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Friday, June 20, 1890.

GENERAL THE RIGHT HON. VISCOUNT WOLSELEY, K.P., G.C.B., &c.,  
&c., Adjutant-General to the Forces, in the Chair.

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## ON THE TRANSPORT OF TROOPS BY RAIL WITHIN THE UNITED KINGDOM.

By Lieutenant-Colonel GEORGE FINDLAY, Engineer and Railway  
Volunteer Staff Corps.

IN approaching the subject upon which I have undertaken to address you, there is one respect in which it will be necessary that I should elaim your indulgence. Although I have the honour to hold the rank of a Lieutenant-Colonel in the Engineer and Railway Volunteer Staff Corps, I cannot, as, practically, a civilian, pretend to an intimate acquaintance with the technicalities of military organization, and I may, therefore, be led into errors, verbal or otherwise, which I can but ask you to overlook. I should like you to realize that I have addressed myself to this question from the point of view of a railway manager, bringing to bear upon it my experience of upwards of thirty-five years, much in the same way as that experience would be brought to bear upon any of the problems which frequently present themselves in the conduct of a large railway traffic at exceptionally busy times, that is to say, looking at it simply with a view to the adaptation of existing means and resources to a given end.

From the time when railways began to assume their present prominence as a potent factor in the life of the community in all European countries, it became evident that the invention of the locomotive steam engine must revolutionize the conditions of modern warfare very much as it had revolutionized everything else, and it came to be obviously a matter of the very first importance that the organization of military transport by railways in time of war should be carefully thought out and planned beforehand, so as to have everything prepared in the event of an emergency arising. No European State of any consequence has failed to grasp the importance of this question, and, briefly put, the problem they had to solve was this:—the railways of the country being such as they are, what are their relations to the State to be in time of peace and war, so far as regards their place in any scheme of national defence, and by whom, and under what conditions; should they be worked in time of actual war-

fare, so as to develop their resources to the utmost extent, and to secure uniformity of action and control, and so that the greatest amount of benefit may be derived from them in the carrying out of whatever operations may become necessary? The different European Governments have endeavoured to solve this problem in various ways.

In Germany, most of the railways being owned by the State, a central bureau has been established, assisted by four local bureaux, and by this means the entire rolling stock of the railways is regulated and controlled in time of peace and for ordinary commercial purposes, even the private railway companies being brought within the same system, and paid at a mileage rate for the use of their wagons. The effect of this would be in time of war to place the carriage and wagon stock of the country absolutely in the hands of the Government, together with the organized machinery for its control. A law passed in 1871 divides the railways into large groups or lines of communication for military purposes in time of war, and defines precisely the relations which are then to exist between the civil and military Officers who would have to carry out the transport arrangements, all the lines being placed at the disposal of the Army and worked by the staff of the Army for its own purposes. Periodical courses of practical instruction, held at the stations, and lasting two and a-half months, have been established, and are attended by Officers and non-commissioned officers of all arms, and those who have undergone this course of training would be detailed, in the event of mobilization, to take over the management of the railways.

In Austria-Hungary, in time of peace, the railways, both Government and private, are combined into groups, for each of which a central bureau or office controls the distribution of rolling stock, as in Germany, and keeps an account of its whereabouts. There is a convention, approved by law, between the War Office and the various railways, providing for their use in time of war, for the terms of user, and for the common utilization of wagon stock as required. What is termed a "Line Commission" is appointed for each main line or group of lines, consisting of a military General Officer and a railway man of some standing. They are called respectively the "Line Commandant" and the "Line Commissary." These "Line Commissions" are responsible to the central military organization for all transport arrangements in time of war.

In France, the plan of a central control of the common rolling stock in time of peace, as in Germany and Austria, has not yet been brought about, owing to difficulties which have arisen in dealing with the private railways, but the Government has power by law, in the event of mobilization, to take possession of the private railways at a specified rate of payment, and some of the railways are already State railways. A Military Commission exists, its President being the Chief of the Headquarters Staff, and this Commission would be charged with the superintendence of the rolling stock, and with all the arrangements for the transport of troops and stores. In time of peace there is a Special Committee for each of the seven railway

systems, viz., the six private railways and the Government railways, each such Committee comprising a military Staff Officer and a practical railway engineer, and these Committees in time of war would work the railways under the instructions of the Military Commission, while, if the operations extended beyond the frontier, they would assume, also, the control of the railways in the occupied territory.

In Italy, the military organization of the railways is very similar to that of France, but the railways belong to the Government, and are worked by two large companies, the distribution and control of the rolling stock of each company being in the hands of a central bureau. A civilian element also is introduced into the Military Commission in time of war by the fact of its including the managers of the two companies.

In the case of Switzerland, most of the principal railway companies have combined to place the control and distribution of their common rolling stock in the hands of a central bureau, which makes a daily distribution of the vehicles, and keeps accounts as between the companies, and this organization would be utilized in time of war to facilitate transport operations. There is, in time of peace, what is called the "Consulting Commission," composed of representatives of the railways, with the War Minister as President, and the duties of this Commission are very similar to those of the French "Military Commission." In time of war, a special "Central Direction" of five members is organized, and takes the place of the "Consulting Commission." This body receives instructions from the Chief of the Staff as to the transport required, and is responsible for carrying them out, and it, in fact, takes over the entire management and control of the Swiss railways, both for military and commercial purposes, for the time being. I am not very clear as to how this body is constituted, or whether the military or the civilian element prevails, but I think in all probability the "Central Direction" is really the "Consulting Commission" under a different title and with a new *status*.

This brief digest will be sufficient to show that all European Governments attach great importance to the question of railway transport, and have done their best to organize it; but in Great Britain, where the whole of the railways have been constructed by private enterprise, and where the number of Companies, great and small, is so large, it is obvious that the antecedent conditions differ so widely from those existing in most Continental States that any such arrangements as those which have been devised in Germany, Austria, France, or Italy would be inapplicable here. My view is that in time of war, when, in accordance with the provisions of the National Defence Act of 1888, the railway companies may be called upon by the Secretary of State for War to suspend, so far as may be necessary, the ordinary traffic, and to devote the railways, in priority, to military purposes, the principal railway officials should become, for the time being, the servants of the State, and the railways should be worked and controlled, under the direction of the Headquarters Staff, by the Officers of the Engineer and Railway Volunteer Staff Corps, who are the managers of the leading railway

companies; that is to say, that the Headquarters Staff would instruct them as to the transport required, and they would be responsible for providing it. The smaller railways should, for the time being, for all purposes connected with military transport, be affiliated to the other leading railways whose managers are Lieutenant-Colonels of the Railway Staff Corps, so that in fact all the railways of the country would be divided into a certain number of groups or sections, each of which would be under the direct management of an Officer of the Railway Staff Corps, these Officers in turn acting in conjunction with the Council of the Corps. Each Officer in charge of a group should be able to requisition stock, if required, from any of the other groups or sections; but this should be done through the medium of the Council, whose business it would be, with a full knowledge of the operations contemplated, and their extent, to regulate the distribution and supply of rolling stock throughout the area affected.

As to the payment ultimately to be made by the Companies for the use of rolling stock other than their own, the Railway Clearing House already provides complete machinery for keeping an account and arranging for payment as between one Company and another, on a system of mileage charges.

As regards the grouping of the lines into sections, I have gone into the details, but I do not think I need trouble you with them at any length. It will be sufficient for the purpose of illustration to say that one group would comprise the Great Eastern, Great Northern, and Manchester, Sheffield, and Lincolnshire Railways for transport on the East Coast between the Thames and the Humber. Another group would include the London and North Western Railway from London to Carlisle and Holyhead, the Great Western Railway from London to Chester, the North Staffordshire Railway, and a portion of the railways in Wales, and so on throughout the country. For each section there would be a Committee, composed of the General Managers of the lines included in the section, assisted by the principal engineers, locomotive engineers, passenger superintendents, and goods managers, the President of the Committee being the Lieutenant-Colonel of the Engineer and Railway Volunteer Staff Corps whose railway was included in the section. In the event of the transport requiring the co-operation of two or more sections of the railways, the Committees of such sections would act in unison, under the directions of the Council of the Railway Staff Corps. Routes, way-bills, and invoices would have to be sent with all troops and stores conveyed over the railways, with a view to a record being kept and the Companies being ultimately remunerated for the services performed.

As to the rules and regulations for the working of the lines, these are now uniform on all railways, and they would, of course, be the same in time of war as in time of peace.

An important provision would be to appoint for each section or group of railways a military Officer of rank, with power to arrange for the supply of food, forage, and water for the troops and horses *en route*, and this Officer should be also able to command the services of

the Royal or Volunteer Engineers to assist the ordinary railway staff in the erection of temporary platforms, landings, or sidings in emergencies when required. He should co-operate with and assist in every way in military matters the Committee of Section having charge of his district, but should not interfere with the working of the railways or the movement of the traffic.

I have outlined this scheme very briefly, and there are numerous details to be filled in, but in its general effect it has met with the approval of the Council of the Engineer and Railway Volunteer Staff Corps, who have been invited by the War Office to consider the whole question, and if ultimately adopted and elaborated as it might be, I believe it would represent the manner in which the perfect organization and ample appliances of the existing railways could be utilized to the greatest advantage for the benefit of the State in time of war.

In my view, this plan, which is somewhat akin to the one adopted in Switzerland, is greatly preferable to the system of organization which has found favour in France, Italy, and Germany, as the latter would have the effect of taking the actual working of the railways, at a period when the greatest strain was put upon them, out of the hands of the experienced officials who control them at ordinary times, and placing it in the hands of military Officers, whose only practical knowledge had been gained by occasional exercises and periods of training. It would, in fact, be very much like taking the command of a great ship from her experienced Captain during a storm and entrusting it to an amateur yachtsman!

The Continental States attach great importance to the possession of strategical lines of railway, both for purposes of attack and for the defence of the frontier; and an able writer in the "Times," treating of the military situation in Northern Europe, has recently shown the great advantage which has been gained by Germany and Austria-Hungary by the construction of such lines, as compared with Russia, who does not possess them to the same extent. He points out that there are no less than eleven German railways leading to the Russian frontier, while in Austria, there are six through lines of railway leading into Galicia; but Russia has no such railways as yet, and the result is that she is forced to maintain enormous masses of troops in her frontier provinces, at great distances from their homes, and from their base of supplies, because she cannot rely upon bringing them rapidly to the front upon the alarm being given. Happy the nation that has no frontier! England has none; or, rather, her frontier is the sea, and her first line of defence is the powerful Navy with which she patrols it. Her Government has no necessity to construct strategical railways, for private enterprise has already covered the country with a complete network of railways which would amply fulfil every requirement of any scheme of national defence.

Since railways first became an important factor in military operations, there have been in Europe but three opportunities of testing their value, and putting to the proof the arrangements made for working them under the strain of warlike operations. An able writer in the "Russian Military Magazin" (Colonel A. von Fendrikh),

has usefully summarized the lessons to be drawn from the Austro-Prussian War of 1866, the Franco-German War of 1870-71, and the Russo-Turkish War of 1877-78, and the result goes to show that, although, as might have been expected, the railways played an important part in the operations which were undertaken, and their use or abuse contributed largely to the results which were arrived at, many mistakes were made, and many failures have to be recorded which a wiser forethought might have avoided. In short, those who played the great game of war had, since they had last engaged in it, become possessed of a new and powerful weapon, but had not yet learned to use it with the dexterity which only comes of practice. Colonel Fendrikh's article has appeared in an English translation in the *Journal of this Institution*,<sup>1</sup> and it will not, therefore, be necessary for me to do more than just touch briefly upon its conclusions.

In the war of 1866, as we learn, although the general organization of the transport by the German railways was good, there was a great want of free communication between the higher military authorities and those charged with the management of the railways, the consequence being that trains were frequently run on slight occasions for the conveyance of small parties of men, or small quantities of stores, involving a great waste of resources. There was no controlling body having a complete grasp of the rolling stock of the country, and of the arrangements for the vehicles being well distributed, promptly unloaded, and returned empty to be used again, so that, at one time, there were nearly a thousand wagons standing under load in one part of the country, while in another there was a great dearth of rolling stock. This is one of the greatest mistakes that can be made. If wagons are restricted to mere conveyance, and unloaded promptly on arrival at their destination and returned, they can be used again and again, whereas if they are kept under load, they not only block up the sidings, which should be free for other purposes, but they are liable to fall into the hands of the enemy in the event of a reverse or a strategical retreat, and meanwhile they are altogether diverted from their legitimate use as vehicles of conveyance.

In 1870, when the German armies were launched upon the French frontier, the Germans showed that they had profited somewhat from the lessons of 1866, for the arrangements for railway transport were extremely methodical and worked fairly well. The entire German railway system was divided into nine main lines of communication for the concentration of troops towards the frontier—one of these being allotted to every two or three army corps. The Line Commissions, who were charged with the management of the transport, had each attached to them a special bureau for the control and distribution of the rolling stock, but still the mistake was made of having no central bureau having a grasp of the whole, so that each separate bureau worked—so to speak—for its own hand, and a certain loss of efficiency was the result. There was also still a want of sufficient promptitude in unloading and returning the wagons, and there proved

<sup>1</sup> Vol. lxxiii, page 1003, *et seq.*



to be a great need for some supreme central administration of the transport of stores during the progress of the operations. Stores were handed over to the railways by the contractors indiscriminately, sometimes in less, and sometimes in greater, quantities than were required, and in the latter case the capacities of the receiving dépôts were often overtaxed; the wagons could not be unloaded, and remained uselessly at the dépôt, there being a want of temporary magazines in which to store the goods until they were required. The Germans, however, as practical people, soon learned the lessons of failure, and began to set their house in order. For instance, we learn that for the 1st and 2nd Armies, quartered near Metz, trains of supplies, in large numbers, arrived at the station at Remilly, but, owing to the want of siding room at that station and others in the rear, and of magazines into which to unload the stores, something like a deadlock at one time resulted, there being upwards of 2,000 wagons containing supplies for these armies, under load. This had the effect of hampering the military operations all along the line to Sarbrücken; but soon a remedy was applied. Magazines were formed at several places, into which the wagons were unloaded, the empties returned, and the sidings cleared, and from that time forward a regular daily supply of food and forage was maintained for the whole Army of occupation. Here we have in a nutshell a great mistake and the remedy. It is obviously useless to despatch vast quantities of stores and munitions to the front without securing that at the point of arrival there shall be ample sidings to receive the wagons, magazines in which to store the goods until required for use, plenty of manual labour to unload them promptly, and adequate means of distributing them to the points where they are needed.

On the side of the French, although there was a complete system of railways directed upon the frontier, and a plentiful supply of rolling stock, and the railway companies displayed the greatest energy in carrying out the task laid upon them, their best efforts were frustrated by the want of a proper understanding between their officers and the military authorities, and between the Headquarters Staff and those who commanded at the front. Contradictory orders were given, countermanded, again given, and again countermanded, and the utmost confusion prevailed, the result being that for weeks, in the neighbourhood of Metz, not only all the sidings, but the main lines and the lines leading to the locomotive sheds, were blocked up with loaded wagons, which ultimately fell into the hands of the Germans. Our author sums up the mistakes of the French in this campaign under so many different heads that I have not time to quote them all, but the most serious defects appear to have been the want of some special bureau of control on the lines of communication, which should have every day the accurate details for regulating the movement of troops and supplies, and of rolling stock, and the strained relations between the military element and the civilian railway staff throughout the campaign.

In the case of the Russo-Turkish War of 1877-78, it would appear from Colonel v. Fendrikh's account that no great advantage was

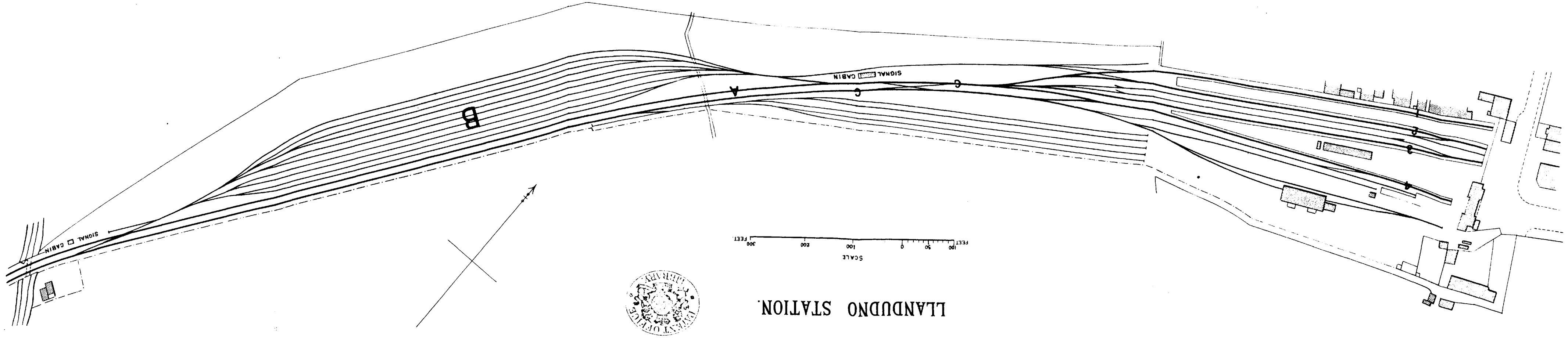
derived from railway transport, for in addition to the available lines being few in number, badly equipped in every respect, and poorly supplied with rolling stock, every mistake was made which it was possible to make, and as the result the greatest confusion prevailed, no proper organization of transport was attempted, and the military operations were greatly hampered in consequence.

These are valuable lessons for us in the art of "how not to do it," and it behoves us to take them to heart and profit as far as may be from the failures of others.

One good and sufficient reason for our seeking to derive what benefit we can from the experiences of other nations is that, happily for us, we have had no such experiences of our own, the most recent warlike operations in these islands having been conducted at a period long anterior to the introduction of railways. It is true that we have had from time to time to deal with Autumn Manœuvres and Volunteer Reviews, but there is hardly any comparison between such occasions as these and the emergency which would arise in the presence of actual warfare. The number of men engaged is comparatively small, and, as regards the Volunteers at any rate, they travel to and fro without much baggage or equipment, and are really almost as easily dealt with by the railway companies as an equal number of holiday excursionists.

What does really afford, however, some indication of what the English railway companies can accomplish in the way of dealing with large masses of people within a brief space of time is a glance at what is done by means of excursion trains on the occasion of the bank holidays, when the special facilities offered to the public by the companies tempt an immense number of people to flock from the large towns into the country, or from one town to another. For example, on the occasion of the last August bank holiday the London and North Western Company, alone, carried between various points within their system, on the two days, Saturday and Monday, 165,000 excursion passengers. The number of excursion, special, and relief trains run on the two days was 1,027, which were composed of about 10,500 vehicles. When you bear in mind that all this was done on only one of the railways of this country, while all the rest were equally well employed, and that it was all over and above the usual every day traffic, and was accomplished, so far as the North Western Company at any rate were concerned, without material interruption to the regular running of the ordinary passenger and goods trains, you will be prepared to realize that the resources of the English railway companies are very great, and that the task of transporting to the scene of operations the largest army which this country could put into the field, and keeping it supplied with provisions and munitions of war, is not one by which their powers would be unduly taxed.

Of course, I am perfectly well aware that to convey 165,000 excursionists is a very different undertaking to transporting an equal number of troops. The excursionists take with them little or no luggage, and all you have to do is to provide sufficient trains for their conveyance and to take proper measures to avoid confusion on the



LLANDUDNO STATION.

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FEET



B

SIGNAL CABIN

SIGNAL CABIN

platforms and at the booking offices. The troops, on the contrary, carry with them large quantities of baggage, horses, carriages, guns, and a host of other *impedimenta*, and all this must be provided for; but, on the other hand, it may be taken for granted that in an emergency there would be no hesitation in partially or wholly suspending the ordinary traffic, while, if necessary, the companies would co-operate one with another in carrying on the transport upon a given line of communication where two or more routes existed, so that there is little doubt that our railways as a whole would prove perfectly competent for any task that might be set them.

Of the great number of excursion passengers to whom I have referred very large bodies were directed upon certain points. For example, we carried to and from Llandudno, during the two days, including ordinary passengers, 21,000 people, the number of trains run being 182, composed of 1,822 vehicles. To and from Blackpool, a great and favourite resort of excursionists from the industrial centres of Lancashire and Yorkshire, the London and North Western and Lancashire and Yorkshire Companies carried on the same two days no less than 100,000 passengers, for whose conveyance upwards of 480 trains were employed, composed of nearly 6,000 vehicles.

Such an invading army as this can only be efficiently dealt with by means of ample accommodation, judiciously laid out, and the most perfect arrangements for working, otherwise the result would be a complete deadlock. You will observe, on the walls, diagrams showing the manner in which the stations and sidings at Blackpool and Llandudno are constructed, and it will not, perhaps, be out of place for me at this stage to give you some idea of the manner in which the accommodation is utilized, as this has a somewhat important bearing upon the question of detraining troops at the point of arrival (see Plate 12).

If you will look first at the diagram of Llandudno, you will observe that there are at that station four of the lines which we call platform lines or bays, that is, lines which run immediately alongside platforms, and these are numbered from 1 to 4. Two of these, Nos. 3 and 4, are reserved for the ordinary traffic, the other two, Nos. 1 and 2, being appropriated on busy days entirely to the excursion traffic. The trains, as they arrive, come in on the blue line marked A, and run either into No. 3 or No. 4 platform line, as the case may be, and as soon as the trains are empty the engines propel them backwards over the blue line into the large group of standing sidings which is marked B on the plan, where they stand for the rest of the day. These standing sidings, ten in number, are nearly two miles in aggregate length. We have no engine-shed at Llandudno itself, but we have a large one at Llandudno Junction, three miles away, and the engines therefore cross to the up main line through the points C, and run back to the junction, where they turn, take coal and water, and prepare for the return trip. When the time arrives for getting the excursionists away on their homeward journey, the engines run from the junction as far as the signal cabin, which is coloured red, at the south end of the excursion sidings, where each one is turned into the

siding in which its train is standing, and propels it forward to one of the platforms, and is ready to go away on the up main line as soon as the passengers have taken their seats.

A striking evidence of what great things can be accomplished in the way of transport within the space of a few hours will be within the experience of any one who has happened to be at the Great Northern Station at Doncaster, on the day of the St. Leger. On this great "day of days" to the good folks of Yorkshire, an immense concourse of people is directed upon Doncaster from all parts of the country, and by no less than six different railway routes, viz., those of the Great Northern, Manchester, Sheffield, and Lincolnshire, London and North Western, Lancashire and Yorkshire, Midland, and North-Eastern Companies, all these people being brought to Doncaster and taken back to their homes again within the space of a single long day of about eighteen hours. The Great Northern Company, who own the station, knowing the sort of deluge they have to expect, make their preparations accordingly. Doncaster being a great locomotive centre of theirs, they have there a large number of sidings, used ordinarily for locomotive purposes, in connection with the engine sheds and shops, and they have also a tolerably extensive goods yard. By six o'clock in the morning of the St. Leger day, all these sidings are cleared out, the goods traffic being, for the time being, suspended, and each siding is prominently numbered, certain groups of sidings being allotted to the trains of each Company. Soon after six o'clock, the long lines of excursion trains, many of which have started at midnight, begin to arrive, every train carrying on the engine a number corresponding to the number of one of the sidings, which has been set apart for its reception, and into which it runs. For such a mass of people, and for one day only, it would be all but impossible to provide platforms for the trains to run to, and, accordingly, the passengers alight without them, on the ballast, and make their way by a bridge across the station to the race ground. As for the trains, each one remains where it is during the day, but the engines get round the carriages by means of convenient crossings, turn on an engine turntable, take in fuel and water, and are placed in front of the trains ready to go away on the return journey. By and by, when the excursionists begin to troop back over the bridge, there is no need for confusion or bewilderment, or enquiries as to where the trains start from, for every excursionist knows the time his train leaves, knows its number, if he has taken the trouble to remember it, and knows also that he will find it exactly where he left it in the morning. The only drawback to all this is that he has to scramble into the train from the ballast as best he can, but race-going folks make little difficulty about this. Meanwhile, the station, with its platforms, waiting-rooms, and conveniences, is kept quite free from the excursion traffic, and the ordinary trains run to and fro as usual.

On the last St. Leger day, there were carried into and out of Doncaster, between morning and night, 99,000 passengers, who travelled in 216 trains, composed of nearly 2,500 vehicles, and yet I am assured by my Great Northern friends that this enormous number of people

were brought together and dispersed to their homes again with practically no confusion or delay, and with but little interruption to the ordinary traffic.

You will thus see that, with ample accommodation and a proper system of roads and sidings, laid out in such a way as exactly to provide for the operations required, the working of the largest traffic becomes a matter of the utmost simplicity, but with inadequate accommodation, or injudicious and ill-adapted arrangements, the wildest confusion is likely to arise, and this is the lesson which I think is to be drawn, for our present purpose, from the working of the excursion traffic. Give an experienced railway superintendent all that he asks for in the way of accommodation at both ends, and an ample staff, and he will face the biggest "rush" with perfect equanimity.

If you look at the diagrams of the two stations at Blackpool, you will see that, making allowance for the accidents of the ground, and their different situation, they are laid out in a very similar manner to the station at Llandudno, except that they are even greater in extent, and the working is, in principle, almost identical, so that I do not know that I need go into further detail with regard to it. All stations of this kind are designed on very much the same lines, the two great *desiderata* being ample platform-space, and long and roomy sidings in which the complete trains may stand during the day.

My object in describing the mode of laying out and working these stations is to impress upon you the fact that at the point of detraining of troops, if accommodation of the description referred to did not already exist, it would be essential for it to be provided.

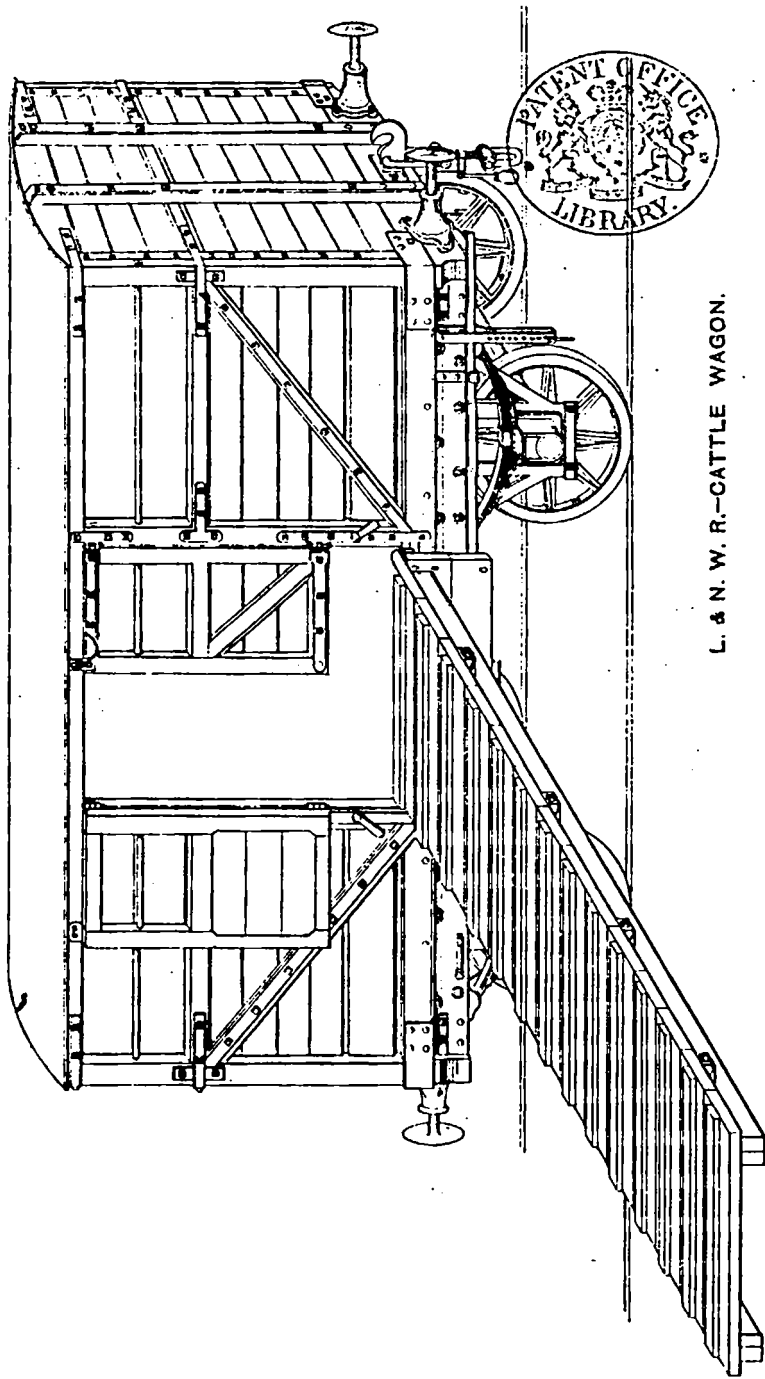
Now I am one of those who believe that in matters of this kind one good plain illustration is worth a great deal of vague generalization, and therefore I propose to show you what I, as a railway manager, after a careful study of the subject, believe would be the arrangements necessary to make in order to transport a body of troops, with all its matériel of war, to a given scene of operations by railway within the shortest possible space of time. I shall begin by asking you to suppose that a somewhat alarming state of things has arisen, that is, that a foreign invader has succeeded in baffling the vigilance of our Fleet, and has commenced to land, or is about to land, troops on the Essex coast, somewhere between Shoeburyness and Southend. Mr. Stanhope, in his speech on introducing the Army Estimates, in March last, foreshadowed what our present resources would enable us to do in such an emergency, and that by utilizing some battalions of Militia we should be in a position to immediately place in the field as our first line of defence about 110,000 men of all arms, divided into three complete Army Corps, leaving the Volunteer Army to occupy certain strong defensive positions as the second line of defence. I am going to assume that the three Army Corps, consisting of regular troops and Militia, have been mobilized, and that the object of the moment is to concentrate them with the least possible loss of time upon the line of Stanford-le-Hope and Chelmsford, occupying what I believe is known to military men as the

Basildon position; but for my present purpose I only intend to occupy myself with the movement of one of the three Army Corps, which I am going to assume has been mobilized at or near the military centre on Lichfield Common and Cannock Chase. Supposing now that I were called upon to undertake the task of transporting this particular Army Corps to the scene of operations; let me explain to you how I should set about it. In the first place, I should endeavour to avoid the common error of over-estimating even the greatest resources, and taking too sanguine a view of what could be accomplished by their means, than which nothing can be more fatal to success. If, for instance, I imagine that trains can be made up and despatched from a given point every twenty minutes, and it turns out in practice that they take half an hour to load, the result will be confusion and disaster, but if I assume that the trains can only be despatched once an hour, and it proves that they could be loaded in less than that time, the only effect would be that the scheme laid down would work with so much the greater smoothness. By all means, therefore, let us in all things under-estimate rather than over-estimate our resources.

In considering the problem I have set before me, the first point is to ascertain the limits of the task assigned to me; in other words, what does an Army Corps consist of? So far as I have been able to gather—and I am quite open to correction on matters of detail such as this—a complete English Army Corps, on a war footing, consists of 3 Divisions, or 21 battalions of infantry, with 3 regiments of divisional cavalry, 9 batteries of divisional field artillery, 3 companies of Royal Engineers, 3 reserve ammunition columns, 3 companies of the Commissariat Transport Corps, and other miscellaneous details, together with the Divisional Staff. But, in addition, there will be the general Staff of the Army Corps, with a brigade of cavalry (3 regiments), 3 batteries of Royal Horse Artillery, 2 field batteries, a corps of Royal Engineers, and  $2\frac{1}{2}$  companies of the Commissariat Transport Corps.

To sum up all this, and to drop, for my purpose, the technical distinction between the divisional cavalry and artillery and the troops of those and other arms attached to the Army Corps, I find that what I have to deal with is as follows:—

- 21 Battalions of infantry.
- 6 Regiments of cavalry.
- 11 Batteries of field artillery.
- 3 Batteries of horse artillery.
- 4 Companies of Royal Engineers with pontoon troop and telegraph battalion.
- $6\frac{1}{2}$  Companies of Commissariat Transport Corps.
- 7 Field hospitals.
- 1 Bearer company.
- Military police.
- Postal and Veterinary Departments.





The whole comprising—

- 33,292 Non-commissioned officers, rank and file, drivers,  
servants, &c.
- 1,231 Commissioned Officers.
- 12,934 Horses and mules of all kinds.
- 1,362 Wheeled vehicles, exclusive of gun carriages.
- 90 Guns.

With, of course, a large quantity of personal baggage and other *impedimenta*.

If you look at a railway map, you will see that the natural route from Lichfield to the imaginary scene of operations is over the Trent Valley Railway to Rugby, thence *viâ* Market Harborough to Peterborough, and from there over the Great Eastern line by way of Cambridge. With a view as nearly as possible to give a clear run for the troop trains, without interruption from the ordinary traffic (supposing that the emergency was not yet so great as to necessitate the entire suspension of the latter), I should devote the Trent Valley Railway between Lichfield and Rugby and the branch between Rugby and Peterborough exclusively to military purposes, working all the ordinary trains from north to south, and *vice versâ*, round by way of Coventry and Birmingham, while for Peterborough they would have to go round by way of Northampton.

I should use for entraining the troops two stations, Lichfield and Tamworth, loading the infantry, as far as possible, from one station, and the cavalry and artillery and military train from the other, so as to keep these separate and avoid confusion. Both the stations are of fair size and not deficient in accommodation for ordinary purposes; but probably, to enable them to meet such a strain as would be put upon them, it would be necessary to supplement the permanent accommodation by erecting temporary platforms and laying down temporary sidings, such as could easily be constructed in a few hours. I believe I am right in saying that the troops themselves can entrain and detrain, if need be, without platforms, and it is well known to those who are experienced in such matters that in the absence of regular loading banks, guns and baggage wagons can be loaded by means of ramps or inclined planes, which can be improvised in a very short time and carried with the trains for use when required, but for loading horses there must be proper landings or loading banks, and these would be constructed with ballast and old sleepers in a few hours. Horses could, however, be unloaded, and even loaded in an emergency, by means of portable ramps or landings, such as are used by railway companies for dealing with cattle at stations where there are no proper cattle landings; and I have here a diagram which shows one of these portable landings, and the manner in which it would be placed in position and made use of (see Plate 13).

While upon the subject of the loading of horses, I may observe that a suggestion has more than once been made that the cattle-trucks used for this purpose should have the ends made to let down, so that the portion of the train composed of these trucks would form

a continuous platform, the horses being walked from the end of the train to the most forward truck. When the first truck was full, the end would be raised to its proper position, and the second truck would be filled in like manner, and so on, the same principle being suggested for the loading of wheeled vehicles. I should like to say with regard to this, that I do not believe the method suggested to be a practicable one, and, in any case, it could not be adopted unless the entire stock of cattle-trucks and carriage-trucks throughout the country were altered as to their mode of construction, since no English railway company, so far as I am aware, constructs its vehicles in this fashion.

I may mention that at the City Station at Lichfield the London and North Western Company have an important goods station, with every convenience for dealing with a large traffic, and no doubt a great deal of the heavy baggage and camp equipment, such as would not necessarily be carried actually with the troops, as well as stores and ammunition, would be despatched from the station in the same way as ordinary traffic in time of peace.

The chief superintendent of the line, with his principal assistant, would be present, and direct the operations in person, and an ample staff of inspectors, foremen, porters, shunters, guards, and others would be concentrated upon the spot. The two stations, Lichfield and Tamworth, would be connected by telephone or telegraph with each other, and with the points of detrainment at the other end, and it would be probably advantageous for a similar communication to be established between all the stations concerned in the operation and the Headquarters Staff.

I should assemble, by the use of the telegraph, an ample supply of rolling stock of all descriptions in the rear, at Stafford and Crewe, and, in the extensive sorting sidings which exist at those places, all the trains would be marshalled and made up and forwarded to Lichfield and Tamworth as required, care being taken not to block up those stations with empty trains before they were wanted, but at the same time always keeping one or two in reserve, so as to guard against any momentary hitch in the arrangements for supplying them.

I should make up long trains, consisting of from twenty-five to thirty vehicles, and run them at a moderate rate of speed, say twenty-five miles an hour, including two or three necessary stoppages on the way, and to haul such heavy weights, at even so low a rate of speed, I should deem it best to employ our largest and most powerful type of goods or coal engine. My principal object in running such heavy trains would be to preserve the tactical units complete as far as possible, as I can easily imagine that if this were done, it would save a vast amount of confusion and delay. For instance, it is not possible to carry an entire battalion of infantry with all its baggage, horses, and vehicles, by one train, but I should take each battalion by two trains, making the two follow each other at a short interval, say of fifteen minutes, so that, practically, they would arrive at their destination together, could be detrained as a whole, and march away

from the station to their camping-ground with all their belongings as a complete battalion.

In the same way I should carry each battery of artillery by two trains following each other at the same interval, but the cavalry would be less easy to deal with, as, according to my computation, each regiment would require more than four trains, that is two regiments would occupy about nine trains, and all that could be done would be to proceed methodically, that is to complete the sending away of one entire regiment before commencing on a second. Of course the military authorities would assist in this, and in the avoidance of confusion and overcrowding, by marching the troops to the points of entrainment, in proper order, and not before the trains were ready for them, the latter being a point of great importance.

The necessity for long trains being admitted, the low rate of speed becomes imperative, and it is equally obvious that the most powerful type of engine must be employed.

Another point to be borne in mind is that each engine must carry with it a sufficient supply of coal to last it on the return, as well as the outward journey, as there will probably be no facilities for re-coaling at the other end. It would be best for the same engines and engine-drivers to work the trains throughout, the Great Eastern Company providing pilotmen to join the trains at Peterborough, as the North Western drivers would not be familiar with the lines and signals.

I believe we should be able to place about forty men in each vehicle as an average, but every vehicle should be conspicuously lettered to show the number of men who should occupy each compartment, so as to avoid confusion. We should use third class carriages as far as possible, but failing these, we should fall back upon second class carriages or what we call composites, and seeing that the men would take with them into the carriages their kits and accoutrements, forty men per vehicle is probably as many as we could reckon on. The Officers' chargers would travel in horse-boxes, but the troop-horses and baggage animals would be loaded in covered cattle-trucks, about six or seven in a truck, each animal being secured by the head, and the ends of the wagons being protected with sheets. The guns and baggage-wagons and other vehicles would be carried on low-sided carriage-trucks.

So far as I can judge from a very careful calculation, I believe that the entire Army Corps, with its complete equipment, could be carried in about 150 trains such as I have described, and I should not feel justified in assuming that these trains could be despatched at one end or received and liberated at the other end at less intervals than one hour for each train, except that, as I have said, in the case of infantry, two trains would depart each hour, following each other at a short interval of, say, fifteen minutes. This calculation, of course, only represents an average, for I am told by those who have had experience in such matters, that while half a battalion of infantry can be entrained in about twenty minutes, a train of cavalry, owing to the restiveness and nervousness of the horses, would sometimes occupy considerably over an hour.

With the block telegraph system in operation there is no difficulty in passing trains over a railway at intervals of five or ten minutes; but the measure of the capacity of the line is of course the rate at which the trains can be got ready and despatched at one end, and unloaded and released at the other end; and I shall, therefore, only assume that by using two stations at each end, and working both by night and day, we should succeed in transporting the whole body to the scene of operations within seventy-two hours, or, roughly speaking, within three days; that is to say that—the distance being about 186 miles—the first train would arrive in eight hours, and the remainder at the rate of two per hour—one at each station—or, in the case of infantry, four per hour, or two at each station. Of course I am assuming that the railway companies, by utilizing all the resources at their command and by employing a system of reliefs with regard to the staff, would have no difficulty in carrying on the operations continuously, both by day and night, until the whole task was accomplished.

In a journey of this length probably two stoppages would be required, one of which would be of sufficient duration to enable the troops to be supplied with food and the horses with forage and water. The trains should not all stop at the same places, but should be alternated so as not to overtax the resources provided at any one point of stoppage; for instance, if the first train made its principal stoppage at Market Harborough, the second would make it at Peterborough, and so on. I take it that the arrangements at these stopping places would be undertaken by the military Officer who I have suggested should be appointed for each group or district of railways to attend to the wants of the troops and horses in the matter of food, forage, and water *en route*, and I presume he would have at his command a staff of helpers and all the necessary appliances.

But now, supposing that all the arrangements for entraining the troops are matured and work smoothly, and that the trains safely reach their destination at the hours appointed, we approach the most difficult part of the problem—and yet the one upon which most depends. At such stations as exist at or near the assumed scene of operations, it is not to be expected that permanent sidings, platforms, landings, and other accommodation of the character required to conduct such extensive operations would be found existing, and it would be necessary to supply the deficiencies by works of a temporary nature, but carefully planned, so as to meet all the requirements of the business in hand.

It will not be forgotten that I have supposed three Army Corps to be making their way simultaneously to the proposed line of defence, while I have only been concerning myself with the movements of one; but it would be a matter of the first importance to fix upon different stations for the detraining of the three Army Corps, as any attempt to concentrate them all at one or two stations could only result in a complete dead-lock. I should therefore propose to appropriate Brentwood and Chelmsford stations for the detraining of the Army Corps coming from Lichfield, leaving a second, which would probably

be coming from the direction of Aldershot, to be dealt with at the various stations on the Tilbury and Southend Railway, and the third, coming probably by the East Coast lines, at some other Great Eastern Stations in the district, such as Ingatestone and Shenfield. As regards what, by this time, I shall be justified in calling *our* Army Corps, I should endeavour to preserve the same distinction as at the point of entrainment, appropriating one of the two stations to cavalry and artillery, and the other, as far as possible, to infantry. The same class of superior officials and the same ample staff of foremen, porters, shunters, &c., would be required as at the point of departure; but the first and most important step to be taken would be at the very outset to despatch to the places of detrainment a staff of platelayers, artisans, and labourers, with an ample supply of rails, sleepers, points, and crossings and other materials, so that they might, as quickly as possible, and working night and day, provide all that was necessary in the way of temporary landings and platforms for unloading guns, baggage, stores, and horses, and sidings into which the numerous trains might run, with convenient crossings to enable the engines to run round the carriages and draw out the empty trains for the return journey. Sufficient siding room should also be provided for standing a certain number of empty trains in the vicinity, which should be kept on hand in the event of their being required for the conveyance of the sick and wounded to the rear. Another important requirement would be to establish at a convenient point on the railway, near the camp, a large temporary goods station, with unloading banks, sidings, steam cranes, and cart approaches, so as to deal in the most convenient manner with the supplies of goods, ammunition, and stores, which would be daily coming to the front so long as the Army was in the field. Probably for this purpose there would be nothing more suitable than the temporary arrangements which it is customary for the railway companies to make in connection with the meetings of the Royal Agricultural Society from year to year.

It would also be necessary for the engineers to make sure of an adequate supply of water for the locomotives and for other purposes; and, if this did not already exist, it would be absolutely essential to meet the deficiency by running a temporary service from the nearest available source.

All the sidings, landings, and other conveniences should be located, not, perhaps, necessarily actually at the stations I have named, but as near to them as possible, and on level ground adjoining the railway, so as to avoid extensive earthworks, and thus minimize the labour and loss of time. For carrying on the work during the hours of darkness it would be found advantageous to use the "Wells" light—a patent, by means of which a powerful light is obtained from crude petroleum or shale oil. This is commonly used now by railway and other contractors for carrying on their works during the night.

On the arrival of a troop train at the point of detrainment, the energies of all concerned would at once be concentrated upon the purpose of unloading the horses, baggage wagons, &c., with the least

possible loss of time, and the troops should be formed up and marched off the ground as quickly as possible, so as to leave the way clear for the arrival of the next train. The engine would meanwhile have taken in fuel and water, and got round the train so as to be ready to start back with it as soon as it was empty.

If I have made my meaning clear, you will have gathered that the difficulties I most fear are those connected with the deficiency of permanent accommodation at the points of detrainment, but, I believe, that by the display of energy and determination on the part of all concerned, and by the lavish use of the large resources which we should undoubtedly have at our command, these difficulties would be overcome, and we should succeed in accomplishing our task with promptitude and efficiency.

I have thus attempted, very briefly, and I fear very imperfectly, to give you a mere outline sketch of what I conceive would be the proper way in which to carry out such an operation as that I have contemplated. As it stands, it is of course a mere skeleton, and numberless details would require to be considered and filled in—difficulties, some of them quite unforeseen, would doubtless crop up from time to time, and would have to be met and overcome as they arose; but what I have said will perhaps suffice to indicate the magnitude of the task which would have to be undertaken, and the careful and methodical arrangements which would be necessary in order to avoid confusion and disaster. I hope, too, I have succeeded in convincing you that it would be an act of worse than folly, at such a crisis, to dream of taking the management of the railways out of the hands of the skilled experts who have passed their lives amidst the practical working of them, and placing it even partially under the control of military men, who, at best, can only possess a theoretical knowledge of the subject. I have tried to make what I have said more clearly intelligible by localizing the operations and assuming a certain state of things; but you will, of course, understand that what I have laid down as being necessary for the transport of an army corps from Lichfield to Chelmsford would be equally applicable to the movement of a similar body of troops from one point to another anywhere within Great Britain.

Before leaving my subject, I should like to say that it is very much a matter of regret to me that the operations of entraining and detraining troops, horses, and guns are so unfamiliar as they are to the British soldier. These, like every other kind of operation, can be carried out in two ways—quickly and expertly, or slowly and clumsily—and the difference must be entirely a matter of practice. It is, in short, a form of drill in itself, which our troops get little or no opportunity of practising. Of course the reason is not far to seek;—at the present rates which the railway companies are authorized to charge for the conveyance of troops and their baggage, the War Office find it cheaper to effect the transport of troops from one part of the country to the other by sea, wherever it is practicable, and this has become so much the practice, that even the Guards, who are sent annually, in turn, to perform garrison duty in Dublin, are sent by sea

round the Land's End, rather than by rail *via* Holyhead, although, in this case, the saving, if any, must be very small indeed. In 1883, Mr. Childers, who was then Chancellor of the Exchequer, negotiated a sort of compromise with the railway companies, which was embodied in what is called the Cheap Trains Act. The effect of this was that, in consideration of certain very partial remissions of the Passenger Duty, the companies became bound to carry Her Majesty's troops, in any numbers up to 150, at three-fourths of the ordinary passenger fares; or if the number exceeded 150 men, at three-fourths of the ordinary fare for the first 150, and half the ordinary fare for the remainder, and to convey military baggage, stores, and ammunition at twopence per ton per mile. But at these rates it is not worth the while of the Government to take the troops by rail instead of by sea, and; moreover, there is no provision for any exceptional rates for the conveyance of cavalry horses, baggage wagons, or guns, and I cannot help thinking it was a pity that Mr. Childers, while he was about it, did not go a little further, and make such terms with the companies as would have resulted in the troops of all arms being transported by rail instead of coastwise by sea. They would thus travel with greater speed and comfort, and would acquire practice in the operations of railway transport, which would be turned to valuable account if such an emergency as that which I have imagined should ever arise. I have no authority to speak for any company, or to do more than express my individual opinion; but I believe that if, some day, when the Secretary of State for War finds a Chancellor of the Exchequer with a surplus to dispose of, he should turn his attention to completing what Mr. Childers left undone, he would not find the railway companies unwilling to deal with the matter in a reasonable spirit.

Major-General Sir REDVERS H. BULLER, U.C., K.C.B., Quartermaster-General to the Forces: I must say that the part of the paper that it was the greatest pleasure to me to hear was the peroration, for to no one more than myself can it be a greater delight to hear that there is some chance of our being able to send troops about by rail. It is fair to say, though, that Mr. Childers made the best bargain in 1883 that the railway companies would allow him to make. It is a very odd thing to us soldiers, that whenever troops have to be moved the railway companies take the uttermost penny, whereas they are quite ready when moving Volunteers to treat them as excursionists, and move them at a fairly remunerative rate. It would be a very great advantage to the Army if railway managers would combine to see this matter in the, I may say, patriotic and liberal spirit in which, as I hope I may judge from these remarks, Mr. Findlay is already beginning to appreciate it. So difficult do we find it to practise troops in entraining and detraining, that despairing of ever getting better terms from the railway companies, we are now building a line at Aldershot on our own ground, on which we hope to practise our troops. I think I may point to that as a proof that we are at present alive to the immense advantages of having a well-understood and complete drill for entraining and detraining, but that the difficulties we have suffered hitherto have been rather the creation of others than our own. In the admirable scheme given by the lecturer for the concentration of an Army Corps, I was struck by the length of time that he allowed for detraining. I have always imagined myself that, whatever the previous difficulties might be, when once you get a train to a station at which you have made moderately good provision for getting horses, guns, and wagons out of the train, the act of detraining should not present great difficulties, and would probably be considerably more rapid than that

of entraining. I imagine that in any actual operations in England, movements by rail would probably be movements of concentration rather than the removal of concentrated troops from one particular spot, and so we should be enabled to entrain our troops at a large number of stations, though detraining them at comparatively few stations. This point is then one of some importance, and I should very much like to hear what the lecturer's experience is with regard to getting people out of a train. There also comes in the question of brows, or the means of making temporary platforms. It is rather hinted at by the lecturer that there are such things in existence, but I can speak for certain of one of the large railways that we most employ, that they have nothing at all that would be of any use. I have always calculated that in any military operations in which railways were largely used, new platform arrangements or brows would have to be constructed beforehand, and that no portable ones that could be got at at short notice exist. I do not know whether there are any on the northern lines, but I think on the southern lines none exist; and, as the lecturer has forcibly pointed out, proper station accommodation must be prepared beforehand if any concentration by railway is to be successful. There is one point which is not mentioned in the lecture, it is one, I think, to which, if we had ever to operate in England, we should have to attach considerable importance, and that is, what is the minimum distance over which it would pay us to move troops by rail; allowing for the time necessarily taken up in entraining and detraining, and the time taken by the railway journey, minimum distance for which we should be justified in using a railway rather than the natural transport of the men? That, I think, in any operations in England is a point that we ought to know something about, and on which at present we have no real data to proceed at all. I have to thank Mr. Findlay for airing this question. It is a great advantage to have it discussed. I know officially what an immense help to the Quartermaster-General's Department the Railway and Engineer Volunteer Staff Corps have always been. They have once or twice worked out for us very considerable schemes most admirably, and I think we are going very shortly to show our gratitude by giving them a still larger and still more comprehensive one to work out.

Colonel FRASER, C.M.G., R.E.: Considering the number of gentlemen present interested in the subject, civilians as well as soldiers, I may mention that the details which Colonel Findlay has so kindly and so ably put before us are practically worked out in the military text-books on the subject, and particularly in the "Soldier's Pocket Book," which owes its authorship to the Chairman. Those of you who have not had occasion or necessity to refer to that book may be glad of an opportunity of turning to it and seeing how these problems have been already practically worked out for the Army, and it will give you some additional facts that bear on the subject.

Lieutenant-Colonel SCOTTER, Engineer and Railway Volunteer Staff Corps (L. & S. W. Railway): I am very sorry that my friend Mr. Findlay whispered my name to Lord Wolseley, because I am rather taken by surprise. I came here to listen to what I hoped would be a very interesting discussion on the very admirable paper that has been read by Mr. Findlay, but as you have been kind enough to call upon me, I may say that, although I agree generally with the remarks made by Mr. Findlay in his paper, I also quite agree with Sir Redvers Buller that Mr. Findlay, with a desire not to over-estimate the time, has considerably under-estimated what can be done by the resources of the railways of this country. I am quite sure, in fact I may say that I have worked it out this morning, that the same Army Corps that Mr. Findlay dealt with as going from Lichfield to the Eastern Counties, instead of occupying three days, leaving the enemy the opportunity of those three days to play about, could have easily been worked in twenty-four hours. Also that in case of emergency it is of the utmost importance, at any rate, that the troops should not be moved by slow trains, but by quick trains. I am not going to point out how this can be done, but I will mention one thing which will show you how, at any rate without altering the scheme of Mr. Findlay at all, it could be done in a day and a half instead of three days. In the first place, Mr. Findlay has told you he should propose to utilize the whole of the railway between Lichfield and Peterborough, and to use it entirely for military purposes. Such being the case, I should like to know why the trains could not be run upon the two lines in-



stead of upon one line only, and if two lines are utilized, only half the time suggested by Mr. Findlay need be occupied in moving an Army Corps to the Eastern Counties. I know that there are little difficulties attending this, but it is a common practice amongst all railway companies. In the case of a break down or accident what is more common, what is more easily done, than to divert the whole of the traffic, both up and down, on ~~the~~ one line? Therefore, in case of a crisis of this kind, when the country is invaded, I think that the arrangements which we make every day, in case of accident, of using the up line for down traffic and *vice versa*, should be brought into use, and the two lines utilized for the transport of an Army Corps with the least possible delay. There is another point I should mention in connection with this lecture, but perhaps I may take the opportunity of putting it in writing, and I could put it more clearly in writing than I could express myself in this distinguished company. But I may say this, that with regard to the point raised as to the accommodation for detraining troops of all kinds, I am sure Mr. Findlay will agree with me when I say, and in fact I think it was stated in his paper, that there is not the slightest difficulty in detraining all the troops upon the ballast; soldiers can easily get out of the train on the ballast. In such a case the station platform would be available for the horses and baggage and artillery, and although railway companies have not many opportunities of testing and showing what they can do, I, representing a company somewhat largely interested in the carriage of troops, am enabled to say with authority that the time allowed by my friend is altogether beyond the actual time occupied. There is not the slightest difficulty in entraining in ten minutes; there is not the slightest difficulty in detraining in the same time, or rather less than more. In regard to cavalry, the only experience that perhaps any railway company in this country has had of carrying a cavalry regiment from one part of the country to the other, at least the only one that I know of, was in connection with the South Western Railway, when a proper record was kept, and is in existence now, of the actual time occupied in entraining a regiment of cavalry, and we found it took thirty minutes. Therefore the time my friend allowed of one hour is, I admit, more than ample, but I do not for a moment question his judgment in rather under-estimating than over-estimating it. I may, perhaps, allude to the other question raised by Sir Redvers Buller. Of course, as Mr. Findlay says in his paper, he has not had the opportunity of discussing with other companies the question of the conveyance of troops by railway, but the general question has often been discussed by railway companies, and I do not think the present moment is an inopportune one for raising the question again. I believe the railway companies would meet that question, as they meet all questions of great national importance like this, in a fair and liberal spirit, and I think, perhaps, it would be found that the terms would be altogether favourable to the War Office.

Lieutenant-Colonel FINDLAY, in reply: I have very little to answer to those who have been good enough to criticize what I have had the honour to read to you in the shape of my lecture. In answer to what the Quartermaster-General said, I quite agree with him that, on the question of detraining, the troops could be detrained more quickly than they could be entrained, but for the purpose of the paper, you will observe, I assumed the concentration of troops at a particular point, going to a given destination, and in that case there is no doubt that the detraining must of necessity occupy the same time as the entraining, because, with the same number of trains going over the same distance to the same destination, you cannot increase the number of trains; therefore the time occupied in despatching the trains would be the time occupied in receiving them, and it would be of no use for your troops to get out of the train at one end more quickly than they got in at the other. That is a perfectly logical conclusion, I think, although I see the Quartermaster-General shaking his head. If troops were concentrated on the same point, but started from several points, I readily admit that the time taken in detraining may be much less than in entraining troops. Upon the question of loading and unloading horses, instead of having embankments and landings, and things of that kind, I believe it has been the case, in France at least, where all their covered wagons are marked to contain thirty-two men or eight horses, all those wagons are fitted with appliances such as I have sketched upon the wall, by which both men and horses can be walked up into the wagon, or out of the wagon, without

using any embankments or landings, or things of that kind. Then the Quarter-master-General cannot resist his economical tendencies even in time of war, for he says, "What is the minimum distance for which it would pay us to use the railway?"

Sir REDVERA BULLER: I was speaking with regard to economy of time, not of money.

Lieutenant-Colonel FINDLAY: If it is a question of economy of time, I was going on to say, no doubt with cavalry starting from a given point, supposing them to go as part of an Army Corps with infantry, it would be possible for them to march a considerable distance ahead, and with advantage. In fact, if my statistics are right, although my friend Mr. Scotter says they are not quite so as to the point of time, in the three days some regiments of cavalry would get on at least half the distance towards Chelmsford if they all started from Lichfield, so that there would be some economy in starting probably cavalry to march part of the distance in advance of the infantry before they took the train, but always taking care that they should arrive at their destination at the appointed time with the other arms of the Service. As to what my friend Mr. Scotter says, as to moving an Army Corps in a shorter space of time than that I have mentioned, I was careful, as I told you, not to over-estimate the possibility of accomplishing a given object. If my paper is of any value at all, it is not so much as to the time it would occupy, or the other details which are more fully and amply set out in the "Soldier's Pocket Book," which I have had the opportunity of studying to a slight extent in preparing this paper, and of which I must confess to a most imperfect knowledge of the details. My first object is to show that in carrying out a great operation, all the necessary individual appliances of railway stock were in the possession of the railways, and that they were ready and willing at the word of command to place them at the disposal of the State; but that when you come to move large bodies of troops and conduct great operations you must at the point of departure, in proportion to the amount of work you have to do, and at the point of detrainment, be provided with the ample means and appliances which are necessary to prevent delay and confusion. I will tell you one principle which I know, and which you have all experienced, I have not the slightest doubt in the world, and that is, that the number of trains that can be carried over a given railway is not greater than what you can digest at the terminal railway station. If you take Cannon Street or Charing Cross, you know how unpleasantly and how angrily sometimes you are detained outside because a train is in the way, and you cannot get inside because another train is occupying the space that you want to go into and occupy in order to get out of the train. That is just the principle with regard to the detrainment of troops. If troops are out of the train, and you have not the means of getting the train out of the way of the next train, it follows as a matter of course there is delay all along the line. I dare say in the statement I have made as to the time that would be occupied, it might be possible to tighten it up and run a little more quickly, and carry out the operation more expeditiously in many ways; but it struck me as most remarkable, as a civilian at least, that the number of horses attached to an Army Corps is nearly half the number of men. For instance, in an Army Corps, including twenty-one battalions of infantry, there are 33,000 non-commissioned officers and men, but there are nearly 13,000 horses to move from one point to another in carrying that Army Corps, assuming that they all go from a point where the Army Corps has been concentrated. I do not know whether Lieutenant-Colonel Scotter has considered the question of entraining 12,934 horses, but to load a train of horses certainly would take at least half an hour, and I have shown you that it takes nine trains to convey two regiments of cavalry, and therefore you must make every allowance for the quickness with which infantry can be moved and the inconvenience which is necessary in moving such a large number of horses. All I can say is, that I am very glad to find that I have perhaps rather over-estimated the time that would be necessary. I hope in the meantime no disaster will be likely to happen in front from the troops not coming up, because I have no doubt we could put on steam and get over that difficulty. If there is anything in my lecture at all, it is this, that ample provision should be made, both at the point of departure and at the point where a large body of troops have to be dealt with, and, above all,

that when you want a large quantity of stores moved you should have practically a railway station improvised at the moment, where you can deal with the loading and unloading of wagons, and not commit the mistake which appears to have been committed in former campaigns on the Continent, of having wagons that could not be unloaded, and nowhere to put the goods when they were unloaded. I thank you very much for the attention you have given me.

LORD WOLSELEY: Ladies and gentlemen, I think you will agree with me that the lecturer need not have apologized in any way whatever for having brought this subject before our notice to-day, because I think, no matter how the subject may be dealt with in technical books, it is one to which the attention of military men cannot be too frequently directed. I regret to say that it is a subject which has not been as well studied as it might have been by many even of our Staff Officers. I was glad to hear Mr. Findlay say at the beginning of his lecture that he intended to deal with the matter, not only in a practical, but in a business-like way. It is a subject which should be, above all others, dealt with in a business-like fashion, but in fact there is not any practical military subject which comes up for discussion in this theatre, and certainly no great subject bearing upon the efficiency of the Army, which should not be at first dealt with upon business lines. The great fault I have always had to find with our old-fashioned Regulations, the Regulations of old times, was that they were not based upon business principles, and if you have to deal with any great subject connected with the Army your first object ought to be to deal with it upon purely and essentially business principles. It has been pointed out by Colonel Fraser that a great deal of the matter referred to by the lecturer has been already brought to notice in a book with which I am somewhat familiar myself, I mean in the "Soldier's Pocket Book." The article on "Railways" in that Pocket Book is compiled from all the information available, both at home and abroad, on this very difficult and very interesting question. There are several points which the lecturer has referred to which have been there laid down, I may almost say definitely, from the war experience of foreign nations. The book from which I quoted very largely in it was written shortly after the Franco-German War, by Colonel Jaquemin, a French Staff Officer, who devoted a great deal of time to the study of the movement of troops by rail. It is a very interesting pamphlet, not at all long, and I would recommend it to all those who wish to study this subject. He points out very clearly that the great source of the misfortunes they had to deal with at the beginning of the war arose from the ignorance of the French Staff as to the means and power of moving troops by rail during war. He gives you the most heart-rending account of some of the great railway stations in France being blocked completely for two or three days, blocked up so as to render the lines altogether useless for military purposes. He points out how troops were often almost starving for want of the provisions with which some railway stations 50 or 100 miles off were crammed. The provision wagons could not be moved, as the lines were blocked through mismanagement. The lecturer has laid a great deal of stress upon the importance of employing, in the event of an invasion of this country, a Staff composed of the traffic managers of our great railway companies. I am sorry he did not communicate with me before he delivered this lecture; had he done so, I could have told him that this is the plan upon which we intend to regulate the movements of our troops in the event of necessity. Indeed, I could have given him a great deal of information in print, and shown him the Regulations which we have already laid down upon this subject, to be adhered to in the event of war. Our plan is exactly the plan that he has so ably and so interestingly described to us. Under the present organization of the Staff of the Army, the Quartermaster-General is charged with moving and feeding the troops in the field. He has to move the troops to their destination, to feed them *en route*, and when they reach the theatre of operations. In our recently compiled Code of Regulations, now some long time in print, although not yet actually published, the movement of troops and the command and administration of the lines of communication are very carefully attended to. The lecturer referred to the fact that England has no frontier. That is a point upon which I think we ought to congratulate ourselves; having no frontier, we are able to defend our coasts by the magnificent fleet upon which we so justly depend. And I may make use of this opportunity of saying, in

passing, this is a point which has been referred to very lately in the House of Commons, when the advisability of providing us with a frontier by joining England to France with a covered isthmus was discussed. I earnestly hope the fact of our having no frontier may be a fact that will last for ever. The lecturer has referred to the experience which railway traffic managers gain by race meetings, and the movement of crowds of civilians on bank holidays. I cannot say that we derive from this experience any very useful data for the movement of troops. You may move half a million of people from London to Epsom in the course of a day, and gain very little information that would be particularly useful in the movement of 50,000 troops. It is not generally remembered that a soldier is not a man who merely carries a pair of racing glasses over his shoulder, but he has a rifle, a large quantity of ammunition, and provisions in his haversack for one, two, or even three days. Besides, every battalion is necessarily accompanied by a certain number of provision and store wagons. There is a certain number of horses for the Staff of the regiment; a large supply of ammunition is also carried in carts or wagons. In fact, the *impedimenta* to be despatched with a battalion of infantry or regiment of cavalry is so large, that, according to the experience we have had hitherto in the movement of troops, I think the lecturer was correct when he said that we could with difficulty embark a battalion of infantry with all its *impedimenta* in a shorter time than thirty minutes. It should be remembered, however, that the *impedimenta* upon which he based his calculation are the *impedimenta* with which we should take the field abroad. If we ever have to mobilize for home defence, we shall not require the same large scale of transport we should want for operations on the Continent. To supply an army in our own country, where we should find provisions always near at hand, it would not be necessary to carry about with us so large an amount of food as we should have to do abroad, and in perhaps a hostile country. The lecturer told us that our soldiers are not very well trained in either entraining or detraining. I grant that we are not, perhaps, as well trained as other nations are upon this point, but foreign armies have almost absolute command over their railways, which are generally the property of the State. We have not that same power over the lines in our own country; but I do not think our men are so badly drilled in this respect as he thinks. In the experience I had as Quartermaster-General of moving large bodies of troops backwards and forwards at some of our great reviews, I calculated what was done upon each of those occasions very accurately. I was myself present at a good deal of the embarkation of the troops in railway carriages, and I thought they did it remarkably well, and, considering all things, I may say very well, and without any hitch; but I quite agree that we might have more experience, and that experience, as the Quartermaster-General has told you, we hope to gain very soon by means of a short railway which we are now constructing at Aldershot, for other purposes outside this one. We shall, however, use it also for the purpose of giving our soldiers experience in getting into trains and getting out of them. The lecturer and others referred to the arrangements made by Mr. Childers for the movement of troops over English railways in times of peace. He inferred that the rates fixed upon precluded the possibility of our moving troops in large numbers generally by rail. In the interests of economy we prefer, as he has described, sending a battalion of Guards from London by sea round the Land's End to Dublin, to sending them across country by rail. That, of course, is a point which is very easily rectified if he and the other railway managers would come forward and promise us that they will carry our men as cheaply by railway as we are now able to send them by sea; we shall be most glad indeed to meet him at once, and to close with his terms; but, as far as I know, the expense would be considerably greater than the expense incurred in sending them by sea. Then, again, he has forgotten another point. Although it may be very important to give our men great experience in getting into trains and out of them, transport by sea is very important also, as giving our men experience of sea transport. In the ordinary course of our military routine, our troops, more than the troops of any other nation in the world, have to make long voyages by sea. I quite agree with him that the terms which were then agreed upon by Mr. Childers are perhaps high, but I am quite certain that Mr. Childers made the best bargain he could, and if those terms were not better for us, it was

not his fault, but the fault of those with whom he had to deal. From my own experience of the conveyance of Officers by rail, I can tell you that when I ask the ticket man at a railway station whether it would be more economical to buy a soldier's ticket or to take a return ticket as an ordinary passenger, I am generally told that the return ticket as an ordinary passenger is the cheaper arrangement. The fact that Lieutenant-Colonel Scotter did not quite agree with the lecturer in all the points he touched on in his lecture proves to me how very essential it is that everything bearing on the movement of bodies of troops by rail should be discussed by a central body composed of some military Officers and the great railway managers of this country. I am very glad to say, as Sir Redvers Buller has told you, that we shortly hope to lay before the railway people of this country a very large scheme indeed for the movement of troops in the event of mobilization for home defence. This will bring before them in a practical form the many points discussed here to-day. I am sure they will work out those problems to the benefit of the country, and certainly to the advantage of the Staff of the Army. It only remains for me, on your behalf, to convey to the lecturer, Lieutenant-Colonel Findlay, our sense of gratitude for his kindness in coming here to-day and giving us his interesting lecture, a lecture not only interesting in itself, but of decided use to all who have heard it, because it cannot fail to turn our attention to a matter which is of very great, of vital, consequence and importance to all who have to do with the administration or command of the Army.