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Publisher: Routledge

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Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Royal United Services Institution. Journal

Publication details, including  
instructions for authors and  
subscription information:

[http://www.tandfonline.com/loi/  
rusi19](http://www.tandfonline.com/loi/rusi19)

## Military Transport

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Published online: 12 Nov 2009.

To cite this article: Lieutenant-Colonel Clifford Parsons (1879)  
Military Transport, Royal United Services Institution. Journal,  
23:102, 790-820, DOI: [10.1080/03071847909441222](https://doi.org/10.1080/03071847909441222)

To link to this article: [http://  
dx.doi.org/10.1080/03071847909441222](http://dx.doi.org/10.1080/03071847909441222)

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# LECTURE.

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Friday, June 6, 1879.

LIEUTENANT-GENERAL SIR DANIEL LYSONS, K.C.B., Quarter-Master-General, in the Chair.

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## MILITARY TRANSPORT.

By Lieutenant-Colonel CLIFFORD PARSONS, Professor of Military Administration and Law, Staff College.

AMONG civilized nations in modern times, one of the principal difficulties which military commanders in the field have to encounter is the adequate supply of their armies with food and war material. In most instances it is not that supplies of either kind cannot be provided by the State, but that their conveyance to the spot at which they are to be consumed constitutes the real difficulty. It is quite unnecessary to dwell upon this, as almost every telegram from the seat of war on the borders of Zululand reminds us of it constantly. Nor are difficulties of this description confined to any particular instances; the well-known paragraph, "Great efforts are being made to overcome the transport difficulties which stand in the way of an early advance," or this day's version of it, "Owing to the difficulties of transport no infantry can enter Zululand beyond Landsman's Drift at present,"<sup>1</sup> might have been written of many similar undertakings.

Both in Abyssinia and Ashantee abundance of supplies could be brought to the base of operations, but the provision and maintenance of the means of transport inland caused serious anxieties and delays.

Again, on a larger scale, and for a more extended period, our maritime resources enabled us to convey to Balaclava almost all that was necessary for the army before Sevastopol, yet the troops, only six miles distant, endured great privations for many months from want of adequate means for distributing the supplies.

The general subject of military transport, omitting altogether transport by sea, which does not come within the scope of my lecture, may conveniently be divided, in the first instance, into: 1st, Inland water transport, that is, by means of navigable rivers, lakes, or canals; 2nd. Railway transport; 3rd. Transport by means of wheeled vehicles on

<sup>1</sup> *Standard*, May 27, 1879. *Daily News*, June 6, 1879.

common roads; and, lastly, by means of pack animals or human carriers. Of these, water transport is the easiest to provide and maintain under all ordinary circumstances where suitable inland water exists; it is also the most economical, and most suitable for heavy weights, such as are involved when siege trains, their ammunition and other appliances have to be transported. It is calculated that a horse can draw twenty-five times as much on a canal as on an ordinary road.

In former times, before the introduction of railroads, the direction of navigable rivers had a considerable influence on the strategy of a campaign, as forming part of the line of supply. In the Peninsula, the Tagus and the Douro, for considerable distances, were thus utilized, and we find the Duke of Wellington making continual efforts, in the course of the war, to improve their navigation. The same, of course, applies to more recent operations in countries where railways are not available. As, for instance, in China, in 1860, the use of part of the river Peiho, as far as Tungchow, where it ceased to be navigable; and in New Zealand, in 1861, where river transport was available at intervals on the line of supply. Again, in the Franco-German War, the collection of supplies at Coblenz, Bingen, Mainz, and other places, to feed the enormous armies concentrating on the Rhine, was mainly performed by steamers bringing provisions purchased in other countries. Inland water transport, however, has some disadvantages which may become serious under certain circumstances, if it is intended to rely mainly upon it. In the first place, it is very easily interrupted; if the enemy should gain possession only for a few hours, and by a very small party, of any part of the water communication, he may so use his temporary advantage as to render navigation impossible for a considerable time afterwards. In a very short time the navigable channel of a river may be blocked by sinking a few laden vessels or barges, which it may take weeks to remove. Some of the locks, or part of an embankment, of a canal may be destroyed by a few charges of powder, or it may be made useless by diverting the channels by which it is fed with water.

For military transport railways are superior to canals in two or three important particulars, their greater speed not only renders them far more efficient for purposes of supply during the continuance of operations, but also enables them to be used for the transport of the troops themselves in effecting their concentration at the outbreak of hostilities. Within reasonable limits railways may be erected or extended either preparatory to or during the course of military undertakings; the first occasion on which this was put in practice was in the Crimea, where about four miles of railway were constructed, from Balaclava to the army before Sevastopol, for the transport both of food and siege material. In Abyssinia about 11 miles of railway were laid from the port of disembarkation; and in the Franco-German War the Prussians constructed a loop line more than 22 English miles in length, from Remilly to Pont-à-Mousson, so as to avoid the fortress of Metz, which blocked the line. The railway from Balaclava to the front was worked in sections as follows: a locomotive

drew the train for two miles in the plain where the ascent was moderate, a stationary engine then drew it up an incline of  $\frac{1}{15}$  for a third of a mile, eight trucks being brought up at a time; two trucks at a time were then drawn by horses up an incline of  $\frac{1}{25}$  for a mile and a half.

In the report furnished with reference to the Abyssinian line, it appears that the working by a civilian staff was very unsatisfactory, and that casualties and dismissals were very numerous; it was then recommended that, in future, men from the ranks of the army should be employed to the greatest extent possible, and the opinion was expressed that engine drivers and foremen platelayers were the only skilled workmen who could not be supplied from the army or from the navy. This line took about four months to construct.

It by no means follows that, when we have to construct railways under similar circumstances, we need adopt the pattern in common use for commercial purposes; there have been many descriptions of light railway produced of late years by able engineers, into the technical merits of which it is not my province to enter. Doubtless a choice could easily be made from among these inventions, and indeed certain constructions of this nature have already been experimented upon. Thus by transporting to the base a moderate amount of material, a useful railway on a small scale might be constructed within a short time, along some part at least of the line of communication. That it should be available at an early stage of the undertaking is an essential feature in the utility of a railway under such circumstances, and the possession of a light line at the very commencement has the additional advantage of facilitating any further constructions that the magnitude of the operations may require.

Railways are equally vulnerable with canals, although it would under most circumstances be more easy to re-establish traffic on a damaged railway than on a damaged canal. Both these modes of transport have the disadvantage of being confined to particular localities. A most able paper on railways as affecting the provision of other army transport was written by Lord Strathnairn, and appended to the report of his committee in 1867; he clearly points out that no general could dispense with his ordinary military transport, because he could at some period of his operations make use of a railway; and argues that, pre-eminently useful as was the railway during the siege of Sevastopol, all its utility would have vanished with a change in the scene of operations. Moreover, experience clearly shows that railways, where they exist, cannot take the place of the ordinary military transport for the distribution of supplies to a large army; first, because it is not considered expedient to carry railway transport too close to the sphere of action, for fear of losing the supplies which must necessarily accumulate at the terminal station, in the event of a retreat or even a small retrograde movement becoming necessary; and next, because it would be impossible to find railways ramifying to all, or even to many, of the fractions of an army of any magnitude, covering perhaps many miles of ground. About one day's march from the army itself was usually considered by the

Germans in 1870, to be the nearest point to which railway transport should be used.

Practically then the principal use to which railways are applied in war after the forces are concentrated, lies in replacing the long lines of wagons passing between the base of supply and the advanced magazines of the army; for this purpose, however, their importance can hardly be overrated when we consider that a very ordinary goods train, such as we see on our lines every day, say 30 trucks carrying an average of eight tons each, conveys as much as 160 fully loaded general service wagons, and will transport the supplies to at least ten times the distance in the 24 hours, allowing the widest margin for delays. Thus, as a minimum estimate, and without taking into account numberless other details which tend to augment the difference, a railway train may safely be said to be equal in transport-power to 1,600 wagons. The German armies around Paris were kept supplied with all they needed by one railway running from 12 to 14 trains a day, at a time when the resources of the country had ceased to contribute to their support in any material degree. General Bronsart von Schellendorff, chief of the staff of the Guard Corps, in his admirable work on the duties of the general staff, estimates a train load at about 246 tons English, equal to two days' rations and corn for an army corps, including its cavalry division, a total of about 37,000 men and 10,000 horses. The military use of railways is in itself a subject of so wide a scope that were I to attempt to discuss it in any detail, it would be to the exclusion of the other branches of military transport to which I must now more particularly confine my remarks.

The relative merits of *draught* and *pack animal* transport have long been a matter of controversy in our army; our experiences of warfare have been, and for the most part may be said still to be, so different from those of continental nations that we naturally view the subject in somewhat a different light. In the great wars of the early part of this century, a time when military organizations were first assuming something like their present type, our operations were chiefly confined to the Peninsula, a country exceptionally rugged and ill-provided with roads, and where commerce was mainly carried on by the use of pack animals. We naturally imbibed the idea, which lasted for so many years afterwards, that there was no means of transport so applicable to military operations as pack animals. The regulations for the supply of military stores to an army in the field, dated 1866, now obsolete, bear ample testimony to the vitality of this idea. Other nations, guided by the light of their experiences of campaigning in central Europe, upheld the use of wheeled carriages, the superiority of which is unquestionable wherever the roads are sufficiently good to admit of their use. The effective wagon-load being from 25 cwt. to 30 cwt., and the average load of a pack-mule, exclusive of the pack-saddle, 160 lbs. or thereabouts, it follows that a wagon carries as many rations as sixteen or seventeen pack-mules; nor does this statement truly represent the economical difference between the two, as food for the animals themselves, either wholly or in part, must in very many

instances be also carried. A simple example, denuded of all contingent intricacies will, I think, best serve to illustrate the state of the case.

Twenty days' complete rations for 10,000 men have to be collected within ten days at an advanced dépôt three days' march from the base of supply, there being neither provisions nor corn procurable by the way. Each mule is to carry a load equivalent to 52 rations, or as nearly as possible 160 lbs., besides his own trappings. To effect this within the time allowed, 385 mules must deliver their loads at the advanced dépôt each day, and, as food for the animals and their attendants halting there for the night must also be carried, at 10 lbs. per mule and 3 lbs. per man, 30 mules must be added for this purpose, making the number 415. Supposing A to be the base of supply, B and C the intermediate stages, and D the advanced dépôt, the calculation will be as follows, viz. :—

	No. of mules.
Halting every night at the advanced dépôt, D .....	415
At C there will be the following numbers every night:—	
Returned from D, and ready to go forward again	
on the morrow.....	415
Arrived from B with the supply for D .....	415
Ditto with corn and rations for the	
station C itself.....	63
Total halting every night at C.....	893
At B there will be the following:—	
Returned from C and to start again on the morrow	478
Arrived from A with the supplies for D, and also	
for the station C .....	478
Arrived from A with corn and rations for the sta-	
tion B itself .....	72
Total halting every night at B.....	1,028
At A there will be the number returned from B, and ready	
for to-morrow's journey.....	550
Total, without any allowance for casualties .....	2,886

A, B, and C would be the head-quarters of each stage, and the allotment of animals would be—to A, 1,100; to B, 956; to C, 830.

Considerable numbers would have to be added as a reserve to meet emergencies, and to allow for the proper percentage of sick, probably not less than 25 per cent. both for sick and days of rest, of which as many as possible should be retained at the base of supply until required, in order to save the transport of their forage, &c. The illustration is merely intended to show the elements which tend to swell the numbers when pack animals are employed.

Now to compare this with the same operation performed by four-

horse wagons, each carrying, say, the moderate load of 25 cwt., or as nearly as possible 910 rations. Supposing all other arrangements to be the same, and the details calculated in a manner analogous to the last case, it will be found that 144 wagons with 576 horses, 50 wagons being allotted to A, 48 to B, and 46 to C, will perform the same work as the 2,886 mules, omitting all mention of the diminution in the number of attendants, the care of sick animals, and the difficulty of supervision.

In addition to the foregoing considerations, pack animals undergo a great deal more fatigue than draught animals in performing their quota of work; each time a short halt takes place the draught animal experiences relief, whereas the other still bears his burden; and in cases where the baggage-trains must be held in immediate readiness to move, pending the result of some tactical operation, the pack animal must remain loaded for hours, as the loading cannot hastily be performed, for on the careful adjustment of the load depends the preservation of the animal's back and his general condition for work. The average percentage of sick among animals performing transport work in a campaign, is estimated at 10 per cent. for draught, and 15 per cent. for pack transport.

There is, on the other hand, a good deal to be said in favour of pack transport. In the first place, our armies have very often to operate in countries impassable by wheeled carriages. This argument is, of course, conclusive for such instances, and, even where good roads exist, troops often get separated from them, and if the country is rugged, can be reached only by pack animals. This must often be the case with individual battalions, which may thus be deprived of access to their regimental reserves of ammunition and their intrenching tools at critical moments.

Again, it is urged in favour of pack animals that roads have frequently become blocked by carriages, and the only method of bringing up supplies has been by pack transport. Casualties of this nature occurred in the Austrian campaign in Italy in 1859; and it is sometimes advocated that means should be provided for the conversion of the draught animals into pack animals for such occasions; but, in addition to the extra trappings that must be carried continually, so as to be ready for an emergency of this kind, there is the difficulty that horses require a considerable amount of training before they will carry a pack-load quietly. It is, I think, worthy of note, as applicable at least to operations in central Europe, that the Germans do not admit that there is any necessity for providing pack animals, all their transport being by means of wheeled carriages. As regards our own service, and considering the exceptional conditions under which our expeditions have generally to be undertaken, it appears desirable that the tables of transport allotted to each of our units of organization on its war establishment should show alternative scales, the one to apply when wheeled carriages can be used, the other when pack transport is a necessity. These should be ready prepared, not only because the number of animals to be provided would differ enormously, but because the composition of the *personnel* in drivers, supervisors, and artificers



must also materially differ. I am given to understand that some steps in this direction are likely to be taken.

For purposes of calculation, pack-loads, including the trappings, may, under ordinary circumstances, be estimated as follows: viz., horse, mule, or bullock, 200 lbs.; camel 400 lbs. to 450 lbs.; donkey 140 lbs.; elephant 15 cwt. to 1 ton.

The horse, mule, pony, donkey, camel, and elephant are all good pack animals; the mule is better for pack transport than the horse, being more sure-footed, more hardy and enduring, and more easily fed. The bullock is inferior in this respect, though often used in India, and employed to some extent in Abyssinia; as a draught animal, too, he is very slow.

The elephant will not stand fire, and, in consequence of this defect, when elephants have been employed for artillery purposes, a sufficient train of bullocks to bring the guns into action has been provided in addition. This was the case in Abyssinia, and at this moment the two heavy batteries (40-pr. Armstrong and 8-inch mortars) belonging to the Quetta Army operating against Afghanistan, have each nine elephants for transport, and 300 bullocks per battery to bring its six pieces into action. The camel is invaluable as a pack-animal, but those used in plains are unsuitable for rough work in hilly country, for which special animals should be obtained. The camel is easily managed and fed when in health, but delicate and difficult to cure when once on the sick list. It has been suggested, by a most able officer in India, whose past experience entitles him to attention on all matters relating to military transport, that it would have been better for us had we, in the present Afghan expedition, trusted more to the mule and less to the camel than we have done.

Time will not allow me to enter into details connected with the peculiarities and management of transport animals. The "Soldier's Pocket Book" contains some concise information concerning them, and Major Furse has dealt with this matter at greater length in his "Studies on Transport." A great deal of information relative to the treatment of the elephant was furnished by the Government of Bombay, for the guidance of the commissariat officers in the Abyssinian expedition, and is to be found in the official account of the same. It seems very doubtful whether the guns could have been transported to Magdala without the assistance of the elephants, 44 of which were landed at Zulla, and the greater number handed over to the artillery.

When transport has to be performed by human carriers, as was the case entirely in the Ashantee expedition, and partially in many other of our operations, as in China, in 1860, and for the Duffla and Looshai expeditions in 1874, there are many points to be considered, which do not enter into the question when other animals are employed. The weaknesses, prejudices, and inclinations of human nature come prominently forward; four-footed animals may break down or even stray, if not properly looked after, but they cannot lay systematic plans to desert in order to avoid distasteful labour, or for fear of their employment leading them into danger. Very large numbers of carriers were lost to

the service by this means, in the earlier part of the operations in Ashantee, and the evil was only alleviated by the exercise of great judgment in their management. Experience showed that the indiscriminate mixing up of men of different tribes in the same companies or gangs did not answer. It was found that the overseers of gangs must be selected, as far as possible, from the same tribe as the bulk of the carriers, in order to be able to control them; and that the carriers showed less inclination to desert when they were worked on the stage system, so that they could, in many instances, return each night to their station, which was very often not far from their own villages.

The load for a carrier, both in China and Ashantee, was 50 lbs., but it did not always quite amount to that. In the Duffa and Looshai expeditions the regulation load was 40 lbs. As it is evident that a fixed weight must be determined upon, so that arrangements may be made for having the stores packed in corresponding quantities, there is much to be said in favour of the smaller load. In the first place, it is not excessive when a longer or more difficult march than usual has to be made, or when women or weakly men have to be employed; and, in the next, the load is more capable of being adjusted to the requirements of the case; on short marches, easy roads, or on great emergencies, four loads may be given to three carriers, or even three loads to two carriers, the extra load being carried alternately, or by any other arrangement suitable to the particular method of carrying adopted by the men.

A most important feature in pack transport is the pack-saddle, an unfortunate selection in this respect has been found from experience to be more instrumental in destroying its efficiency than perhaps any other single cause. A bad pack-saddle will inevitably give the animals sore backs, when they become useless for considerable periods, during which, however, they necessarily require attendance, and other animals must in many instances be employed in bringing them their food. It is often found advisable to adhere to the saddle to which the animal is accustomed, and which has doubtless been found suitable to the country in which he has been obtained and performs his work. This, however, cannot apply to the thousands of horses and mules purchased for an expedition from widely different sources, and arriving without any equipment at all at the base of operations. We have now an excellent general-service pack-saddle of a kind used largely and much approved in the Abyssinian expedition, and which has since undergone various improvements. It is known as the Otago pattern; there are two sizes, one for large or medium, the other for smaller animals, weighing respectively, with all other trappings,  $44\frac{1}{2}$  lbs. and  $38\frac{1}{2}$  lbs. The saddle has a comfortable seat, upon which, when no other load is carried, a man can be mounted.

The next point for consideration is the description of wheeled carriage most suitable for general military transport. The qualities essential for a good military carriage are the following:—Interior capacity to receive, and strength sufficient to convey its load under ordinarily difficult circumstances; stability, that it may not easily overturn on rugged roads; lightness of draught; facility of turning

within a moderate compass; durability; simplicity of construction, so as to be easily repaired and easily packed for shipment; and, lastly, lightness of construction, as far as is consistent with the requirements just enumerated.

There have been endless controversies as to the relative merits of four-wheeled and two-wheeled vehicles. The evidence given before Lord Strathnairn's Committee in 1867 furnishes abundance of arguments on both sides. The principal merits ascribed to the two-wheeled cart with two horses are, that the horse draws to more advantage, being closer to his load; that it is easier driven and can be turned easier than the wagon; that it can go over worse ground and is easier extricated from a difficulty; that it carries at least as much in proportion to the horses employed; is more simple in construction, and therefore more easily repaired; and that it is more easily stowed on board ship.

The chief advantages claimed for the four-wheeled wagon with four horses are that the animals suffer less wear and tear in doing their work, and that a less number of them are liable to sore backs; that the wagon is easier to load, as less accuracy in distributing and balancing the weight is requisite; that it takes up less room on the line of march with reference to the quantity carried; that the loss or breakdown of one of its horses is of less importance, as it could proceed with three, while the cart with half its draught-power gone might be lost; and lastly, that a less number of drivers are requisite.

The vehicles in general use in the country where an army is operating must always constitute a very considerable part of its transport. It is utterly impossible to supply from home more than that required as regular military transport accompanying the troops, and for the divisional and army corps establishments of various kinds. The immense amount of transport to maintain the supplies along the line of communication must always consist of such vehicles and animals as can most easily be obtained by purchase, by hire, or by requisition, and must often be of a very miscellaneous kind. There is little to be gained by discussions as to the suitability of the local transport when no other is to be had to the extent required; it generally happens that it is fairly suitable; sometimes, indeed, it is found superior in its own country to any other that can be supplied from a distance. This appears to have been the case in the Red River expedition, where the two-horsed wagons commonly used throughout Western Canada were employed. These, as Sir Garnet Wolseley himself states, stood the work over the extremely rough roads very well, while the two-wheeled carts provided for the occasion were found unsuitable.

The different descriptions of transport vehicles required for military purposes are very numerous, as almost every special service necessitates a specially constructed wagon; thus in the Engineer service alone there are no less than nine descriptions of carriages employed—the pontoon wagon, the trestle wagon, the telegraph-wire wagon, the office wagon, the photographic wagon, the miners' wagon, the store wagon, the forge wagon, and the tip-cart. For the medical department there are the ambulance wagon, the pharmacy wagon, and the

water-cart, &c. It would, however, detain you too long to enter into details of this kind; the able treatise on military carriages by captain Kemmis, royal artillery, published under the authority of the war department, describes fully both the principles and the details of construction of every military carriage produced by the royal carriage department, and to this work I must refer those who desire to go deeply into these particulars.

There is, however, one carriage the use of which is so general that it deserves particular notice; it is that known as the general service-wagon, designed, as its name indicates, for the conveyance of every description of stores and supplies for which special vehicles are not necessary. The latest pattern to govern future manufacture is that dated July, 1875, known as Mark IV. Its general construction is very similar to that of previous patterns; the fore-carriage locks completely under to facilitate turning, the equirota principle—that is, with all the four wheels of the same diameter—upon which some older patterns were constructed, having been definitely abandoned. It is fitted with floating raves, movable bale-hoops and cover, and with a driving box and footboard in front. The capacity of its body is, length, 9 feet 8 inches; breadth, 3 feet 8 inches; depth, 1 foot 8 inches, or 59 cubic feet; the height from the floor of the body to the top of the bale-hoops is 4 feet, giving a total interior space, up to the cover, of about 120 or 130 cubic feet; its full load is about 30 cwt. It is not a spring wagon, its wheels are of the sizes now adopted for almost all our military carriages, viz., 4 feet 8 inches, and 3 feet 4 inches, in diameter, their track is also the same, viz., 5 feet 2 inches. The weight of this wagon is a trifle under 18 cwt., it can be very easily fitted as a forge-wagon when necessary. On service and when fully loaded, it is drawn by four horses on the shaft principle, each of the near horses being ridden by a driver, as in almost all our carriages of the regular military type. Driving with reins from the box can, however, be resorted to when it is expedient, sets of reins being now provided for the purpose. In the opinion of many of our officers most competent to judge, this mode of driving might, and probably would, be largely resorted to when travelling on good roads, as a saving to the horses and a prevention of sore backs, but I think it is generally admitted that for transport that must of necessity accompany the troops, be the roads good or bad, the postillion fashion should be maintained, as by it difficulties are surmounted which would be insuperable to wagons driven from the box.

With reference to draught-power for transport purposes, the time has come when the traction-engine must be reckoned as one of the auxiliaries. On account of the paucity of horses in Italy, especially of the kind fit for heavy draught work, the Italians have introduced the traction-engine as part of their military transport, the long level roads of northern Italy being favourable for the purpose. They were apparently first used experimentally in 1874 and 1875, in the neighbourhoods of Turin, Verona, and other large garrisons, and since then their use has been extended at each of the subsequent annual manœuvres, being confined to the supply columns in the rear of the army. Considerable improvements have taken place in the construc-

tion of the engine. From the best available sources of information, it appears that the latest that have been purchased are engines of about six horse-power, able to draw about ten four-horse wagons on a moderate road at an average speed of three miles an hour, and able to maintain this if necessary for about 16 hours. The engine is fitted underneath with a windlass and coils of strong chain or wire-rope, from 80 to 100 metres long, by means of which it is enabled to extricate wagons or heavy guns out of difficulties, and even, by making fast the end of the chain, to surmount steep and rugged pieces of road by the simple process of winding itself up by successive stages.

Traction-engines must of necessity be confined to the best roads, as they would very speedily destroy any road with a light foundation; there is, moreover, considerable difficulty and delay in causing an engine with its train of wagons to turn sharp angles where one road joins another, thus their utility is much restricted. In our own case it will probably be found that their principal use will be for work in connection with the wharves or other landing places, and the stores established at the base; perhaps also, under favourable circumstances, for the working of the first stage or two forwards; because at or near the base labour is more easily obtainable for keeping in order the roads upon which the engines would travel, and there also the greatest demand for transport occurs. It seems that on some occasions the working of the traction-engines during manœuvres in Italy has been less satisfactory than at others; this has been attributed mainly to want of knowledge and skill on the part of the drivers, and steps appear to have been taken to keep a sufficient number in training.

Having thus far touched upon some of the principal details, we must now turn to what may be deemed the broader side of the question, namely, the organization of military transport.

It is a well recognized principle, founded not only on the experiences of modern warfare, but on the opinion of the ablest commanders of a past generation, that the transport service with an army, to be efficient, must have a military organization. The adoption of this principle has gradually brought about, both in our own and in other European armies, the division of transport into three classes, viz., regimental, departmental, and general transport.

The regimental transport is that which is placed entirely under the management and control of the commander of the battalion or other unit, for the purpose of meeting its immediate wants; subject to the contingency that, when this transport is not actually required for marching purposes, it may be made available for services of a general kind, either wholly or in part, as may be deemed expedient by the commander of the brigade, the division, or the army corps. A British battalion on its war footing, assuming that in an undertaking of any magnitude in Europe tents could not accompany the force, has twelve transport carriages, viz., two wagons for regimental purposes generally; two for provisions, carrying at least a day's rations; four company wagons, that is, one for every two companies; three ammunition carts, carrying the regimental reserve of 30 rounds per rifle; and one cart for intrenching tools, of which it carries 300, picks and shovels

together. A cavalry regiment is very similarly equipped, having, however, a field forge in place of a tool cart, and but one ammunition cart; thus its carriages are ten in number. A battery of artillery has four carriages in addition to its guns and their ammunition wagons. Under the present system for providing and maintaining regimental transport the battalion or regiment furnishes out of its own ranks the officer, sergeant, and 22 drivers required for that service, the men receiving such previous training as may be possible at some station where there are companies of regular transport in garrison; the horses are supplied through the agency of the Commissariat and Transport Department; the wagons and other material by the Ordnance Store Department. By a recent regulation, the nucleus which the regiments of cavalry and battalions of infantry first for foreign service hitherto maintained as a groundwork for expanding their regimental transport, has been withdrawn; each cavalry regiment, however, is allowed four squadron carts on its peace establishment, to be used with troop-horses when required.

There are officers of great experience in the service whose opinions are highly valued on such subjects, who advocate a change in this respect. They suggest that the whole regimental transport establishment should be supplied complete from the Commissariat and Transport Department, being attached to the battalion for duty, discipline, &c., but remaining under the supervision of the department for administrative and technical purposes; the advantages to accrue being, that effective soldiers need not be withdrawn from the regimental ranks for transport purposes; that battalions would have an efficient transport at an earlier period on mobilization; that the transport could be better looked after in technical matters by proper transport officers; and that when utilized for general purposes, apart from the battalion, it would work more harmoniously with the rest of the departmental transport. On the other hand, even supposing that the department could furnish all that is necessary at a moment when demands upon its resources are pouring in from every quarter, and its own requirements are at a maximum, I fear that the *personnel* would find themselves in the position of men with two masters, and the proverbial consequences would follow. The evil of denuding the ranks of efficient soldiers unquestionably requires a remedy, which could doubtless be applied without so radical a change; and I can see no reason for supposing that any difficulty would arise in temporarily gathering together and utilizing for general purposes such portions of the regimental transport as would otherwise remain idle during a prolonged halt, or under any other similar circumstances, provided it is worked under its own officers or non-commissioned officers, and in larger undertakings under the brigade or divisional baggage-masters. The commander of the brigade, division, or army corps, as the case may be, must be the sole judge of the expediency of so employing the regimental transport; he would, however, be advised on this point by his principal Commissariat officer. Were the transport to be only attached, instead of belonging, to battalions, it appears to me that, after a protracted halt and other employments, it would soon cease to have the character of

regimental transport at all. That the regimental transport system is a good one may, I think, be taken for granted, from its prevalence in the armies of Europe, and the desire on the part of the Government of India which, I have most excellent reasons for stating, has recently become manifest, to develop the system in the regiments there serving, both European and native.

Departmental transport includes all transport, other than regimental, that forms part of the establishment of the brigade, division, or army corps in the field, and that marches, encamps, and works in connection with the unit to which it belongs.

That portion of the Army Service Corps which belongs to the commissariat and transport department is, by the latest regulations, organized in 16 companies on the peace establishment; each company contains a *personnel* both for transport duties and duties of supply, the necessary number for the former duty being on its mounted establishment; thus the distinction between *transport* companies and *supply* companies, formerly existing, has been abolished, and in future all will receive a sufficient training in transport duties whatever their ordinary employment may be. This, I am informed on the best authority, will apply to officers as well as to the non-commissioned officers and men. Each company has a sufficient cadre to admit of its division into two parts, each part by augmentation to become a complete company, so that on mobilization 32 companies in all can be produced, each subdivided into four sections. The departmental transport of an army corps absorbs eight companies; three to supply its divisions with their first line, one company for each division appropriated by sections, thus,—each of the two brigades absorbs a section of 11 wagons (field forges included) for its staff baggage, butchery implements, and one day's rations and corn for the brigade; one section is allotted to the divisional staff, military police, commissariat and transport detachment, &c., with one day's provisions and corn for the divisional troops and details (cavalry regiment, artillery, rifle battalion, &c.); the remaining section furnishes transport for the divisional bearer-company. In its first line, the army-corps staff and all details not belonging to divisions (cavalry brigade, corps artillery, corps engineers, &c.) require one entire company, including the carriage of the one day's rations and corn, so that these troops may be on an equal footing with the divisions as regards provisions. Thus four out of the eight companies are required for the first line of transport.

The second line, like the first, is distributed separately, viz., that required for each division, and that for the army-corps details not belonging to divisions; it provides transport for the divisional field hospitals (two per division), and for three out of the six movable field hospitals on the corps establishment, it being considered that this number is the greatest that can need removal at any one time: it carries an additional day's rations and corn, both for the divisions and corps details, and furnishes transport for the field bakery and butchery column as well as for the ordnance store department of the corps. In this manner three more companies are absorbed; the eighth company is held in reserve for such purposes as circumstances dictate; it could

carry, if necessary, tent equipment for about three-fourths of the army corps; or, a far more probable use in a European campaign, and one to which it is, I understand, intended to apply it when a line of communications is established, it might be withdrawn from the departmental transport of the army corps, and be advantageously employed in connection with the advanced dépôt.

On the war establishment neither the companies nor the sections have a uniform strength; it is wisely determined that, within reasonable limits, the strength of the company or section shall correspond to the work that is required of it, and work together as a whole; any other plan would necessitate the breaking up of companies into fractions working apart from each other, a radical defect in any military organization; the companies range from 182 of all ranks with 83 carriages, to 230 of all ranks, with 127 carriages.

The general principles of organization and method of distribution of the departmental as well as the regimental transport are not dependent upon the particular means by which the actual carrying is performed; a variation in the means may alter the number of animals and their drivers, probably also the number of minor supervisors requisite, and even the sources from which these are obtained, but can hardly, in itself, be a valid reason for altering the framework of a complicated structure.

The usual data upon which calculations as to the length of road occupied on the march by transport of the regimental or departmental description are based—are as follows, viz. :—

Including an interval of 4 yards from the tail-board of one carriage to the horse's head of the succeeding one, each vehicle with two horses abreast may be estimated as occupying a length of 12 yards; with four horses two abreast, 16 yards, and so on, adding 4 yards for every pair of horses abreast; this applies to guns and their wagons nearly enough for all practical purposes. A pack-horse or mule is allowed a minimum of 4 yards in length, the breadth must depend upon the mode of loading, but it could hardly be less than 8 or 9 feet, so as to avoid collision. A fair estimate for strings of camels seems to be about 5 yards per camel, including the slightly increased interval at the end of each string. Thus, taking the division as practically the marching unit, its troops, accompanied only by such portions of its transport as must be at hand for an action, including half its reserve ammunition column and its bearer company, would occupy 4 miles of road, while the rest of its transport, following as might be found expedient, would occupy  $2\frac{1}{4}$  miles more, making the whole about  $6\frac{1}{4}$  miles. This includes the unavoidable lengthening out of the column during the march, estimated at one-third added to its original length.

The length of road occupied is very considerably increased when pack-transport has to be substituted for wheeled carriages, and depends so materially on the number of animals that can march abreast upon the road, that it is useless to attempt to frame an estimate or general application. It is moreover found that both pack animals and human carriers open out very much on the march, and are much more difficult to confine within anything like reasonable limits as to road space, than are wheeled vehicles.



I must now pass to the third category, or what is termed the *General transport of the army*.

The regulations for the organization of the line of communications of an army in the field divide, for purposes of command and administration, the area existing between the rear of the fighting force and the base of operations into three sections, viz: the base itself; the road, or roads; the advanced depôt; each under a commandant aided by a staff representing all the departments of the army whose functions connect them with these sections respectively. Over the whole of this system is placed a general officer with the designation of Inspector-General of the line of communications, whose authority is paramount over all troops and others either employed in or passing through this area, over all the military departments working therein each according to its functions, and who is responsible for every transaction connected with the service of the army in front which takes place between the base and the advanced depôt, both inclusive. The general transport of the army is the transport, whether of the regular military type, hired, requisitioned, or purchased, which is brought into military use within this area; not, however, including the railway service, the control of which, under the direct authority of the Inspector-General of the line of communications and unconnected with all other transport, is specially provided for by the same code of regulations. It is this general transport which, either in the absence of railways or as supplementary to them, pushes forward supplies to the advanced depôt within tangible reach of the departmental transport of the army; and it is this transport, almost always composed of heterogeneous elements, brought together often from different parts of the world and with a *personnel* speaking various languages, that commonly presents the greatest difficulty in organizing for the effective service of the line.

When our transport companies have been divided each into two, and augmented to the war strength, we shall have done our utmost in the direction of expanding our existing organization, and it is highly improbable that, in a large undertaking, any important fraction of the general transport of the army could be of the strictly military type. New organizations become a necessity and the material obtainable must be utilized. Vehicles, harness, workshops, and other appliances have to be provided on a large scale, as also depôts both for spare animals and for the reception of those sick or disabled.

The scenes of our military undertakings vary so endlessly, and the conditions differ so materially that no predetermined type of organization for this description of transport could possibly be applicable to all cases; nor does it often happen that the experiences of one operation throw very much light on the organization requisite for others. Nevertheless certain general deductions may be drawn from successive experiences, so that we may at least be forewarned as to the general requirements of a transport service of this extemporised character, and of the difficulties we may expect to meet with in our path; but it surely is unreasonable to expect to get rid altogether of the defects and weaknesses inherent in

every hasty construction. One of the first points to be determined must necessarily be the system upon which it is intended to work the transport, that is, whether the wagons or animals are to be worked by stages, returning to their own stations after performing a stage; or whether convoys are to be carried through several marches, only returning after an interval perhaps of many days. The experiences of all our recent expeditions are in favour of the stage system whenever it can be adopted. The transport was so worked in the Abyssinian expedition, in Ashantee, and is now being so worked in our operations against Afghanistan. An example from one of the columns will serve to illustrate the case.

Brigadier-General Phayre, the Inspector-General in charge of the line of communications of the Quetta Army, extending from Sukkur to Dadur, a distance of 164 miles, received orders towards the end of January in the present year to make arrangements for conveying six months' supply for 30,000 men to Dadur for Quetta by the 1st May, the total weight being estimated at 360,000 maunds, or 13,224 tons.

For the section of road between Sukkur and Jacobabad, 51 miles, were available 2,580 bullock-carts with two bullocks each, the cart carrying a load of 10 maunds, or  $7\frac{1}{4}$  cwt.; these were equally distributed to work on four stages, the stations being at the base end of each stage, viz., Sukkur, Meygrani, Shikarpore, and Hamayin, the average distance apart being 13 miles—this gave 645 carts per stage, 10 per stage being considered as spare; half the carts were to go forward each day and return empty the next, so that it was estimated 95,000 maunds per month would be carried. There appears to have been no provision for a day of rest beyond that possible by the use of the 20 spare bullocks; this was probably due to the fact that the stages were of moderate length, and that the return journey was performed empty, probably also steps were being taken to increase the number of bullocks first available. Between Jacobabad and Dadur, 113 miles, the work was to be performed by pack-transport, for which camels were at once made available, in number about three-fourths of that required to keep pace with the operations on the other section of road, and steps were taken to provide the rest. The 7,750 available camels were allotted to seven stages; there were, however, only six stations, the second stage being a double one, viz., Jacobabad, Nehal ka Goti (double), Barshori, Kassim ka Joke, Bagh, and Haji ka Shahr; 1,000 working animals and 50 spare were allotted to each stage, leaving 400 as a reserve at Jacobabad to meet emergencies. Thus, at 5 maunds, or 411 lbs. per camel, it was estimated that even at the commencement of the work 75,000 maunds per month would be delivered.

With reference to the system prescribed by the regulations for the organization of the line of communications, I am able to state from reliable sources of information placed at my disposal by the kindness and through the instrumentality of Colonel C. B. Brackenbury, who was to have lectured on this occasion, that its application, in a form modified so as to meet the requirements of the case, on the Sukkur-Quetta-Candahar line of operations in Afghanistan has been attended with marked success, and that some progress had been made in apply-

ing it also to the Kurum line. It is evident also that the Government of India fully concurs in the principle of these regulations, and is seeking to develop the system for future undertakings. Taking the Khyber line as an illustration under existing circumstances, although the system has not actually been put into practice on that line, Peshawur is the base, the officer there commanding might become the base commandant in addition to his district command, a road commandant to be appointed from the second division, and the commander of that division, whose functions would extend to Jellalabad, 88 miles from Peshawur, to become the Inspector-General of the line of communications. Jellalabad to be regarded as the advanced depôt until such time as the first division should advance beyond Gundamak, whereupon this latter place would in its turn become the advanced depôt. This sketch is also derived from the source of information to which I have just alluded. I am unable to give any similar examples from the operations against Zululand, the systematic organization of the line of communications apparently having been too recently undertaken to furnish any reliable lessons at present. The mode of transport in this latter undertaking is peculiar and cumbersome to the last degree. Sixteen oxen draw a long and heavy wagon, the load of which ought not, so far as I can gather, to exceed 30 cwt. or thereabouts, for that portion at least which actually accompanies the troops, if they are to make even average marches with success; as both the capacity and strength of these wagons very considerably exceeds this, the temptation to give them their full load is great, and many evils are spoken of in consequence. Captain MacGregor, staff officer to colonel Pearson during the isolation of the column in Ekowe, writing in February, says, the curse of South African warfare is the transport; he speaks of endeavours made at Ekowe to use their bullocks as pack animals, 16 of which would carry what he considered a proper wagon-load to accompany troops under such circumstances. These attempts appear to have met with a partial success, the want of pack-equipment being the main obstacle; the chief advantage sought to be obtained was that the march of the troops need not then be confined to the beaten tracks, and thus that the enemy might not know with any certainty, as he does at present, the precise spot at which to attack them on the march. There are proverbially two sides to every question, and before accepting this as a solution of the difficulty, we ought to inquire what provision is to be made in substitution for the shelter the wagons afford when no tents accompany the force, and for the defensive enclosure both for men and animals that is so readily obtained by means of a well constructed laager; also, whether the largely increased number of drivers this would necessitate could be obtained, and could be depended on to stay with the troops when the enemy was at hand.

To return, however, to the subject of the organization of units of transport. In the short time at my disposal, I do not purpose troubling you with full details of organizations which have been adopted on various occasions. The historical accounts of our expeditions contain, in most instances, though not always in a concise

form, information from which to derive a sufficiency of such details. From these recorded experiences, coupled with the best opinions I am able to gather from intercourse with officers connected with this service, a few data may doubtless be safely derived for general guidance, and I should only be too glad, after the lecture, to correct my assumptions on further light being brought to bear on the subject. First, in the case of wheeled transport. Every driver, whether in the regular or in an extemporized organization, can, both on the road and in camp, take charge of a minimum of one pair and a maximum of two pair of horses or mules, the maximum only for emergencies of short duration. Draught bullocks do not require so much attendance, as we find at the Cape two men in charge of the 16 bullocks belonging to the wagon. A supervisor on the first step of the ladder can look after from five to ten wagons or carts, according to the number of men and animals belonging to them, and the extent to which the necessities of the case demand a strict conformity to military rules, and other circumstances; thus, a sergeant or a corporal can supervise five 4-horse wagons of the strictly military type, while a supervisor has been found sufficient for every ten 2-horse carts with civilian drivers, as in the organization for the Bengal famine relief operations in 1874. And we find that a petty non-commissioned officer to about every seven mixed vehicles, mostly 2-horse wagons, is considered sufficient in the German organization of their wagon-park columns of hired or requisitioned transport; our own transport officers appear to think that an efficient non-commissioned officer could supervise ten such vehicles. Again, a captain, a subaltern, and a sergeant-major are considered sufficient for the German unit of irregular transport, such as I have just referred to, consisting of 82 vehicles and about 200 horses; this agrees very nearly with an estimate most kindly furnished to me by the Commissary-General at Head Quarters, viz., that 1,000 animals, in companies of 250 each, would require two commissioned and two warrant officers (conductors) per company, a field officer in charge of the whole, with an adjutant, quartermaster, and veterinary surgeon, and that to render such a unit thoroughly efficient for campaigning, the following establishment should be provided for each company; first with reference to pack-transport, viz. :—

One company sergeant-major as pay sergeant, one trumpeter, and eight riding-horses or mules for officers and sergeants.

	Sergeants.	Corporals and Second Corporals.	Privates or Muleteers, &c.
For transport duties .....	4	8	125
Saddlers and harness makers .....	1	2	..
Farriers and shoeing smiths .....	1	2	2
Bâtmen, and for various duties .....	..	..	15
Total..	6	12	142

It would no doubt be prudent that the organization should, in the first instance, provide for one muleteer to every two mules, as it would probably be found the number of muleteers would soon be diminished by casualties, while the number of animals must be maintained from the reserves by every effort, otherwise the work allotted to the company could not be performed.

For a company of wheeled transport, including vehicles of all descriptions, the strength should also be determined by the number of animals rather than by the number or description of vehicles, as the carrying power must necessarily be fairly proportionate to the draught, the effective load for such transport on fair roads probably averaging about 6 cwt. per horse or mule. Taking, therefore, the same strength of company, viz., 250 animals, the variation from the establishment above suggested would be but slight; thus, a wheeler-sergeant and two wheeler-corporals must be added, and the farriers and smiths must understand carriage-work as well as shoeing.

For the supervision of the artificers, each battalion of four companies, whether of pack or wagon-transport, would require a farrier-major, a wheeler-major, and a saddler-major, and the workshops should be in common for all the companies at one station.

It is a fatal mistake to over-estimate the powers of transport, and thus afford inducements to subordinates to overload it, in order to fulfil the expectations of their superiors. Assuming, therefore, that three-fourths of its strength can be relied upon for actual work every day, a fair and moderate assumption, the data for calculations would be that a company of pack-transport of the foregoing type could carry an effective load of about 13 tons, and a company of draught-transport about 56 tons.

In the Abyssinian expedition, a division of 2,000 pack-mules was in charge of a captain, with a subaltern for each 1,000, but, according to Sir Robert Napier's amended organization, there were in addition a host of minor supervisors, and it must be remembered that the management of the transport in this expedition was based upon habits and customs prevalent in India, whence the major part of it was derived. The work was performed in companies of 150 animals. It may be said that in India there is no military organization of the transport service. Vehicles and animals, accompanied by their accustomed attendants with a proportion of overseers, are obtained by a sort of compulsory requisition, the inhabitants, from immemorial custom, recognizing the right of the ruling power to their use for Government purposes. The personnel is controlled in peace by the simple process of dismissing objectionable individuals, and in war they are, of course, camp followers, and amenable to military discipline.

Under ordinary circumstances one attendant has been considered sufficient for every three pack-mules or horses, as in China in 1860, in Abyssinia in 1868, and in the famine relief operations in Bengal in 1874. In New Zealand, however, in 1861, one attendant seems to have been allotted to every two animals, a good proportion to commence with.

In coolie organizations, such as we have resorted to in China, in

Ashantee, and in the Duffla and Looshai expeditions, a supervisor for every 25 carriers is sufficient, four such sections making a company of 100, which may be commanded by a selected non-commissioned officer. The combination of companies into larger units must, I think, greatly depend upon the conditions under which they are to work.

In any organization, however, whatever its character, required to work along an extended length of road, there must be arrangements to provide for a strict supervision, exercised by inspectors of superior rank allotted to definite sections of road, and constantly on the move thereon, so that they may actually witness the working of every part of their charge at frequent and uncertain periods. Over the whole must be a director, aided by one or more assistants. Even the functions of the director may require subdivision in very extensive undertakings, as was the case in Abyssinia on the division of the transport for working purposes into highland and lowland trains, a sub-director being appointed for the highland train, to receive orders direct from the staff at army headquarters.

In working transport on the stage system there are several obvious advantages; thus, at least each alternate day every man, animal, and article of equipment comes under the eye of the officer in charge at the station to which it belongs, and thus can be more easily kept in a state of efficiency. The unremunerative weights are less, as only a very small portion of the kits of the drivers and others need be taken with them, and the responsibility for the condition of the component parts of the system, as well as for the work actually done on each stage, is easily fixed.

When through two or more contiguous stages vehicles of nearly the same type are used, so that the mode of attaching the draught animals does not materially differ, the vehicles themselves may advantageously be sent through that part of the line, instead of being unloaded at each stage, the drivers with the animals and their harness returning to their station with the empty vehicles performing the homeward journey; it is only on the first starting such a plan that there will be any delay in their return.

Whether or not it may be advisable to make arrangements by which each convoy should be able to return to its station the same night, must, I think, depend upon the particular circumstances of each case. This might, of course, be effected either by increasing the number of stations and making the day's progress of the stores cover two stages, or by causing intermediate stations to send half their carriages, &c., forwards laden, and half backwards unladen, meeting those of the adjacent stations midway. The advantages of returning home each night are considerable; the average daily stages, when the transport returns the next day unladen, can hardly exceed 20 miles, probably 18 would be a safer estimate; whereas by equalizing each day's work, half being performed laden and half unladen, probably 11 to 12 miles each way might be accomplished with the same wear upon the animals; there would thus be a gain in the day's progress, in addition to the immense advantage of every man and animal sleeping each night at his own station. On the other hand, this plan has the serious disad-

vantage, either of largely increasing the number of stations, and entailing the inconveniences of numerous separate establishments, or of involving complex arrangements for meeting and transferring stores midway; and it is probably on account of these drawbacks that we find the single stage system more often adopted.

On first commencing to prepare my lecture, it was my intention to explain the leading features of the transport systems adopted in some of the continental armies; I have been compelled to abandon this branch of the subject, feeling that I have already made large demands upon the patience of my hearers. I consider, moreover, that however interesting, and in some respects also instructive, may be the arrangements of our neighbours, there is a strict limit to the points therein from which we can derive lessons practically useful as guides in our own case; as with every other description of machine, so with an army, each limb must be so constructed as to work in unison with the other limbs for the efficient service of the body, therefore unless we mean to remodel the original framework, it is of little use to borrow a ready-made part of some other machine, in the hope that by good luck it may fit into the place where we perceive there is a deficiency in our own.

There is still one question, and it is a very old one, that must not remain altogether unnoticed, although the mere mention of it opens a wide field for discussion; it is, whether it is desirable to combine transport duties with those of supply, and hold one chief responsible for both; or whether transport should be controlled by a separate chief, and be dealt out to the supply department on its requisition, as to other branches of the army.

The report of one of our ablest Committees, Lord Strathnairn's, which bears date March 5th, 1867, contains the following opinions, viz.:—"The Committee have agreed that army transport should be organized as one service, and, as transport is so intimately connected with and is of such vital importance to, supply, it must necessarily be under the direction of the officer at the head of the administrative staff of the army who is responsible for the supply. It would, in fact, be impossible to enforce such responsibility without giving absolute control over the means by which the supplies are collected and conveyed."

The Committee consider also, that in bringing the supply department under one control with the transport, they have ensured both large reductions in the quantity of stores and economy of the transport, which separate and independent supply departments would otherwise compete for, to the general detriment of the Service."

I submit that the head of the administrative staff, contemplated by the Committee when these views were expressed, is, in substance, the chief of the commissariat department as now constituted, for they did not recommend that the charge of material of war should be included in his responsibilities. The functions of the late control department were made to embrace this charge in consequence of the report of a later Committee, and the mistake has been rectified by the establishment of a separate ordnance store department.

The advocates for the establishment of a separate department for transport, independent of the commissariat, urge two principal objections to their combination: first, that in peace time by far the greater number of officers of the department are employed in supply duties, and receive no training in those relating to transport, and thus, when an urgent demand for trained transport officers arises, they are not forthcoming, and their duties have to be performed by others unused to the work. Secondly, that the difficulties in expanding the transport service are greatly augmented by the unwillingness of line officers to serve under officers in the junior ranks of the commissariat and transport department, and thus the most suitable are not always obtained.

Supposing a separate department for transport to be established, would it be of such a magnitude as to offer greater facilities for the training during peace of more numerous officers and non-commissioned officers than are at present trained? Would not the increased expenses of a separate department, even on the scale of our present transport service, inevitably invite, in our economical fits, the application of the pruning knife to that part of our military establishments which would least show the lopping to the public eye, until practically there would be but a shadow left? Whereas by connecting it with a large and influential branch of our administrative machinery which has not only the power, but doubtless also a direct inducement, so to employ the transport in connection with its own transactions as to justify the expenses of its maintenance, such tendencies to retrenchment are greatly modified. A separate department at home must be followed by a similar change at all our military stations where local transport is now employed under the commissariat; are we prepared to set up such detached establishments under separate transport officers? Almost all our colonial wars are preceded by a period of uncertainty as to the magnitude which the undertaking is likely to assume, during which existing institutions are gradually expanded according to the exigencies that arise; thus, were we to adopt the principle of separation at home, while in our colonies the transport remained under the commissariat, would not the same embarrassment that took place in the New Zealand war occur over again, namely, that on the arrival from home of part of our transport (then a separate service) it could not be utilized in connection with the existing local organization under the commissariat which had grown up out of the peace establishment, and separate employment had to be found for it.

Unless the separated transport corps had something approaching to a combatant status, would expansion be an easier process than it is now? Would combatant officers be more willing to serve under those of its subordinate grades than they now are under those of the commissariat? and, when our transport had such a status, was it so great a success as to tempt us to repeat the experiment? Had it not rather become something between artillery and light cavalry, officered by those who for the most part never were, and never aimed at becoming, skilled in the duties appertaining to a carrying organization? Again, in every petty transaction involving both supply and



transport, when the services are distinct, endless difficulties arise with reference to the responsibility for the stores during transit, and their due delivery at their destination, and when separate conductors are sent in charge of the stores, they can but very imperfectly perform their duties without any authority over the proceedings of the transport party.

A discussion is to follow; I imagine, therefore, that one who presumes to lecture should clearly indicate his own opinion on so important a point relating to his subject; if that has not been already done, I must say, with the greatest respect for the opposite views held by many officers of far wider experience, that my own answers to the questions suggested are unfavourable to the principle of separation. The approaching reorganization of the Commissariat and Transport Department, whereby it will be given a character far more strictly military than it has ever hitherto had, with officers who have passed years in the combatant ranks, will doubtless confirm its thorough recognition as a cordial fellow-worker for the common weal by all other branches of the army, and remove many of the difficulties in the way of an expansion of its transport service. Until this new scheme bears fruit it is a point worth considering, whether, when large numbers of combatant officers are necessarily employed in transport duties in campaigning, it would not be possible to meet their known objections and prejudices, by such a distribution along the line of communications as would ensure one of their own number being in command of the transport at any station where many are employed, receiving his orders from the superior commissariat officer in charge of any given district; his strict co-operation with the supply officer, when there is one, might doubtless be confidently relied on, as each would have the same superior. Moreover, the royal warrant under which the department is constituted clearly implies that during active service combatant officers with special ability and aptitude for the organization and management of transport, may be temporarily appointed to any grade therein; thus, in addition to the talent contained in the department itself, it practically has, on emergencies, the command of that in other branches of the service also, without the slightest infringement of the principle that the chief of the commissariat with an army or an army corps, is also chief of its transport.

There are several special branches of the subject of military transport to some of which I have but casually alluded, and others have not been mentioned at all. Among these are the wide and highly important subject of the military use of railways, the transport of ammunition, the transport of heavy siege trains, the transport of sick and wounded in war, the order of march and the protection of convoys, the methods of encamping transport, and the recruiting and training of soldiers of the transport service. Some of these have already been the subject of consideration in this Institution, and, as regards such as have not, we may perhaps venture to hope that, as opportunity offers, the Council may be pleased, with the assistance of those who have made these special branches their study, to afford us the opportunity for having them fully discussed.

Colonel ALCOCK: In the presence of so many distinguished Officers, I should have thought it presumption on my part to be the first to address this meeting; but as no one has risen for that purpose, I may, perhaps, be allowed to say a few words. I am sure we shall agree that this excellent lecture has added much to the scientific and practical knowledge of the members of our Institution. At the commencement the lecturer referred to the difference between our system and those of the Continent. It is evident that our military system must be one entirely peculiar to ourselves. We have a problem of our own, and cannot conform entirely to the characteristics of Continental nations, inasmuch as they act upon entirely different principles. The railways are the essential elements of their strategy; but our men are raised in a different manner, are employed in every part of the world, in every climate, and in every description of war, and are, with their employment and duties, generally beyond the reach of railways. I remember the description of a Pioneer railway<sup>1</sup> once given in this Institution, and we then saw the extraordinary advantage that might be derived from being enabled to push a railway into an enemy's country with great rapidity. The lecturer has referred to the Zulu War; and I may mention that foreigners are regarding our operations simply with a view to ultimate results, while we necessarily look to the very important and anxious details of what is now going on. The Germans say that Africa can never be civilized until the English have brought the Kafir races under control. The French seem to have something of the same opinion; for Victor Hugo, only the other day, said that Europe would never be satisfied with Africa in a state of paralysis now communism is the troubling spirit of the age, and he said that the remedy for that social danger would be found in emigration to Africa, by which proletarians would be changed into landed proprietors, I suppose, in Central Africa. A German author, Dr. Fabri, has also referred to the same subject with respect to colonization and colonies, including Central Africa. He proves, by statistics, an increasing population in Germany beyond the means of support, which is an increase of the proletariat, the social consequences of which would be very critical. Now the well-being of a country depends upon the power of expansion; but as our colonies are open to the emigrants of all countries, it follows that our armies have fought and are fighting in the civilizing service of the world. I mention this to show that foreigners take an interest in the question, and imagine that there is a wider and a deeper meaning in this war than we ourselves supposed. I have been reminded that I must not introduce any new subject, and I confine myself to what I believe to be of some interest, namely, the fact that, with the consequences of this war there is association in the minds of different people, in one way or another, the future condition of Central as well as of Southern Africa.

General Sir ARTHUR CONYNGHAME: As the subject of transport in Zululand and South Africa has been alluded to by the lecturer, I think it my duty, having had some experience in it, to say a few words to this meeting. I consider that the system of wagon transport in South Africa is unduly underrated. We must remember that the wagon with sixteen bullocks in South Africa has been an institution of that country before the time at which we took possession of it, and the facility with which large amounts of goods and provisions could be carried in South Africa by this means is astonishing. It would surprise many people were I to tell them of the distances or the undertakings which are carried out by this transport in South Africa. Men are unceasingly for years engaged in this employment, sleeping under their wagons, which indeed make exceedingly good coverings, and they thus convey goods from Cape Town 900 miles into the interior, and indeed very much further, towards the Zambesi. If this description of transport were condemned, it would be necessary to send other wagons from this country; and if transport by oxen were condemned, it must be supplemented by a larger number of mules, imported from South America or other countries at an immense cost. Wars in South Africa are very sudden; considerable reliance must therefore be placed upon the transport to be found in the country. It has been said that sixteen bullocks, if they were made to carry loads upon their backs, would conjointly carry 32 cwt., and that that quantity would be equal to the load carried in a wagon.

<sup>1</sup> Haddan's Pioneer Railway.

Here, I consider, a great mistake is made; instead of only a ton and a half being a load for a wagon, I know that these wagons will carry, under particular circumstances, as much as five tons: and therefore the advantage of the wagon in that respect is very great. I may add, however, that it is not a good plan to trust entirely for the transport of these large wagons in South Africa. When I had the honour of commanding there, I did my best to supplement it by a system of Scotch carts, with two oxen; these were exceedingly useful. When bad roads had to be traversed, I caused brakes to be attached to these carts, which had a very good effect in retarding their progress down hill. These small carts were built to carry at least 3 cwt., and thus substituting six or eight Scotch carts for one wagon, if one broke down, it was not difficult to transfer the load to the others. I believe Lord Chelmsford has done his best to increase the number of Scotch carts. The advantage is undoubted; they readily run down small hills and declivities; and the wheels can even be taken off and the carts carried for a short distance, where it would be impossible to move the large wagons across bad spruits or streams. I took some pains, also, to have some of the mules trained to carry pack-saddles; but it must be remembered that in South Africa, at certain seasons of the year, it is exceedingly difficult to feed bullocks at all. I allude especially to the months of June, July, and August. Then, if an army must move, it adds enormously not only to the expense but also to the required supplies, for the bullocks, when there is grass, feed themselves, but for the mules a considerable quantity of grain must be carried. Mr. Chairman, looking upon my former position in South Africa, I thought it my duty to make these few observations upon the subject of transport now before this meeting.

Captain GEDDES: There is one point of detail in this matter which we shall all have to consider sooner or later, viz., the *personal* carriage of ammunition and intrenching tools. These should always be with the men. The general transport does not deal with this point. In fact, when intrenching tools are wanted, they are very often not to the fore. My suggestion is simply this: let each section of a company (say 20 or 25 men) carry their intrenching tools in a hand-cart; such a cart might be utilized to carry spare ammunition, for instance, a box of 600 rounds, giving some 30 rounds per man; even three or more days' provisions might be added, and still the cart kept well within the capability of two men to draw. It may sound curious to suggest such an addition as four hand-carts to the *mâteriel* of a company, but I believe the time is coming (especially when repeating arms will be used) that these hand-carts must form part and parcel of the company, be drilled with them, and, in fact, be always on the spot.<sup>1</sup>

Captain APRIL, late Transport Corps: I would venture to say a few words bearing on this most important subject; having had great experience in the transport service, I feel that my remarks may not be out of place from a practical point of view. The great question with regard to transport is its organization, and that means expense. It would be too painful, perhaps, to go back to the Crimean War, where we saw nothing but disorganization and failure; after that sad experience we formed, from the remnants of the Land Transport Corps, the "Military Train," under Colonel McMurdo. That was an exceedingly well-organized corps, and they thoroughly did their work, as was shown in the several imaginary campaigns on Woolmer Common. The corps was well officered and commanded, the drivers thoroughly trained and efficient; and although the Military Train were few in number, not more than ten battalions of 400 men in each, the whole proved a great success. There was only one thing against it, viz., the very great expense. If you have an organized transport of that description, capable of taking the field (I am speaking of horses and wagons), you must have an expensive transport. With regard to the use of railways, as shown by the lecturer, that is not a matter of transport, it is simply conveying supplies from the base of operations to the *dépôt*, which would of course be taken advantage of so soon as we had firm hold and could establish ourselves; but what we have to get at is, conveying supplies from the *dépôt* to the army in front. I would suggest a plan by which the difficulties we are now labouring under in

<sup>1</sup> Such a cart has been invented by Colonel T. Martin, late 4th King's Own, and may be seen in the Museum of the Institution.—Ed.

South Africa from the want of transport could be easily and inexpensively overcome. We have always suffered and our advance been retarded from this most important arm of the service. The transport I allude to is the Chinese Coolie Corps, the most perfect, inexpensive transport in the world. During the campaign in China, the Coolie Corps saved, I might almost say, the British Army; for had it not been for those splendid fellows, we could never have arrived in the time we did at the gates of Peking. The canal transport was of some service, but always open to attack and consequent destruction. Another great advantage of the Chinese coolies is, that they can defend themselves, and behind intrenchments they are very formidable enemies to deal with. In the China campaign, 1858-59, we sent out one battalion of the Military Train, consisting of about 400 men; this force, on arriving at Hong Kong, was broken up into sections, and scattered in all directions to take charge of effete men of different castes sent from all parts of India; to these were added Manilla men; and a more incongruous mass of human wretchedness cannot be conceived. We brought ponies from Manilla, ponies from Japan (the latter so vicious that no one could go near them), bullocks from China, bullocks from India, too sacred to be touched; before landing at Petang more than 2,000 animals died. Not to enter into further details, too painful to bear light, suffice it to say, that the whole thing broke down, and we had to fall back upon the resources of the country, which fortunately were equal to the emergency. I have no doubt that with a very little organization a Coolie Transport Corps could be formed, which, for economy and efficiency, would not be surpassed. The Chinese are a most sober, tractable race, and under European Officers will fight to the last.

Admiral SELWYN: Although a naval Officer, I venture to rise to communicate to the meeting one item of progress which has been made in this question. We are all aware that a very large proportion of the weight of every article of food arises from water. I am able to put before you the fact that you can diminish the weight of all food necessary to be carried for an army, its horses, and men, down to one-sixth of what is at present carried, and that with perfect facility. It is being done; and where such food has been sent out to the army at the Cape it has received the high commendation of General Officers on the spot. The result of this will be that instead of 52 rations weighing 160 lbs., we shall bring them down to 27 lbs., and this will solve a very large portion of the difficulty. I should like to correct a mistake made the other night in the House of Commons where it was stated that the erbswurst was simply pea soup. The erbswurst is something more than that: it is a carefully prepared chemical food in which every element necessary to support human life is properly proportioned, and its keeping qualities are absolute for any number of years. You may, therefore, dismiss from your minds a great many of the necessities which have been spoken of if you will consent to examine carefully the progress which can be made. Then there is another direction in which economy may be gained, and it may be seen in the difference in the wagons used throughout America and Canada in their power of transport compared to their weight, and those used in most other countries. This arises largely from comprehending the true use of steel and the true use of hickory. I was in such a wagon drawn by two horses at night, and we came to the mouth of a canyon in the Rocky Mountains. It was late at night, and I suppose we were blocked by a rock about the size and height of this table; but the driver made his horses get up on the rock and coolly dragged the wagon over it. I got out to see the condition of the wheels, and I found that they were just as good as before: they had not sustained any injury. There was not a bolt or anything else broken. I am bound to say that the wagons are built rather loosely. They approach much more nearly to the great Cape wagons, in which hide is largely used instead of other fastenings. If you desire to subject such a structure as a wagon to undue strains of that kind, you must provide for the free play of its parts. That I think has been too much ignored in our present wagon construction, and we may derive some information in that respect from American and African practice.

Sir WILLIAM CODRINGTON: The question of transport, no doubt, is one of the most important the army can consider, and we certainly in the Crimea had difficulties connected with it. The circumstances of the expedition to the Crimea were such, in Lord Raglan's opinion, as to render a limitation of baggage necessary, and not a

single baggage animal was with the divisions of the army. With the 27,000 men and officers, we took nothing but 150 mules attached to each division for its small arm ammunition. That shows that there was no nucleus of transport whatever at that moment, and subsequently we had to get on as well as we could under the difficulties of the passage from Balaklava, which was through a sea of mud. So little does England keep up an establishment of this kind, which is essential to the well-being of an army even in the smallest expedition, that I remember it was necessary, when we had to consider as to a future campaign to take 300 bayonets from each division of the army of the Crimea in order that the division should be made at all movable. That shows how essential it is that the Government of this country, if it really wants to keep troops efficient for the Cape, or anywhere else, should keep up the nucleus of an establishment in real efficiency. You may get a certain quantity of transport, as Sir Arthur Cunynghame has mentioned, from the native inhabitants, and it is essential to make use of it; but in order to provide for your ammunition, and a certain number of days' supply, the nucleus of a military transport should be maintained. A Land Transport Corps and Military Train was attempted to be established here, but as a matter of economy it was cut down, I may say ruthlessly; that is the real ground of our not being able at once to move. We see it in almost every expedition that has taken place. Look at the difficulties at this moment in Zululand, where the advance has to be put off unfortunately day after day, possibly from the want of that very nucleus which could be expanded when once you have a fixed military establishment; but you cannot extend it if you have merely a few men and no means. Therefore, it is really a question of the Government and money and nothing else. Whether the commissariat is to have charge of its own transport, or whether the transport is to be a separate establishment, may be a difficult question to decide; but transport arrangements ought to be considered, being vital to the efficiency of an army if that army is to be movable.

General McMurdo: My name was mentioned just now in connection with the services of the Military Train, and I think it only right to say the Military Train, as it was organized by me after the Crimean War, was not according to principles that I approved of. The Military Train followed the establishment of the Land Transport Corps, but not upon the principles of that corps. I found new principles cut out and dried for me upon my reaching this country from the Crimea several months after the army had returned home. In saying this I think I should be only keeping you in the dark if I did not explain how the Land Transport Corps came to be established during the Crimean War. I do not wish to urge here my own opinions of the principles on which the transport of an army should be conducted, it is necessary to describe the Land Transport Corps in order to show how it was that I could not approve of, and that I never considered the Military Train a really working corps. It was in that first desperate winter of 1854 that I received, when in Dublin, a letter from the late Lord Hardinge, then Commander-in-Chief, saying, "You know what has happened in the Crimea, that the army is hard pushed through the excessive hardships of the climate, the difficulties the commissariat have to encounter, and the entire breakdown of the transport, and I desire you to come over and confer with the Duke of Newcastle upon the steps necessary to restore the transport of the army." I went over immediately; but I did not leave my hotel until I had laid down the principles upon which alone I would act, and those were that the corps I proposed to form should be entirely separate from the Commissariat Department. I was not urging principles of my own, but those of a great and an acknowledged soldier, Sir Charles Napier, who, in the campaign in Scinde, saw the necessity of organized transport; and I assisted him in the formation of what was then called the Scinde Cavalry Baggage Corps on the principle of entire separation from the Commissariat Department. The objects that he had in view were first to prevent over-loading. The second, to maintain due order of movement upon the line of march. The third was, by armed and disciplined drivers, to release the infantry of the line from the duties of baggage and grazing guards. These were his chief points, and in forming the Land Transport Corps of the army in the Crimea I followed those principles, and I believe they would have been successful had the army taken the field. But we were obliged to

throw the whole strength of that portion of the transport, which was brought to the Crimea, into the siege operations. It was my intention, however, if we had taken the field, that the system of regimental, divisional, and departmental transport should be commonly followed with a reserve available for extraordinary requirements. I quite agree with those who mention the extreme difficulty of the transport question wherever the army happens to operate; my idea at the time I started for the Crimea was to make full use of natives as drivers; but I very soon found that they were utterly useless. Europeans had to take their places, and, as Sir William Codrington has just said, he had to reckon upon the contingency of withdrawing for this purpose so many bayonets from the army. The same difficulty presents itself just now in Zululand where Wood's column is said to be crippled because the native drivers have deserted. The wagons are good, the oxen are there, but large numbers of the drivers, who are a trained class of men, having deserted, operations are at a standstill: therefore, whenever we make war we ought to have a Land Transport Corps as a distinct department. But here I may mention that there was one part of the Land Transport Corps with which we succeeded particularly well, namely, the administrative branch, through the working of which the resources of every country within the theatre of war were drawn upon by means of agents for purchase and accountants; and thus, in addition to the Crimea, depôts were formed at Trebizond and Sinope, Scutari and Antioch, where at the time the peace was signed 27,000 animals were collected, probably sufficient if it had been determined to put the army in the field. The lecturer mentioned the obvious difficulties presented to troops of regular transport, such as the Military Train, being sent out suddenly for service, foreign to their training, as was the case (which he instanced) with a battalion of the Military Train sent to the New Zealand War, where the army was already operating with transport furnished by the Commissariat Department.<sup>1</sup> For where there are commissariat Officers, there should be Officers of the Transport Department also, to take up the threads from the commencement. The transport of ammunition is another most important point. Before the Crimean War there was for the carriage of small arm ammunition what, I think, they called the "Small Arm Ammunition Brigade," consisting of a certain number of trained drivers, horses, and wagons—a complete establishment, in fact, for the transport of the small arm ammunition of the army; and if that brigade had been carried to the Crimea with Lord Raglan's expedition, we should not have heard of over-loaded mules kept moving in circles during every halt of the troops, to prevent them from lying down! But what happened to this small arm ammunition brigade? The artillery wanted horses, drivers, and harness to establish fresh batteries for the field, and so two batteries were formed out of the small arm ammunition brigade. That, I think, was a great mistake. I endeavoured to establish a system for the transport of small arm ammunition, but more powerful influence than mine prevailed, so that the transport of ammunition was taken from the Military Train, and given over once more to that branch of the service that had at the commencement of the war broken up that important service, in order to equip their own batteries. The argument I used was this: "Suppose a brigade of infantry in action had to retire to a fresh position, and that the battery supporting it had to retire also. Suppose, also, the casualties among the horses so numerous as to cripple the movement of the battery; would not the commander sacrifice the small arm ammunition wagons rather than his guns?" Naturally, and however much mistaken, that would be his first thought. I consider, indeed, that the recurrence of another great war will show once more (when it may be again too late) that separation of the transport of the reserves of small arm ammunition from the artillery is as necessary as that of general transport from the commissariat.

MR. HADDAN, C.E.: Though not a military man, I have always understood that mechanical precision was the soul of military organization; but, when an ultra-civilized army, the pink of mechanical perfection, is brought face to face with primitive conditions of transport, then comes the tug of war, for I fail to see how it is to be expected that harmony can exist between the two extremes. It is evident,

<sup>1</sup> But if the Military Train had been formed on the principle of the Land Transport Corps, the result would have been different.

therefore, that some handy means of transport is required, which shall work with mathematical precision in all weathers, and under all circumstances. The model on the table shows how, by using a single rail elevated a few feet above the ground, the physical difficulties of the soil may be conveniently ignored, while the elements are not provoked by interference with their attributes of a long enjoyed free right of way. Compared with a bad road, the advantage, even with animal traction, would be ten to one in favour of the ariel tram, that is to say, on the ascents, while on the falling gradients gravitation would perform the work gratis, and at a velocity sufficient to secure a through average speed superior to any existing form of animal transport. It must not be forgotten that through speed is of little importance, since it only affects the *first* delivery. The tram would be worked on the stage system, the animals being confined to the ascents, made as short as possible consistent with commanding the descents. Since in a campaign it is *le premier pas qui coute*, the first line should be pushed forward on a rough and ready plan, and worked by animals. To effect this, the construction materials would be carried forward in the following makeshift but efficient manner, so as to do away with return empties, which are the bugbears of transport, especially of single lines. This would be effected, as shown in the model, by the materials and stores being so arranged as to be suspended in pairs astride the rail, in donkey and pannier fashion, the load hanging on light temporary wheels running on the rail, without the intermediary of a vehicle of any sort, the freight, like that of timber lorries, being self-supporting. The wheels are double discs, bolted together in the middle, the bolt having a capstan-head, through which a stick is placed to tighten it for brake purposes. The sheet iron wheels only cost about 2s. 6d. each, so their loss is not an item for consideration, while the store cases will come in handy for many useful purposes, and at worst for firewood. Semi-cylinders are the best form for the cases, a pair being easily transported by rolling and, moreover, useful as pontoons. The cases are to be water-tight, and contain sufficient air-space to enable them to be discharged over the ship's side into the sea. The towing animals would choose their own ground anywhere within 100 feet of the structure; but all unduly high situations, such as river crossings, &c., should be arranged to be traversed by gravitation. This is the principle which I have had the honour to submit to General Clifford, and upon the practical suitability of which to Zululand he has spoken favourably, and requisitioned for 100 miles for use in the field. The whole of the materials being in the market, ten days will suffice for the manufacture and shipment of the railway complete, and about twenty days for its erection, and the rates current are so exaggerated as to pay for the whole in five days.

Mr. G. FLEMING, 2nd Life Guards: This question of transport is one of the most important questions in relation to our army, for no branch requires a greater amount of attention to details. In my experience, the most expensive and troublesome kind of transport is the pack transport, and a great deal of the trouble and expense is due to want of forethought. In the first place, our transport is neglected during peace time, and it is only when war breaks out, that we begin to direct attention to it. What happens? We are obliged to procure animals from all parts of the world, and sometimes natives to attend them, from all parts of the world, and our nucleus of home transport is utterly unable to control such a large mass of transport as is collected on these occasions. Such was the case in China, and also in the Crimea. I think it would be very much to the advantage of the country if we had a school in which Officers as well as men could receive a certain amount of instruction in animal management, for the loss sustained on service is something appalling, and a large proportion of it might be altogether prevented. The amount of destruction caused in China, in a few days, from the use of bad pack-saddles, was something terrible, and this was a matter about which we might have had some foreknowledge. Again, at the last moment, we are obliged to draw upon the army for Officers to manage the transport, and such Officers have generally no knowledge of the management of animals—no knowledge of the loading or working of them—and the consequence is that in a very short time the animals entrusted to their charge break down. I do not think it reflects very much credit upon us as a civilized and military Power to feel that we have no school in which Officers, both of cavalry, artillery, and the line, can be taught some of the rudiments of animal management.

In other countries we have schools attached to the large Government stables, in which Officers receive this knowledge, and I am quite convinced that those countries must largely benefit by the knowledge which those Officers acquire. With regard to the question of food and transport, it is most important that every article to be carried should be reduced to the smallest weight and bulk. We have been trying experiments with the biscuits now before you, and they seem to show that animals can be kept for a number of days on at least one-third of the weight of ordinary forage. These are matters of detail which deserve the most earnest consideration, and I am sure I shall be forgiven for directing attention to them. I am quite convinced that upon the transport of the army depends the usefulness of the army, and I think our neglected transport has caused the country a very heavy loss indeed, and very great inconvenience.

Commissary POWELL, War Office: The question of transport will ever remain a difficult one for our Commanders to deal with. In the first or fighting line of an army the fewer non-combatant mouths and transport animals we have to feed the better; happy, indeed, would be the Commander who could banish them from his lines altogether. A suggestion has recently been made, by the Rev. H. G. Mason, M.A., of Croydon, which, if found practicable, would, I cannot help thinking, be of immense service in this direction; it was to the effect that a hand-barrow with a single wheel, similar to that of a bicycle, running through its centre, could be so arranged as to enable *two* soldiers to carry at least  $1\frac{1}{2}$  cwt. in addition to their own arms and kit, and keep up with their regiment while marching, regardless of obstacles which would be insurmountable to our ordinary wheeled transport. The advantage of such a system will, I venture to think, be at once apparent to those who have had practical experience in the transport service. 150 of these *hand-wheels* would carry upwards of 11 tons—a weight more than sufficient for the requirements of a regiment 1,000 strong. The 300 bayonets temporarily withdrawn while the regiment is in motion would be available at any moment by lagging the wheels and leaving them under a baggage guard, or in case of sudden attack they could be formed into a breast-work of no mean importance. From a supply point of view, such a system would be invaluable, rendering the fighting line independent of its advanced depôts for days at a time. To attain the degrees of mobility necessary for armies now-a-days, the soldier must carry less on his person than he has hitherto done. His three days' rations, 100 rounds of ammunition, great coat, small spade and arms, about 30 lbs. in weight, is as much as we ought to tax him with; all other necessities should fall on the regimental means of conveyance, whatever that may be. The question of the separation of transport from the commissariat has occupied the minds of our military administrators for years. After the experience of many campaigns, and on the recommendation of a Royal Commission, the two services were combined in 1870, and have remained so to the present time. The question is too large for me to venture on at this late hour, but I would ask those Officers who advocate the separation of these services whether any one of them would undertake the responsibility of supplying an army in the field without having the control of the transport in his hands?

The CHAIRMAN: We must thank Colonel Clifford Parsons for the very able manner in which he has dealt with this subject. He has compiled his lecture in a very short space of time, and I think the very clear manner in which he has produced his arguments is most creditable to him, able as we all know him to be. I think, in all our considerations of this subject, we should clearly bear in mind the three great divisions that exist in our system of transport. 1st. The line of communication from the base of operations to the advanced magazine. 2nd. The transport from the advanced magazine to the headquarters of divisions. 3rd. The distribution of rations, stores, &c., from the division headquarters to the different brigades and regiments. The transport from the base to the advanced magazine may be by railway, canal, hired transport, or in fact by any means, according to the nature of the country. From the advanced magazine, which should be one day's march from the front, to the division headquarters, must be trained departmental transport, and what is in front of that, the distribution to the regiments, must be regimental transport. If we bear in mind these three divisions, all our arguments and discussions on the subject will be much facilitated. The organization of the unit of



transport with pack animals has been under consideration for a considerable time. It would have been elaborated long ago, had it not been for the death of our much-lamented Colonel Home, who had that subject under his consideration at the time of his death. It is now under consideration again, and I hope, before very long, we shall have the organization of pack transport fully worked out, as well as the transport with wagons. It may also be carried out with elephant and camel transport for India as well. The great points of contention are with regard to the regimental transport, and whether the transport is to be a separate corps altogether, or whether it is to be undertaken by the commissariat department. There are many arguments on either side of the question, in respect to both those subjects. Perhaps, one of the strongest features we have to consider in the organization of the regimental transport is this: if it was to be supplied by the commissariat, the organization of the commissariat in time of peace must necessarily be very large; there should be a great number of Officers and non-commissioned officers prepared beforehand, ready to be attached at once on mobilization of the regiments. If the non-commissioned officers and Officers, as it has been proposed by some, are to be regimental, and the men only commissariat, I think it would form a very awkward kind of organization. If they are to be all commissariat, I think it is very questionable whether the department, when they are endeavouring to bring their own corps up to a war strength, and have great difficulties in expanding it, would be able to part with so many Officers, non-commissioned officers, and men as would be required by the regiments to form their transport; whereas, if it is purely regimental, the regiments will take care of themselves, find their own men, and will require only their horses from the commissariat. With regard to the question respecting the Transport Corps, it must be remembered that the medical and the ordnance departments require transport as well as the commissariat, and it is a question whether it would not be better to have a separate corps, giving the transport to the different departments—commissariat, medical, and ordnance—the portion that is given to each being permanently attached to it during the time that it is required, or whether, considering that the commissariat are most interested in the transport, it would not be better to throw the responsibility of the transport entirely upon them. These are matters which it is difficult to decide, and they must remain for discussion amongst those who advocate the two principles. I now propose a vote of thanks to Colonel Parsons for his excellent lecture on this occasion.