a master bar at the end, is certainly against a change from the neat turn-out of shafts with good wheel horses. The German Artillery may look clumsy to us, but the outward appearance is compensated for by the ease with which a disabled wheel horse can be removed, and by the uniformity of their harness.

However, if a trial of pole draught were determined on, the constructive talent of the R.A. and R.E. would doubtless be equal to securing the most sporting turn-out without losing sight of essentials.

V.

Pole draught is applicable not only to the gun carriages and wagons of Horse Artillery and Field Batteries, but it might well be regularly adopted for all descriptions of four-wheeled carriages, except, perhaps, for those of siege-train equipments, which require two shaft horses.

It is not only applicable to the ordnance carriages used for the transport work of an Army in the field, but it is much the more desirable method for the purpose. In his excellent treatise on "Mili-

tary Transport," Colonel Furze, after pointing out that it would be better to have transport carriages driven from the box in preference to the postillion system, on account of the waste of power in having a rider for every pair of horses for slow road work, and also because trained men are required for postillion drivers, and cannot be got together in sufficient numbers for a campaign, or kept up during one, makes an appeal for the adoption of pole draught. He writes: "Whilst still on the subject of wheel transport, let us advocate the use of poles in place of shafts for transport purposes, principally on the same grounds on which we have advocated the employment of drivers in place of riders. Shafts are no doubt better for carriages moving at speed, for rapid manœuvring, turning, &c., but they are undesirable where these points are of no object, for they throw all the weight of the wagon on the shaft horse when going down hill, passing over obstacles, or backing; thus the work is not as equally divided as it is when the pole is used."

The case of the pole is here advocated for driving with long reins, but the arguments in its favour are equally cogent with the postillion system, which is obviously requisite for Field Artillery and Engineer Troops, since it is impossible for a box driver to retain his seat securely off main roads. Besides, detached pairs of horses must have a mounted driver, and it is, moreover, necessary to have a man to guide and hold up each pair on difficult ground, or in night marching, and to keep them quiet when frightened.

It is evident, therefore, that the adoption of pole draught is a question of great interest to Transport Officers, as well as to Artillery Officers.

It should be noted that pole draught is already in use, or can be used with all types and patterns of four-wheeled transport wagons, such as the general service of the latest marks, ammunition and store, ambulance, bread and meat, pharmacy, &c.

These wagons are constructed for both pole and shafts, but the former is seldom used except by the Army Service Corps with a pair of horses driven from the box in camps and garrisons. This is chiefly because long reins and whips are not supplied to other services on a peace establishment, although on a war footing all batteries and ammunition and supply columns will have a proportion of such stores for alternative driving. The service harness, though primarily designed (as the Equipment Regulations say) for postillion driving with shafts, can be adapted for driving with a pole, as laid down therein; but since shafts are supplied with the store and other extra wagons belonging to the R.A. and R.E., these services usually follow their ordinary custom of draught.

The special natures of R.E. wagons are fitted for shafts only, because that corps has decided to have every pair of horses in their teams equipped with wheel harness, in order that they may be available for carts on construction works.

The R.E. appear also to keep in view the necessity of being able to put any pair in the wheel of a team, a change that the R.A. do not systematically practise, because the lead and centre horses are

often so much taller than the wheelers, that the hand horses of these pairs would carry the shafts uncomfortably, if not unworkably high.

VI.

The possible reintroduction of "galloper guns" for Cavalry, and of "battalion guns" for Infantry, foreshadowed by recent trials of regimental machine-guns, is a further sign of the pressing necessity of relieving other Arms from the grave drawbacks of replacing shaft horses under fire.

Light machine-guns do not require heavy wheel horses, and, therefore, horses fit for pole work will be much more easily found in the ranks of a Cavalry regiment. These considerations seem to point to the absolute necessity of using the pole with such guns. Most horses will draw on a pole without giving trouble, but as every horse will not take quietly to shaft work, disastrous delay might be caused if a horse were taken from the ranks to replace a disabled wheeler, and it refused to move, kicked, or tried to lie down under the weight and confinement of the shafts. This in the case of a machine-gun, with only a pair of horses, would cause a greater difficulty than with a field gun, on account of the absence of lead horses to keep the recalcitrant one on his legs. The adoption of a pole would probably to a great extent obviate the drawback experienced by the panting of the shaft horse making steady aim difficult on first coming into action.

The question of draught is also of great importance to such Volunteer Artillery Corps as are armed with field guns. They have by the latest regulations been emancipated from having farm horses with carters walking by their side, and are empowered to horse their guns and have mounted postillion drivers. It is certain, therefore, that as the hired horses will, as a rule, have been accustomed to drays and vans with pole draught, they would take to their work more kindly if they do not find themselves put into shafts; and, consequently, those who are not in every-day contact with horses will be saved from one of the most anxious and perplexing duties of Field Artillery Officers, viz., the dealing with shaft horses. In connection with the supply of horses, it is a question of the greatest importance to the Royal Artillery in particular, and to all departments that use carriages. With our large number of skeleton batteries that have to be raised to war strength on mobilization, and with a Transport Department that has practically to be created for field service, it is most advisable to adopt a system of draught which can be easily taken up by the untrained remounts of many sorts that will have to be collected on an emergency.

VII.

There has long been on record a notable instance of the impossibility of shaft draught, under circumstances that might occur again, or which have occurred from time to time since then, and made

Officers who were responsible for the organization of Field Artillery on foreign expeditions, wishful for the simplicity of poles.

In Duncan's "History of the Royal Artillery," there are long quotations from General Lawson's narrative of the Expedition to Egypt in 1800, which is a MS. in the R.A. Library, Woolwich. Therein are detailed the expedients adopted for making the carriages of the train sent from England suitable for the difficulties of locomotion in that country. The General writes: "Every reform possible was made to lighten the travelling of the ordnance." He then specifies how poles were at once substituted for shafts, as soon as wood could be obtained, on account of the inferiority of the "poor undersized" horses that had been purchased at Constantinople; and relates how finally light guns were turned out with pole teams and gunners on the hand horses, besides limber gunners and others on axletree seats, which were improvised for the occasion.

Among the remarks on the preparations and experiences of the expedition, one paragraph is as follows: "Foreigners frequently observe the singularity of shafts being preferred in the British Artillery carriages to the poles made use of by all other nations as being simpler, lighter, and cheaper; added to which the experience of having travelled over the most difficult features of Europe, and ground of every description, with them, fully evinces their perfect sufficiency. A strong instance of the inconvenience of shafts occurred to us at Rahmanieh: just as one of the 6-pounders was limbering up, the shaft horse was killed by the enemy; much time was lost in clearing the carriage from him, and the harness being also much damaged, rendered it difficult to supply another in his place."

The above extract sums up the whole question, and the comments are as applicable now as 90 years ago.

VIII.

It may well be asked, why, if the mobility of our field guns is so satisfactory, standing as it does first of all European Artilleries for general handiness in manœuvring, we need make a change? Will it not be dangerous to alter what works so well? Is not the appearance of our teams more like business than that which any other army can show? Do they not approach more the character of sporting coach teams, which are pre-eminently a British *spécialité*? It may, however, be asked in reply, can we feel sure that this superiority in peace manœuvres and this system which has been sufficient in our wars against primitive and savage foes, will suffice on European battlefields against organized troops? If we wait on till we can make up our minds for a change, it may only be to find by bitter experience that the British Artillery must conform to modern methods. Can we contemplate calmly the picture of a battery in action, and realize the loss of men who, instead of being valuably employed in keeping up the fire, are struggling with fallen shaft horses so that the supply of ammunition fail not, and whilst so detained are one by one rendered *hors-de-combat* by a wither-

ing Infantry fire? Field guns are now more than ever anchored to their position as long as it is a good one, and as long as they can support the general fight. All possible refitting is to be carried out in position, and if when the order comes to advance, the teams have been so reduced in consequence of the delays which have kept gun limber and wagon teams unnecessarily under fire, from the difficulties with shaft horses, then the movement may be rendered useless.

The greater losses that may be anticipated in future wars among Artillery draught horses in action arises as well from the increased accuracy and volume of Infantry fire as from the necessity, that has arisen of keeping a proportion of the ammunition wagons close to a battery, whereby their ability to replace gun horses owing to their own casualties, is so much reduced. It must be remembered, too, that Infantry are now taught that when opposed to Artillery they should endeavour to get as near as possible, and direct their attention first to any teams that may be visible.

There are, unfortunately, no statistics available in comparing shaft and pole draught under fire. The advantages claimed for the latter ought to be supported by statistics of lives and time saved to Field Artillery, and consequently to other Arms, in action, and of economy in horse flesh in all departments; but the British Army stands alone in the use of shafts, and we cannot deduce any lessons on the relative merits of the two systems from the latest continental campaigns. However, the universal use of poles in foreign armies, and there being no attempt or wish on their part to follow our example, may well make us hesitate as to the practical correctness of our course. Can we feel sure that in the matter of replacing horses in action we shall be capable of doing so as easily as our neighbours? Could the severe losses in the last campaigns have been dealt with so well if time had been occupied, and, therefore, lives risked, whilst shaft horses were being continually replaced?

It is recorded that in the battles near Metz in the campaign of 1870, many batteries of the German Artillery lost more than three-fourths of their horses, and some lost even more than their complement. Severe losses were made good from the ammunition columns, but it became a question, writes Captain Hoffbauer, whether they ought not to have been supplied by a horse dépôt, since, by depriving the columns of so many horses, there was always the risk of rendering them temporarily incapable of marching, and of making the supply of ammunition an uncertainty.

The usual calculation in the British Artillery for spare horses is 10 per cent. on the total establishment, which is varied between the riding and the draught horses. A battery of H.A. and a light Field Battery have exactly the same number of draught horses on a war footing, viz., 98, and for these the H.A. Battery has 12 spare horses, which gives more than the above percentage, and the Field Battery has eight, which gives less.

Assuming, for the sake of illustration, that all the spare horses are available for the combatant portion of a battery in action, say at the beginning of a battle, there will be a much higher proportion

than the above for replacing casualties in the teams under fire. Since only 54 horses, or the teams of six guns and three ammunition wagons, would probably be under fire at any one time, the ratio of spare horses to teamed horses would be about 1 to 4 in the Horse Artillery, and 1 to 7 in the Field Batteries.

This seems ample, and as the gun limbers will, besides, be completed when necessary from the teams of emptied wagons before they go away to the rear, the real difficulty will fall on the lines of wagons to keep finding horses to send full loads of ammunition to the front.

Of the principal foreign artilleries concerning whose establishments I have been able to gain some information, the French seem to have made about the same estimate for spare horses as ourselves, but in the German and other armies it appears to be less.

Hence it may be taken as certain that pole draught will not increase our establishments in peace or war.

IX.

The first obstacle to any change in equipment is the question of cost. Fortunately the change now before us appears to have economy to recommend it. The alterations in the carriages and harness, as they tend to simplification and lightness, will in the end surely bring about economy in original cost and in renewals. The ability to be satisfied with moderate sized horses must ultimately introduce an economy into Army expenditure, not only in war-time, as to the class of remounts bought up for field service, but also in the initial purchase of draught horses in peace-time.

In view of campaigning exigencies, it would be better to have only moderate sized horses at home for the following reasons:—

1. Small horses get less knocked about and require less space on board ship, which are points of especial significance to us who must always embark for active service.

2. Small horses want less forage, and, therefore, effect a saving to the commissariat charges for supply and for transport.

3. Small horses suffer less than large animals from "short commons" and irregular feeding on service.

4. Small horses can be more easily, and, therefore, more expeditiously harnessed, mounted, and efficiently groomed by short drivers; and, further, the smaller the carcase of a disabled horse the more easy will be the work to clear it away, and perhaps unharness it, for wearied men in action.

It is well known what good work small Cape horses can do in draught in their own country and in India. The Bombay Horse Artillery found 14.2 Arabs work admirably, even as shaft horses, and in such rough country as Afghanistan; the Royal Artillery batteries also that went out to India for the Mutiny did good service with horses that were very small compared with those they had left at home.

This, however, is no argument in favour of any small horses being

used for shaft work, since it is only the pluck of Arabs and those of kindred blood that carries them through exertions that underbred horses would never face; but these instances do show that an angle of traction less than that usually accepted as correct is practically workable, and that small horses are fitted for Artillery draught.

The Artillery in India have for many years been remounted with Australian horses, which have constantly improved in size and quality according as the breeders found the market good enough for increased attention to out-turn. Against this the Commissariat Department can probably show that their forage accounts have proportionately increased since moderate sized Arabs, Persians, and Capes have been displaced by large Walers.

These facts and considerations bring into prominence the economy that may be judiciously and reasonably practised in the supply of smaller draught horses than we get now if pole draught were adopted. Other economies may also be looked for with smaller animals. The harness may be lightened, and the shoes and nails would be of smaller sizes, and, therefore, in both items there would be a saving of material in providing large quantities, and the transport of spare stores on service would be sensibly decreased.

It is much to be hoped that a trial of pole draught with limber carriages will be authorized under regimental and departmental officers, in order to find out how the system can be worked; but not, I respectfully deprecate, to compare it with a system which, though it has contributed to good work in the past, is now an impossibility in action. The comparison, without the realities of battle, would, I fear, only lead to adverse conclusions.

The trial should be made to test the facilities of what may be termed "the interior manœuvres" of a battery, viz.: the changing and replacing horses, &c., as much as for marching capabilities, which so largely depend on careful supervision, and are, therefore, more under control.

The technical questions must, of course, be settled by a Committee, such as: the system of pole fittings, whether counterpoise, like the Madras and the German, or supported, like the Bengal and the French; and the consequent details, whether swingletrees, or pole-yokes, or collar-bars; and the mode of trace attachment; also the re-adjustment of the balance of the limber, and questions of harness, such as a mixture of collars and breast straps, and the carrying of breechings by centre horses, and by all spare horses in harness.

It should here be noted that an admirable paper, lately published by Lieut.-Colonel Walford, R.A., in the Proceedings of the R.A. Institution, Vol. XVII, No. 10, giving a description of the Swiss Artillery, contains details of their system of pole draught which are well worthy of attention.

The draught of carts, such as store, forge, tip, water, ambulance, and scotch, will have to be arranged for, and unless these can be satisfactorily balanced for pole draught, a proportion of shaft harness will have to be retained.

X.

It is difficult to be bold enough to advocate a change when our present system of shaft draught has been so long in use, and has not been the cause of any breakdown on service. It is, however, very questionable whether it is now suited to an age of more practical equipments, necessitated by the short, sharp, and decisive character of modern campaigns, and the deadly effect of modern firearms.

The fact of poles having been used by the contending armies in the greatest war that has been fought with modern weapons, and that disaster was not caused on either side by the failure of their Field Artillery on a question of draught, may be taken as a proof of the capability of the system under heavy and destructive fire. It may be presumed, from the silence of writers on the Franco-German War regarding this point, that the subject of replacing horses disabled in action or over-strained in marching never got beyond the stage of a battery detail, and was always more or less easily provided for.

It is an instructive fact, from which we may argue that the facilities of replacing horses in the German Artillery are satisfactory, that Prince Kraft, in his "Letters on Artillery," lays no stress on the subject, making the replenishment of ammunition the great anxiety, as its want is the only cause of a battery becoming non-effective.

The application of pole draught does not require prolonged experiment, for the question has already been settled for us by the Bengal and Madras Artilleries. The brilliant results obtained by forced marches which insured opportune arrival at critical moments, and by skilful and rapid manœuvring to take up positions which secured victory, are matters of British military history, and testify to the value of the system. The details of equipment which had then been perfected are so clearly recorded that the force of Field Artillery now in India might at once revert to the practice of those who helped to win and keep that country; and for campaigning elsewhere the rough experiences of former days in India, irrespective of the examples of foreign Artilleries, are sufficient to warrant the universal adoption of poles without delay.

The Regular Army is in a responsible position towards all the auxiliary and supplementary forces of the Empire. We are looked to as the example, and our example must be according to the latest ideas and the most approved methods known among military nations. We, on our part, have had for many years to look to the Continental armies for practical experiences in warfare under modern conditions, and directly and indirectly, knowingly and insensibly, we have in different ways adopted many of their reforms.

The question of draught is especially an artillery detail, and the example of the Royal Artillery has hitherto been followed throughout the Army. On them, therefore, will rest in a measure the responsibility of retaining the present system against the experience of the great-armies of Europe.

Let us carefully note again the numerous and important interests,

besides those of the Imperial Field Artillery, that are involved in the adoption of pole draught.

The Cavalry and Infantry may have in the future a particular interest in machine-guns, and they have always regimental transport to deal with. The Engineers have an almost identical interest with the Artillery as regards their Pontoon and other field Troops which may come under fire. The Transport Services have a direct and potent interest, and the Volunteer Corps who have field guns are interested in having the matter of draught made as easy as possible. The Land Forces in our Colonies are assuming a definite organization, and look to the headquarters of the Imperial Army for instruction and pattern of equipment. Are we not, therefore, assuming a very grave responsibility if we let them adopt shaft draught in the face of modern experiences? Does not the militia character of their organization, together with the fact that the horse ordinarily used in our Colonies is of a small class, demand that they should have the simplest equipment? We may well be cautious lest we lead them astray, and then, like the United States after the establishment of the American Republic, we see them abandon the British shaft draught and decide on pole draught as more suited to the needs and characteristics of their country. We must, then, set them a good example, and deal with this question before it is too late; before campaigning necessities arise, when, like the attempt to change horses in mid stream, hasty reform is most dangerous.

Conclusion.

I am perfectly aware that I have been contending for a change on a mere supposition, viz., the supposition that in any future campaign the loss of horses in the Artillery, the Engineers, and the Transport columns, departmental and regimental, will be intensified by the embarrassment of shafts. Whether it is due to the enemy's fire, or to the utter exhaustion and breakdown of horses in the long and rapid marches that the vigorous strategy of modern warfare demand, the casualties will, I conceive, be enormous. It goes without saying, that they ought not to be increased by difficulties due to a want of simplicity in our method of draught.

I have attempted to sketch, though only faintly, the not improbable prostration of a battery in action from the additional work thrown on all ranks by the casualties among shaft horses hampering the supply of ammunition. Engineer troops, in the conduct of their important duties, will experience similar difficulties with shaft horses when caught under fire; and Transport columns on the march, whether caught under fire or not, will often be delayed by shaft horses (perhaps one keeping a whole column waiting in a narrow defile or road), and thus the best laid calculations for the rapid pushing forward of supplies may be defeated.

It is, therefore, to the reasonableness of this supposition that the issue before us is, in my opinion, narrowed.

There is well known amongst us artillerymen the saying of a

gallant senior Officer, now passed away [*requiescat in pace!*] that "a change is an innovation, and any innovation is to be deprecated." That statement, I think, may be held to be broadly correct in principle, as when a change appears to be advocated only for the sake of change, it is certainly to be deprecated. The Service has good reason to rejoice that this view has lately been so clearly enunciated by the august head of the Army, and if I did not think that the change I advocate were urgent, and of the greatest importance, I would not have ventured thus publicly to invite a discussion on it.

I have adverted to the practice of foreign armies, but it is by no means with the intention of proposing any exact following of their example as to detail, for to follow is to be behind, and that is a position that the British Army can never be content with.

The old proverb that "practice makes perfect" has well been turned to read "progress makes perfect." Let us then progress, according to the dictates of modern conditions, as near to that will-o'-the-wisp perfection as we can; and however much we are, and justly, *Laudatores temporis acti*, we shall better safeguard the reputation of which we are so jealous, by correcting and perfecting our organization in every particular.

The CHAIRMAN: This lecture has raised a very important point. Everybody must admit that the question of how we are to couple the wheel horses, especially in our military vehicles, is a very important question. I think the lecturer has raised it very fairly and on very broad grounds, and it will be very interesting if gentlemen who have experience, either in transport or artillery details connected with this matter, will give their opinion on the points that have been raised.

Major-General C. B. BRACKENBURY (the late): I only rise to strengthen, as far as lies in my power, the words that have fallen from the lecturer, who has put together in a most interesting way not only the arguments on the side that he advocates, but those on the other side. So much has he done so, that at one time I thought he must have said to himself, "Here I am actually posing as a firebrand, to which I am not much accustomed." He, therefore, in a soothing way, takes care to tell us that we are the first of all European artilleries in general handiness and manœuvring. No one will be inclined to dispute the excellence of our artillery, certainly not I, who am an artillery Officer myself; but, at the same time, I should like to know what the word "manœuvro" means in a case of this sort. If it means drill, whether you can turn sharply to the right or to the left, or reverse sharply, then I agree with him; but having seen a good deal of poles in actual work in great campaigns, I must honestly say that I never saw a single difficulty in manœuvring arising out of the use of the pole. There is a drill-ground near Berlin where movements of artillery are carried out in a very practical way. They set up jumps, banks and ditches, ditches and banks together, and various obstacles, and over these they go at a gallop. I have seen the poles wriggling about in a way that would not look pleasant to British eyes, because we have been accustomed to the shafts, and the pole is not the fashion with us; but I never saw the slightest accident occur from its use; therefore in these matters of practical manœuvring I do not see why we must necessarily claim any very great superiority. The question hangs, of course, on the kind of manœuvring. It is very well understood now that what is required of artillery is that it should be able to march fast and far, to come into position rapidly, and then shoot well. The third point is not one that we are discussing to-day, but the others that I have mentioned are quite as consistent with pole draught as with shafts. There is one principle of field artillery which the lecturer did not name: it is one which has interested me for many years, which I brought forward a long time ago in this Institution, and which has since then been so far adopted in the British Army that I believe it now governs the

use of the arm at Aldershot, in so far that in coming into action the horses are unhooked and taken to the rear. This recognized principle is that while in action by far the greatest losses of all are in horses, and the next in men, there is no practical loss in action in the matériel. The greatest loss of all is in the horses; therefore it has always stood to reason that the horses should be unhooked and taken to the rear. What does that mean? It means that you have to bring up your horses when you want to move the guns again, and hook them in, perhaps under fire. Anybody who has had experience in the field with horse artillery must know what an immense advantage pole draught will give in doing that rapidly. The lecturer mentioned the Fire Brigade. I have watched the turn-out of the fire engines, and on one occasion I timed it from the moment of the ringing of the bell to the moment when the engine issued through the gates at the gallop, and it was exactly eleven seconds. I ask anybody whether it would be possible to take a great shaft horse and stick him into the shafts, and buckle straps here, and buckle straps there, and put him in the condition of a swaddled baby in anything like that time, or in any practically short time? It really is a very long business indeed, and such a delay might cause the loss of guns. The lecturer has told us a great deal, and has done so extremely well, about various other points, such as the horses in the shafts falling, and the enormous difficulty there is in getting them out. Those who have been in the horse artillery, as I have, and as he has, and as others here have, must know perfectly well what it means. A horse falls, perhaps hit by a bullet of the enemy; bang goes the shaft upon him; there he lies in such a position that it is almost impossible to extricate him; you really cannot get him out for a considerable time. The result is that your gun is enormously delayed in coming into action, which is a very serious matter. This does not occur with pole draught. You cannot imagine in pole draught any difficulty whatever in getting one of the horses out. After so thoroughly exhaustive a paper, I have nothing more to add except to express my congratulations to the lecturer on having given us such an excellent and practical address.

Colonel REEVES, C.B. (A. S. Corps): I was waiting for an Officer of General Brackenbury's experience to speak as to the artillery view of this case before I ventured to make any remarks. I think there can be no doubt that with the transport, which is the branch of the Service I represent, the pole is the thing. We see it in the experience of all other countries; we see it abroad in our own Colonies; we see it more particularly at the Cape, and in Natal; we see it in Canada; and nowhere, when we go out of this country, do we see pairs of horses fastened to four-wheeled vehicles by means of shafts. We have, as our lecturer said, realized now that there is a departure with regard to transport carriages. The new transport carriage, with which our Chairman has been so much connected in producing, has the pole and nothing else. Of course there are poles and poles, and it does not follow that because wagons that we have already in the Service have poles, that they are satisfactory, because some of the poles have not been of the right pattern; but I am perfectly convinced, if you have a proper pole, that is the proper system of attachment for the wheel horses in the case of four-wheeled carriages. The great advantage is it does not upset your horses by their having to carry such a weight on the back. The weight of a pair of shafts alone on the wheel horse is 28 lbs.; you get rid of that with the pole. Of course there are details as to how the pole can be best carried, and there are various opinions on that subject, but many of the opinions which have been expressed against it are, I am convinced, very theoretical, because, as I said before, if we look to the experience of other countries we see these poles constantly in use, and we use them ourselves abroad. If any gentleman takes an interest in these things, I will venture to say there is a very excellent pole to be seen at the Military Exhibition on a Grove's travelling oven, a German invention. The great feature of the attachment is the play of the fore carriage. Of course in a four-wheeled carriage for field service you would either have your pole to hinge to some extent, or you must get the play at the king bolt. I think it might interest somebody to see that pole. You can lift it up to 6 feet above you, or you can depress it and sit down upon it without the slightest injury at all.

Lieutenant-Colonel ALT (22nd Middx. R. Vols.): I should like to say a few words upon this subject. I do not speak as a gunner or Royal Engineer, but from the humble point of view of a Volunteer with reference to the machine-gun for infantry service. As a student of military history, and as a frequent traveller in Continental countries and in the United States, I can fully endorse what the lecturer and Colonel Brackenbury have said as to the practicability and common-sense, business-like advantages of the pole over shafts for military draught. With regard to the machine-gun, in the introduction of which the corps I command has been associated, we commenced by using limbers and shafts, but soon found that they were unworkable, and we finally adopted a two-wheeled limber carriage which I designed and which practically has a pole, that is to say, the trail is used as a pole; it has one crossbar at the end of it with a hinged prolongation of the pole, and another crossbar to this, by which the men are able to pick it up or drop it at a moment's notice. As evidence of what we can do I may mention that from column of route we can halt, come into action to the front or to the right or left and fire fifty rounds in thirty-five seconds, to do which we have to open the drawer and sit on the hoppers. Of course this is very different to a fire engine, simply hooking on and coming out of a stable, but we can beat the fire engine in getting to work. I am not at all an advocate of animal draught for machine-guns for infantry battalions, but if the authorities were to say that animal draught must be used, then undoubtedly we should never attempt to work with shafts. It is no longer the rôle of artillery to remain at long range from a position, but on the contrary to get well to the front and stick there. Certainly the rôle of the machine-gun should be the same, and I have always endeavoured to work them as far to the front as possible even in the fighting line, and if horses or ponies were used for that purpose a great advantage would be to get them away from the pole as quickly as possible by using a simple attachment with hooks. If we were to move forward again or to get the machine-gun out of action, then it could only be done with the facility which is absolutely necessary under such circumstances by some simple attachment to a pole. I can only offer my humble opinion in favour of the pole system of draught in preference to shafts, having proved it in the working of machine-guns, and I thank the lecturer for having brought the matter forward.

Lieut.-Gen. Sir R. BRIDDLPH, G.C.M.G., R.A.: It was not my intention when I first heard of this lecture to speak at it, but I think it would be to be regretted that the meeting should dissolve with an entire unanimity in favour of the pole, and I think that everything has not been said that could be said on behalf of shafts. I think that as regards poles and shafts the matter is not of that vital importance which the lecturer appears to me to attribute to it, because I am convinced that if we were to adopt the pole to-morrow, or if the German Army were to adopt the shaft to-morrow, neither artillery would sensibly lose its value. There are certain points connected with it which I do not think have been brought to the notice of the meeting; for instance, the lecturer appeared to think that the whole object of the shaft, as regards its facility for pulling up, was the smartness of manœuvring on parade. Now I will venture to say that that is not the case, that it is not the advantage of pulling up smartly, but it is pulling up with efficiency. Those who, like the lecturer, have experience in field artillery and horse artillery will know that one of the great cares of the wheel driver is always to be able to pull up in time to avoid injuring the horse in front of him, a thing which with a pole it is most difficult to avoid. If anything checks the pace, the shaft may be brought upwards or pushed off to the right, but you cannot do that with the pole, and that is one great evil. I am quite aware of the difficulties attending the removing of a shaft horse which is disabled, in comparison with the same difficulty when the pole is used: that we are all acquainted with, and it is quite obvious that that is one of the greatest disadvantages of the shaft; but on the other hand there is another disadvantage of the pole which has been very lightly touched on, and that is the liability to run into banks. In going over banks or rough ground there is not the slightest doubt in the world that the shafts do give far greater facilities.

General BRACKENBURY: They do not do it.

Sir R. BIDDULPH: I merely took the lecturer's word for it, not having had personal experience in driving guns with the pole, but he said there was that difficulty, and it is one which I have heard mentioned by Officers of foreign artillery. Of course, as I say, I have never driven a field gun with a pole over rough ground, and therefore I could not answer for myself, but there is not that difficulty with the shaft. The question has also been introduced of horse supply. The lecturer said he thought by adopting the pole you would lessen the expense, that you could have smaller horses; they would eat less forage and so on; and I fear they would be able, therefore, to do less work. I have an impression that if you give less money for your horse and he requires less food and less of everything else that he is not so good a horse all round. We consider it an advantage in England that we have a superior kind of horse, and I am certainly aware that we cannot always replace our horses in foreign countries, but on a matter of horse supply I should not venture to say anything in the presence of the Inspector General of Remounts, who is so much more capable of saying anything that is to be said on that point. As regards carrying wheel harness, it is not entirely new to the Service. I have seen the Royal Artillery carrying the wheel harness on the wheel centre horses. I have, if I remember right, seen it done in the Crimea; so that it is not quite a novelty, but is thirty or forty years old. It certainly is very desirable to have spare wheel harness. There is another point, and that is the liability of a pole to break. Those who have had experience in coaching in England know that the most dangerous accident that can happen to a coach is to break a pole; breaking a wheel is not nearly so dangerous, because the coach stops, but breaking a pole is most dangerous and is the source of the greatest number of fatal coaching accidents that have occurred either in past or in present days. A pole is not only more easily broken than a shaft, but when it happens you cannot go on; you can go on with a broken shaft, but you cannot with a broken pole; and as to carrying a spare pole you can certainly carry a spare pole, but not on the gun; it must be on a wagon, and it is more difficult to carry than a spare shaft. These are points which have to be faced. I mention them not as disparaging poles, but as showing that there are two sides to the question. I was rather alarmed when I heard that the gunners would be employed in extricating fallen shaft horses instead of keeping up their fire. I really think in the circumstances mentioned we should expect the battery to go on fighting the gun and not attempt to disengage the shaft horse, until, and unless, the battery were required to move. But after all, that is only a question of a few minutes perhaps, and moreover the day of battle is not one in a hundred. What you have to do is to deal with your ordinary marching; that is the thing to look to. I observe the lecturer said that "if a comparison were made without the realities of battle, it would lead to adverse conclusions," from which I gather that he feels sensibly that as regards manœuvring and ordinary work, the shaft has the advantage. It is possible that, as regards transport along the road, the pole may have advantages. But I think that shafts are admitted, even by foreign Officers, to be the best for manœuvring the gun. The pole is by far the most ancient mode, and we adopted the shaft because we thought it was a better mode; therefore it is not an "antiquated form of equipment," but a more modern one. I think that shafts were adopted with a sincere desire to get something a little better than the pole.

Mr. T. H. BRIGG: I have listened with great pleasure and interest to the able lecture which has just been delivered, and as one having studied natural law as applied to mechanics for over twenty years, and, to the knowledge of our gallant Chairman, having devoted at least twenty-six months entirely to the subject of draught, I feel somewhat able at least to say one or two words upon the subject. The pole has its advantages, and so has the shaft. I am only sorry that the subject has not been treated so comprehensively as I should have liked from a scientific point of view. I have always considered that in the British Army we have possessed some of the finest mathematicians that ever lived, and I cannot but think that this subject is one that has never had creditable attention drawn to it; otherwise I am sure that, as in other things, there would be seen something very seriously wrong in our present incomplete method of attaching horses. The subject of draught, as it has been treated by various authors, has been merely considered

and determined upon by a very short-sighted method of attaching a rope to a dynamometer and another to the vehicle itself, registering the amount of force necessary to overcome certain impediments in the road without in any way taking into consideration the action of the pull on the horse himself, which is of infinitely greater importance than the pull on the carriage. The plan referred to I say is absolutely wrong: there is neither sense nor reason in any such test being resorted to to ascertain what is the best angle of draught, and so forth. I should like to ask the lecturer what the military have considered the best angle? If it can be shown that 40 per cent. or 20 per cent., nay, even only 10 per cent., of a saving of horse power can be effected, and that another means of attachment will not only not reduce the vitality of our horses in time of war, but will enable them to take our guns over roads, making short cuts, and securing, commanding, and shielding positions that could not otherwise be obtained, then I feel sure that the question will present itself as one of the first magnitude. I think that a vast assistance can be rendered to our Army and to the nation by a thorough investigation of this most important question of draught. We have more means and opportunities of settling it than any other nation. I should like to refer you to the result of some experiments which have been made with a wagon specially built for manual power. A trial was made by two well-known coach builders, and with practically the same results; the wagon was loaded and an obstacle placed in front of the wheels which they were just able to get over. In order to find out how much surplus force they had left, I tied a dynamometer to the hind axle, and it was found that with the ordinary means of attachment they could only register about 46 lbs., but with the new means of attachment and with the same load they actually registered over 125 lbs. As I have said, I should like to ask what is considered the best angle, and how much weight ought to be carried by the horse, which alone could determine the ease and comfort with which he travels? The lecturer has referred to "bowling along," in the case of the ordinary two-wheeled trap, which is balanced upon the axle. I would remind the lecturer there are times when the horse would bowl along infinitely better if he had a lot of weight on his back; and there are also times and conditions when he would bowl along to the best advantage if a part of his weight could be carried by the wheels, as in the case of a hansom cab or a costermonger's cart. The question as to when and how much, or how little, weight a horse should carry is a matter of paramount importance with regard to the question of draught, and I shall only be too happy to demonstrate to any gentleman by practical experiment, and that with my attachment at least twice as much draught can be obtained as can be obtained ordinarily.

[P.S.—Had the discussion turned upon the scientific bearing of the question, it would have given me an opportunity of saying something of a more definite nature, which under the circumstances I did not feel justified in saying.]

Major-General the Hon. A. STEWART: I am not going to enter into a discussion upon the merits of shaft and pole draught for military purposes, although I made up my mind in favour of the former many years ago, but I will simply point out that the lecturer has not given us any information as to any occasion on which the shaft system has broken down. Shafts have been used during the Crimean War, and during all the wars that have occurred in our own generation, and no doubt there are many gentlemen here present who could give us instances if accidents had there occurred—occasioned by the use of the shafts. I think we should have some information of that kind before we can lay down authoritatively that the pole is superior to the shaft in any way.

Major-General F. G. RAVENHILL, R.A. (Inspector-General of Remounts): The subject of horses has been touched on, and as it particularly affects myself and interests every other Officer in the room, I think it right that I should say a few words on it. Ever since I have been in the Service, great stress has been laid on the fact of the difficulty of replacing shaft horses, but I never remember to have heard of a gun being lost from this cause. If a shaft horse is wounded, or a horse comes down, I admit it is with some difficulty you can disengage him from the shafts; on the other hand, with regard to the difficulty of replacing shaft horses, I think it may be lessened by the teams of gun and military carriages generally being properly horsed, and when all horses

are fit to be put into the shafts, this is what we should try to get as nearly as possible. There is no insuperable difficulty about having centro horses, and even if it is desirable, led horses of teams fitted with breeching to their harness. This used to be done, but it has latterly fallen into disuse; as Sir Robert Biddulph said, I have seen it done, and well remember it, in my gun teams in India. This question of military draught has rather been sprung upon us to-day, for it is hardly the question of military draught which the lecturer has taken up. The question seems to me to be entirely one of artillery draught. It appears to be alone reopening the well-worn question of whether in the artillery the pole or shaft draught is best adapted for our work, and the one by which you get most good out of the horses. It seems to me the question to be considered on military draught divides itself into two heads, viz., those draught carriages which in the artillery bring guns, and which in the case of the Royal Engineers may have to bring pontoons, telegraph wires, and other necessities to the front, or fighting line. These carriages have to work over all kinds of broken ground, and being on a two-wheel system require the shaft draught, with a firmer stamp of horse, whilst for the other nature of military draught more generally used on metal roads or the beaten tracks for transport purposes, pole draught may be desirable. I advocate that those carriages which have to act in the first line under fire should be fitted with shafts, because they give greater power and greater facility for manœuvring; and when I am talking about manœuvring, what I understand to be wanted is to be able to let a gun travel safely at the rate of twenty to thirty miles a day, and that after several days' marching you may have to take up a position in a particular place over very broken ground, with very difficult and contracted gateways, or bridges, or passes to get through. This, I think, would be much more securely done, and always has been better done, by shafts than it could be by pole draught. In England the pole draught is made use of for coaches, for omnibuses, and most of our heavy conveyances about London, because the roads are smooth and they have no broken ground to go over. If I had to drive a four-in-hand coach across country, I should think twice before I did it with a pole. There is one difficulty with regard to this subject which has not been touched on, and that is the great mixture of harness which would be necessary if you adopt pole draught. Uniformity in Service harness is a great thing, but how are you going to adapt harness of pole draught for your many forms of carts that are and have to be used in the Service? This very morning I saw between twenty and thirty new pattern ammunition carts passing my house; every one of these had a pair of horses of the Army Service Corps which had on the ordinary wheel harness for shaft draught, such as is always used in the Artillery, so that wheel harness for shaft draught must be maintained, and in the consideration of this subject this question of uniformity must not be lost sight of. With the ordinary wheel harness fitted for shaft draught, there is no reason why it should not be utilized also in pole draught; for transport work the pole draught may be the best, when ordinary wheel harness could be adapted for it. With regard to the question about the stamp of horses, I do not consider there is that difficulty about getting a shaft horse which many people think. The lecturer seems to me to have had for some little time past "shaft horse on the brain;" this may have exercised some influence over him. No doubt where a shaft horse is killed another can be found to take its place. Other countries have not adopted this shaft draught system, because there is no doubt the horses you get abroad are generally narrow or light, and not so well adapted for shaft draught as our English horses are. We are particularly fortunate in getting good, weighty, "firm horses." The lecturer has rather laid stress on the fact that throughout England pole draught is becoming, or has become, almost universal; in this I differ from him. It is only in large cities and towns of England, where the paving or roadway is good, that you meet with the pole draught. All over the country of England in the rural districts you most generally find shafts, even in large cities; take, for instance the parcel vans and carts, all the cabs, Irish cars, tradesmen's and covered carts, with all, the horses are accustomed to shaft draught. I have seen more horses refuse absolutely to draw and go into the collar with the point of a pole in front of them, from being pole-shy, than horses refusing to take the shafts, in which they are usually first taught to go quietly; that part of the argument which the lecturer

therefore brought before us cannot be considered of much weight. The importance of the subject which the lecturer has brought before us in an ample manner is great, and I think we ought to thank him for the same.

The CHAIRMAN (Sir R. Buller) : I was very much obliged to Sir Robert Biddulph when he rose, because I was afraid at that period of the debate that I was to be left alone to advance views which the unanimous opinion of the meeting would be thoroughly against, but I think I am a little supported now. I confess I do not agree with the lecturer at all, and I think he has a little misled himself, because he confuses two cases which, to my mind, ought to be treated on an entirely different basis, that is to say, the question of the pole and shafts as applied to a four-wheeled carriage, and as applied to a two-wheeled carriage. I do not think there is the slightest analogy between the two cases. A gun-carriage certainly is, in my opinion—and, in fact, any limber-carriage is—a two-wheeled carriage. As Colonel Reeves has said, we have lately adopted, and, I believe, I may say with the entire approval of the Service, a pole system for transport carriages, that is to say, for those that are four-wheeled; but it would have been impossible for us to have adopted, even for four-wheeled carriages, the pole system, unless we had been able to adopt a hinged pole, because every one of us who has had experience of draught in South Africa, and in rough countries, has found out that a fixed pole cannot conveniently be used. Our old pattern general service wagons could not be used in South Africa, because, among other reasons, in descending steep drifts or hills, wherever there was a steep pitch up and down, the pole, being stiff, ran into the ground, and took the horses on to their knees. Over and over again have I seen that happen, and it is only with a hinged pole that you can really overcome this difficulty. I cannot myself see how anybody could apply the hinged pole system to a two-wheeled vehicle. If it could be done, very good; but if it cannot be done, then I think shafts, being the shortest, must be the best. There is another reason why I should certainly myself deprecate any sudden change from shafts to poles for gun-carriages. A good many years ago, an Officer, to whom I am indebted for much most valuable advice, cautioned me particularly as to one point. He said, "Whenever you find a system or a regulation or a custom that is well-established and has worked well, and you cannot ascertain why it was adopted, never rashly propose to change it, because you may be certain that its adoption did away with some grave inconvenience. No other theory will satisfactorily account for the fact that the reason why it was adopted has been lost sight of. If you make a change, you will get back into the inconvenience." Shafts for artillery draught were, I believe, permanently adopted in our Army by a very strong Committee in 1865. The Committee was composed principally of artillery Officers, and at that time we had in our Army the most experienced body of artillery Officers that we can ever expect to see, because they had had the advantage of experience both in the Crimean and in the Indian Mutiny campaigns; they had also present with them at the time the experience of the Indian artillery, who, I think I am correct in saying, in two of the three Presidencies had pole systems, each having a different pole system. The result that the experience of these Officers gave us was that, although they differed in some respects as to other artillery details, they unanimously adopted the shaft, and they appeared to be so satisfied it was the best, that they gave no reason whatever for adopting it, so that, following the advice I have before quoted, I certainly, myself, deprecate the change. To take another argument, I think it is hardly fair on this question to compare the Fire Brigade with the artillery as General Brackenbury did. When he mentioned the Fire Brigade, he hardly, I suppose, proposed to hook in field artillery by the simple attachments used by the Fire Brigade. I, myself, last year endeavoured to introduce a trace-hook into the artillery and into general use, depending on the Fire Brigade principle, of an indiarubber ring, and doing away with the tie, but every artillery Officer said, "That is a gimcrack affair, it is fit for nothing, and it won't do for us." With reference to machine-guns, I think that human draught is in some respects very wisely advocated, and if you have human draught you may have a pole; but I cannot help believing that if you are to have horse draught you would have to have a limber, otherwise the machine-gun would upset; and if you come to a limber-carriage, I think you will find shafts the best for the reasons I have previously advocated. The great point made by the

lecturer, I really have no right to say anything about, that is, as to whether it takes much more time to take a wounded horse out of the shafts than it would do to take such a horse away from the pole. Before coming here I tried to find Colonel Slade, because he, I imagine, has had as much experience of this point as most artillery Officers lately. Some years ago he told me that at Maiwand they had a good many wheelers to take out, but there was no difficulty, they could take out a horse and get a horse in as easily as possible. So, at least, I understood him, and if that be so, the lecturer's main argument is not a strong one. The whole subject is worthy of full consideration, but I hope that before the artillery ask to change the method, which on the whole may be said to work well, they will make the fullest and most exhaustive inquiry possible into the peculiarities of the new system they propose to adopt.

Colonel HOBART: Gentlemen, I deem it a great satisfaction that I should have selected a subject which has drawn such an audience together, and I am much obliged to you for the attention with which you have kindly heard me. General Brackenbury seemed to think that I went almost too far, and gave too fair an account of the system I oppose. I am very glad of such a comment, because I only wanted to get a good discussion from the advocates on each side. By "manœuvring," I meant, of course, merely drill manœuvres, not the grand manœuvres of an army getting into battle position. On this point, however, I may have gone too far, as all artillery Officers are not agreed, and as smart wheeling depends on having specially good wheel horses. I dismissed the question shortly in my desire to clear the ground from objections, in order to insist on that great advantage of poles, viz., the ease of replacing disabled horses. Sir Robert Biddulph spoke especially about not being able to pull up so quickly with a pole as with shafts, and the consequent danger of the former digging into the horses in front. That may be the case, but it can be palliated, as such difficulties are now, by the fitting of the harness, by the skill of the drivers, and by the supervision of Officers and non-commissioned officers. The Americans, in order to meet this difficulty, put a pad on the end of the pole. Then, as to smaller horses not being equal to field artillery work, that depends on quality and breeding, and pole draught will relieve the Remount Department from the necessity of buying heavy horses. I did not wish to convey the idea that carrying breechings on other than wheel horses, is a novelty; I know we do not regularly practise it in the Artillery, though the Engineers and the Transport have adopted it. I must ask attention again to the fact which I specially laid stress upon, namely, that it was the want of ammunition that would break down a battery's action, which may be caused by loss of time and lives in dealing with shaft horses. I hold no idea that the Major directing the fire of a battery would go to the rear to look after the horses; the Captain and Subalterns and non-commissioned officers would undoubtedly do that. Colonel Alt gave a general approval, and said that it would be an advantage that machine-guns should be used with poles, if work was required beyond that of man-handling, which is the primary method adopted for battalion guns. I wish some cavalry Officer had spoken to experience with horses. As to the antiquity of poles and shafts, the pole draught is the more ancient, and, though I did not trace the probable reasons for the adoption of shafts, I expect that want of roads or very bad ones had much to do with it. They were adopted and have been retained for what were sound reasons once, but their continued retention is, I maintain, impossible under altered circumstances. To Mr. Brigg, I must reply that I never proposed to enter into the scientific question of draught and its technicalities. It is laid down in text-books that the practical angle of draught is 6°, and I have not attempted to deal with weights borne or drawn by a horse. General Ravenhill seemed to think that I dwelt overmuch upon the idea that horses should be interchangeable. This being a discussion for Army purposes, I did not refer to the custom of the Artillery, but to what the Engineers do and the Transport, who I believe make all the horses interchangeable. The reason I gave for artillery horses not being so easily interchangeable as in other corps is because there is a vast difference between the heights of the different pairs of horses in a team. In a smart horse artillery team in England, the leaders may be 16.1 and the wheel horses 15.2 to 15.3, and the centre horses something between the two pairs, which precludes

the idea of a re-arrangement. I wish that the discussion had been rendered more valuable by the expression of opinion from Officers of the late Indian artilleries who had practical experience of pole work, and from Officers who are conversant with such trials as have already taken place with poles at Aldershot or elsewhere.¹

The CHAIRMAN: I am sure we are all very much obliged to Colonel Hobart for raising this important question, though we may not all agree with what he has said.

¹ The following notes are by Lieut.-Colonel J. C. Dalton, R.A., D.A.A.G., on the Spanish Artillery, which he describes as "very good and very mobile."

"With regard to the statement by the lecturer early in his lecture to the effect that the 'curricule bar' method of supporting the pole was *impossible*, because a postillion driver could not be employed, I should like to remark that in the Spanish field artillery the pole is supported by a curricule-bar, called in Spanish the 'violin.' This 'violin' is a long bar of wood, tapering towards the ends from the centre. It passes through two iron loops which are fixed on the crown of the gullet-plate (apparently) of the saddles, and by means of a strap suspended from the centre of this bar the pole is supported. The bar has free lateral movement. It does not seem to interfere with the driver, who rides the 'near' mule, though I confess to having thought it looked very awkward when I saw the batteries drilling in Spain, and should hesitate before advocating it as the best system of supporting the pole. However this may be, the Spaniards are quite satisfied with it. The weight of the pole comes on to the mule's back (or withers), instead of the neck. To keep the carriage back there are pole-straps from the point of the pole to a breast-strap (like our breast harness), which is connected with the breeching. The mule thus carries a sort of continuous body-strap (breeching and breast harness in one) which is supported by hip and bearing straps and by a strap from the collar. Each mule carries a saddle, that on the hand-mule being used to carry the driver's kit and cornsacks. With the 8-centimetre gun each mule has in peace-time about 7 cwt. to pull without gunners mounted, and 8 cwt. with four gunners mounted. The weights with the 9-centimetre are very little more. On war establishment the weights are in each case reduced by nearly 2 cwt."

Lieut.-Colonel Dalton has also communicated to the lecturer the fact that the R.A. Officers who are now attached to the Egyptian Army, where pole draught is used, "all swear by it," and say that "for mobility, lightness, balance, and general utility, it is far superior to the shafts."—B. II.