Supply of an Army During Active Operations

ESPANET

Supplying Armies in the Field as Exemplified During the Civil War

SHARPE

NOTES ON THE

SUPPLY OF AN ARMY

DURING ACTIVE OPERATIONS,

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The Art of Supplying Armies in the Field as Exemplified During the Civil War.

PRIZE ESSAY.

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Notes on the Supply of an Army.

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INTRODUCTION.

It is a well-recognized fact that success in any profession can only be achieved by hard and conscientious study. This is particularly true of the Military profession, wherein a lack of familiarity with the principles of the art may cause not only severe reverses to an army, but will entail needless loss of life, and avoidable suffering.

Our officers have recognized the necessity and obligation of studying the art of troop-leading and battle-tactics, and service schools have been established, whereat officers are compelled to study these branches, and are given such practical experience as it is possible to obtain during a period of peace. But we have almost entirely neglected that great branch of the art which has to do with maintenance of troops in the field; that is, Military Administration.

The importance of this subject is recognized in all foreign services, and Staff Schools are now considered absolutely necessary. The result being that the literature of this branch of the Military profession is most profuse. In the French Army the officers connected with the Supply Corps are obliged to attend a course in one of the schools established for that branch of the Service, and it is recognized as necessary that all officers, both of the staff and line, should have some knowledge of the art of supplying troops in the field, to the end that they can lend a more intelligent assistance when occasion requires, and can thereby keep their men in a better condition of health, and husband their strength, so as to put the greatest possible effective force in line of battle at a critical moment.

Napoleon has declared that the study of Military History is essential in order to develop a commander. This history, of course, pertains to wars in all countries, and the student notes any improvements in the question of armament, and upon this bases the organization to be adopted in the army, and the battle tactics which must conform to these improvements and developments. The same study must be pursued in the branch of Military Administration, and each army must perfect itself by adopting those methods which have proved advantageous in former campaigns. The general officers, and all line officers, must be thoroughly familiar with these conditions and requirements; otherwise the Administrative Departments would be apt to insist that the administrative necessities are more important than the purely military; but, as General Lewal expresses it, "dans une armée, le chef est tout ou il n'est rien. S'il ne domine pas ses services auxiliares, il est dominé par eux. Maître ou soliveau, il n'y a pas d'autre alternative."

In the last thirty years the Science of Statistics has taken long strides, and the reports made by the Statistical Departments of each country are becoming each year more valuable, because more accurate. The whole question of supplying armies, now that they have reached such enormous size, is largely dependent upon the resources of the theatre in which the operations are conducted. To thoroughly utilize these resources, they must be known beforehand, or, in other words, the Supply Departments of the army must have familiarized themselves with the statistical data of the countries in which the operations are conducted.

The accompanying work of Espanet is the most concise work on the subject of supplying an army which has been published, and shows the necessity for studying the statistical resources of countries, and the manner of forming the

statistical tables and applying these, so to ascertain whether the army can be supplied from the resources of a country. It, of course, discusses the problem of supply only as relates to the particular method described in the title. If it was the author's purpose to treat the problem in its entirety, the work would necessarily have been greatly extended in order to include all the various methods of supplying an army in the field, during the different periods of a campaign. This work is, however, considered as being specially applicable for our army, as it clearly shows the great improvements which have been introduced into the art of supplying troops in the field, due to the numerous innovations in the methods and means of land transportation in the last thirty-five years, and particularly to the development of the Science of Statistics. It also clearly shows the necessity for the establishment of a Staff School, whereat officers of our Supply Departments could be given a thorough course of instruction in the various methods of supplying an army in the field, and would be made familiar with the literature of the special branch of their profession. If such a school had been established, we would long ere this have drawn useful lessons from the methods employed in supplying the armies during our Civil War, and would certainly have prepared Regulations setting forth the precise duties of the various supply officers for an army in the field. If we had had, at the outbreak of the Spanish-American War, a set of Regulations, carefully drawn, describing in most minute detail the functions and duties of supply officers, and such officers had been familiar with the same, they would have known that in the field a commander of an army, or a smaller body acting separately, had full control over all matters of supply; and under such circumstances it is improbable that the correspondent of the London *Times* would

have been justified in writing to his paper that (using the word "commissariat" as applied in the British Army) "the commissariat is a huge joke." During and immediately subsequent to the Crimean War, correspondents and military critics could have made, and did justly make, similar remarks concerning the commissariat in the British Army. The fruitful lesson England culled from that war was the necessity for the establishment of a Staff School. The result being that British officers have contributed largely to the literature of the Art of Military Administration, and their treatises embrace all methods of supplying an army under every possible condition or phase of a campaign. Familiarity with the English treatises on this subject might have precluded, during our late war, the commission of many blunders, and spared our troops unnecessary hardships and discomforts.

A short account of the "Art of Supplying Armies in the Field, as Exemplified during the Civil War," is subjoined, the purpose being to illustrate the manner in which the principles were applied by our armies during active campaigns. The command of the sea, and the peculiar formation of the country, intersected as it was by numerous and deep rivers, which rendered it possible to move large fleets of transports to within easy distances of most of the armies, made the problem of supply a comparatively easy one, and rendered the formation of large and numerous wagon trains unnecessary; the facility with which railroads were constructed or repaired also assisted in dispensing with such trains. General Baratier, one of the ablest writers on the subject of Military Administration, has expressed most emphatically his admiration of the manner in which the art of supplying armies in the field was applied during our Civil War. Is it probable that foreign military students will express similar

encomiums regarding the art of supplying troops in the field as exemplified during the Spanish-American War, and is it probable that the useful lesson they will draw from that war is that we have demonstrated to foreign countries the fact that they can now abolish, because no longer needed, their Staff Schools?

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PREFACE.

"The country will be drawn upon as if nothing can be forwarded from the rear, but at the same time the trains and supplies will be organized at the rear as if nothing can be obtained from the country by the Army."—*Order dated January 11, 1893, Art. 49.*

The Regulations of November 20, 1889, and of January 11, 1893, prescribe the rules to be adopted for the service of subsistence and the method of supply. However, in administration, more than in any other part of the military art, theory is not sufficient, and it is necessary to be acquainted with the practical application of the Regulations. Lacking opportunities to make actual trials of the theories, it is necessary to train one's self by means of fictitious operations and by study; this work is devoted to a study of that sort.

But instead of considering a scheme of fictitious operations in order to apply the Regulations, I have endeavored to reduce to a limited number of examples the formations and situations which it is possible to consider for an army, and to observe how the general rules can adapt themselves to them. It is a general study, midway between the extremes, which are, on the one hand, the Regulations, and, on the other, an ordinary discussion of a particular subject.

From the tactical or strategical point of view, the number of situations is unlimited, but it appears, from the consideration of the supply and subsistence, that the number of formations to examine is, on the contrary, very limited. From the tactical and strategical consideration, the exterior circumstances and moral factors constantly intervene to change the situation, and are of the greatest importance; but they do not affect, to the same extent, the problem of

supply, of which the elements are almost entirely geometrical, and result principally from the relations of position of the army corps, and from the degree of concentration.

It is possible, then, to reduce to a small number of types the formations and positions of the army; to consider and also to consolidate, as it were in a single study, all those that it would be possible to make on the different subjects.

We should logically commence this work by a short account of the principal tactical or strategical dispositions, from the point of view of an examination of the formation types. This examination is contained in Chapter I.; in the following chapters we will examine how the methods of supply, either by utilization of the local resources or by trains from the rear, should be applied to these formations, and which of these methods can to the best advantage be used in each case.

CHAPTER I.

I.

Disregarding the periods of mobilization and of concentration, during which the subsistence is provided by special means, we will confine our discussion to the period of active operations, and more especially to the marches.

For the present discussion, every operation may be reduced to the following:

The army being assembled at a point, S, to transport it to another point, O, where it is to operate. In strategical language S and O are termed the subjective and objective points, and S O the line of operaation. But S and O and the line S O are not mathematical points and lines. These points and lines represent, on the contrary, zones of country more or less extensive, the configuration and area of which are of great importance, not only as concerns military operations solely, but more particularly as concerns the administration; as these determine the extent of the zones available for the subsistence, and also affect the length of the marches for the trains bearing supplies.

The extent of these zones varies according to circumstances; in general, it may be said at once that the army, dispersed at the beginning of the campaign and when far from the enemy, closes up more and more as it approaches

its objective and attains its maximum concentration on contact with the enemy. But this extreme concentration is a critical state from which the army should be relieved as soon as possible; it is thus seen that the successive operations which constitute a campaign present a series of concentrations and expansions executed in conformity with this principle, which sums up nearly all strategy, "that it is necessary to know when to concentrate to fight and to disperse in order to obtain subsistence."

This first point shows us that if the administrative necessities should never be permitted to supersede the military considerations, they have nevertheless an important rôle in the preparation and conduct of the war. We will find, in the course of this discussion, more than one opportunity to point out the necessary harmony between the military considerations and the administrative requirements that it is necessary for a general to weigh and to give each its proper place, depending upon circumstances.

Although administration and strategy may conflict in more than one point, it would be foreign to our subject to discuss the matter here, or even briefly to state the principles which govern the conduct of war; but it is necessary, in order to understand the workings of the service of supply, to know the general formations which an army may assume.

It is necessary at first to define the meaning of this word "army," which, in ordinary language, has very different acceptations. Hereafter, unless stated otherwise, we will always designate by this word the union of a particular number of army corps. Two principal types appear to have been adopted for the composition of armies. The first is the army formed of five army corps with an average effective strength of 30,000 men, of which the total effective strength is 150,000. The second type is the army of four

army corps with increased effective strength, each corps generally divided into three divisions. The average effective strength of the army corps in this case is 45,000 men, which gives this type of army a total effective of 180,000 men. It will often be necessary to state which one of these two types of an army is considered, particularly for the discussion of the marching formations which is the chief purpose of this chapter.

In the general order of march of an army three principal elements concern the administration, considered in connection with supply; these are:

1. The general order of march.
2. The location and extent of the halting stations.
3. The length and order of succession of the marches.

We will discuss successively each of these elements in their relation with the service of supply.

II. General Order of March of an Army.

In the general order of march it is necessary to consider the form itself and the extent of the formation.

The order of march is dependent upon: the relative position of the army corps in line or in échelon; the assignment to each corps of one road or of several roads; the assignment of the same road to troops of one or of several army corps. It is evident at a glance that all these conditions will have some effect upon the question of supply, which will be much more readily accomplished for one army corps established upon several roads than if only one road is assigned to each corps, and especially so if two corps are compelled to march in a single column.

The number of combinations and possible forms is without limit; the choice of these depends upon circumstances, upon the *terrain* and the object to be obtained; at a

distance from the enemy, if there is no reason to fear surprises, it is possible to spread out more, to take advantage of a greater number of roads, to march in column of divisions, and, if it comes to the worst, to march by army corps. Upon approaching the enemy it will be necessary to close in, and then, either for tactical reasons or simply by the insufficiency of the road system, not only will the march have to be by army corps, but it will, in addition, be necessary to assign several army corps to the same road. In certain cases the écheloning of the army corps, instead of taking place in *depth*, will be made laterally; in this case an army corps marching upon two or more roads to the front is followed by the troops belonging to another army corps, and even by the troops of several different army corps.

We will give some examples of these various formations.

The most simple type is the lineal formation, in which all the army corps march to the front, either in columns of divisions, or in columns of army corps:

Fig. 2.

Although very often in Europe there are a sufficient number of roads to enable an army to march thus, "experience shows that it can only be done in rare instances . . ; nearly always it will be forced to form two échelons distant half a march from each other, with three corps in first line and two in second."*

*Derrécagaix, "La Guerre moderne," Vol. I., page 592.

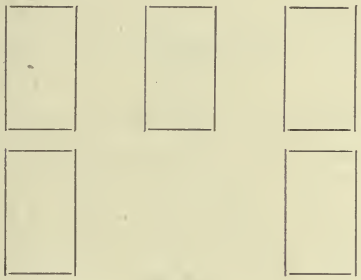

Fig. 3.

This was the formation of the 3d German Army in August, 1870, in its march upon Nancy.

A similar formation would be the arrangement in a square of an army of four corps, with two corps in the first line and two in the second.

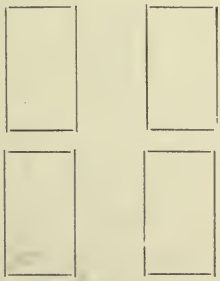

Fig. 4.

As a last example, we will give the order of march of an army described in the treatise on strategy and tactics of Colonel Bonneau of the Ecole supérieure de Guerre. This order of march, which appears to be rather complicated, and of which we fail to see the practical value, is, however, interesting because it embraces a combination of nearly all the possible orders of march for écheloning the corps of an army. In this order of march, represented in Figure 5 shown below, we find:

1. An army corps, G, in column on a single road;

2. A corps, D, marching in column of divisions on two roads;

3. An army corps, A, forming the principal advance guard, and disposed on three roads, but followed on each road by troops of different army corps: on road II., by a division belonging to corps D; on road IV., by a division belonging to corps C; on the central road, by a division of corps C and by the entire reserve corps R; on this road III. we have, then, a column of the strength of two army corps, but comprising troops belonging to three different corps:

III. Dimensions of the Order of March.

In addition to the form of the order of march, we are interested in knowing its length; as this length will in reality govern the degree of concentration of the army, and consequently the greater or less difficulty that will be encountered in providing the supplies.

March Front.—The extent of the order of march in width is called the "march front." The limitation of the march front is one of the most difficult problems in strategy, of which we will not enter into a discussion; it is sufficient for our purpose to state the general results.

The extent of the march front is calculated in accordance with this principle: that the army may always be concentrated before it is possible to be surprised by the enemy, which is equivalent to saying that the march front should always be less than the distance which separates the army from the enemy.*

From the foregoing it is evident that at a distance from the enemy the march front can attain a great development.

*Général Berthaut, "Principes de Stratégie," page 220.

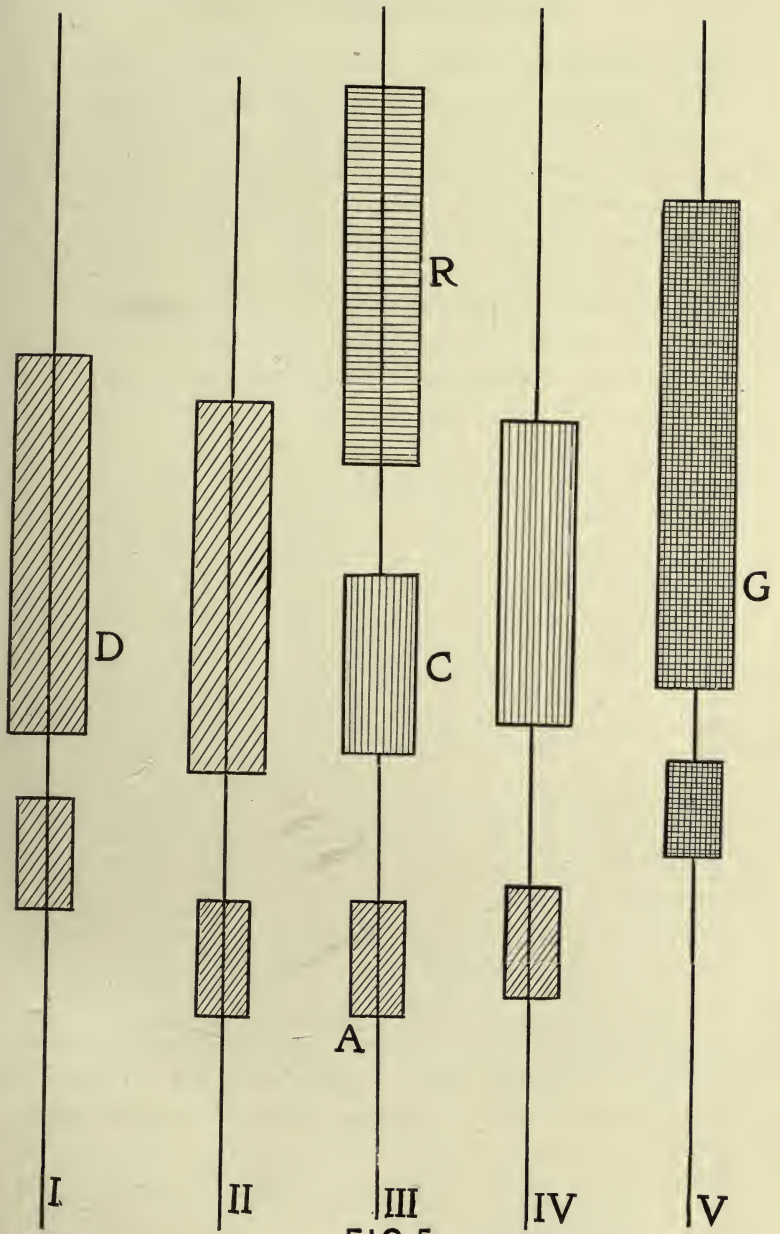

FIG. 5

History* gives us examples of armies marching under such conditions on a front of 100, 200, and even 250 kilometres; but, strictly speaking, these marches at great dispersion were only marches of concentration, and undoubtedly will not illustrate anything more. Actually, the concentration of armies being effected by means of railroads, the hostile armies will be opposed to each other from the commencement of hostilities on a limited front, the extent of which depends principally on the capacity of the railroad system.

In the period of active operations, when surprises are always possible, the army must be able to be concentrated in a day. General Derrécagaix† estimates that for this reason, even at a distance from the enemy, the front should not exceed 64 kilometres, and that it should average from 40 to 45 kilometres. But on approaching the enemy the front contracts and tends to approach, as to a lower limit, the front of battle,‡ which averages from 25 to 30 kilometres, depending upon the effective strength.

We have already had occasion in several instances to make use of the expressions, "at a distance from the enemy," "in contact"; they explain themselves. However, it will be of service, in order to be explicit, to understand the average value of these expressions, and we will admit, with Colonel Maillard,§ that it is necessary to adopt the following averages:

*March of the Grand Army from the Rhine to the Danube in 1805; march of concentration of the French Army in 1806, etc.

†Derrécagaix, "La Guerre moderne," Vol. I., pp. 89 and 90.

‡The front of battle is determined by the requirement of 6 men to the running metre; the front of battle of an army of 150 000 men will be $\frac{150{,}000}{6} = 25$ kilometers; that of an army of 180,000 men would be $\frac{180{,}000}{6} = 30$ kilometers. (Commandant Bonneau, "Cours de l'Ecole de Guerre.")

§Colonel Maillard, "Eléments de Guerre," 1st Part, page 65.

At a distance from the enemy, under 80 kilometres;
Near the enemy, from 80 to 20 kilometres;
In contact, under 20 kilometres.

From the above we will add in summing up:

At a distance from the enemy—that is to say, up to 80 kilometres from him—the march front may be extensive, but it is best not to exceed 54 kilometres. Near the enemy, between 80 and 20 kilometres, the march front should not exceed 40 to 45 kilometres, and narrows as much as possible as the contact with the enemy draws nearer. In contact the march front is equal to the front of battle—25 to 30 kilometres.

Space between the Columns; Breadth of the Zones of Supply.—Knowing the march front, the space between the columns of the lines of march follows: if the army is formed in five columns (Figs. 3 and 5), the space between the columns of the line of march varies from 6 to 10 kilometres when the front varies from 25 to 40 kilometres. If the army is formed in only three columns (Fig. 4), the space between the columns of the lines of march under the same conditions would be from 12 to 20 kilometres.

Upon the march the zones assigned to each column for the utilization of the local resources generally extend to the middle of the interval which separates one column from the neighboring column; it is thus seen that the figures above given for the distance between columns of the lines of march likewise measure the width of the zones of supply that may be assigned to each column, and that this width should be estimated on the average from 8 to 10 kilometres (Fig. 6).

Depth of the Order of March.—The depth of the order of march depends upon the manner of échelonning the army corps, upon the strength and length of the various columns. But the length of the columns as affecting the march is only

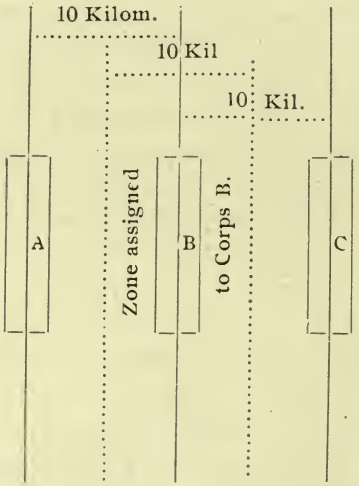

Fig. 6.

of secondary importance in the present discussion, because it has no influence whatever upon the workings of the service of subsistence and upon the supply; it is not the same thing as the space occupied in the formation each evening for the halt. The army is not subsisted by the country it traverses, but from the places in which it halts; it is therefore the extent of the zone in which the halt is made which affects this discussion. This question will be considered in the following paragraph.

IV. Disposition and Extent of the Cantonments.

In general, the order of the halt has the same form as the order of march; the écheloning of the army corps is the same; but each column is more or less closed up, or dispersed to the right and left of the principal road, depending upon circumstances and the topography of the country.

"In general," as Clausewitz* says, "the most favorable

*Clausewitz, "Théorie de la grande Guerre," Vol. I., page 334.

form to give to the cantonments will be that of an oval, not well defined, which approaches to some extent the form of a rectangle."

The shorter axis of this oval is perpendicular to the line of march; it is limited by this consideration, that the troops cannot stretch out too far to the right and left, either to avoid exposing them to useless fatigues or to prevent encroaching upon ground of the side columns. The longer axis, or depth of the cantonments, depends upon the circumstances under which the march is made, and is determined in accordance with the following considerations, which lead to three principal types for the formation during a halt.

Cantonment in order of march and on a depth equal to the total length of the marching column. At a distance from the enemy it is of primary importance to avoid exposing the troops to useless fatigues and to accelerate the rapidity of the movements;* for this purpose the lateral movements and those for closing up the column are checked; the column is cantoned in the order of march and in depth, even upon the road or without wandering more than 2 or 3 kilometres. In such a case the zone of cantonments has the form of a very narrow band, being from 4 to 6 kilometres in width, and in length equal to that of the column, or, for an army corps, 20 to 22 kilometres. This zone has an area of from 80 to 120 square kilometres; in round numbers, 100 square kilometres.

Cantonment reduced in depth, on an average, equal to the last length of the marching column. Even at a distance from the enemy, it will not always be possible to give the formation for the halt so great a depth: "the necessity of having the regimental trains belonging to the cantonments of the

*Général Berthaut, "Principes de Stratégie," page 229 *et sequitur.*

head of the column sufficiently near the means of supply, in order that the resupply of these trains can be accomplished before the march is commenced the following day," will necessitate a reduction in the depth of the cantonments, and it may be stated "that the practical depth best suited to the interior economy of the army corps is about equal to half the depth of the corresponding column."*

"In the vicinity of the enemy it is much more important to insure the safety of the army than the rapidity of the march; it is necessary to take up each night positions affording advantages for engaging in battle, upon a water-course, a chain of hills; all the troops of each of the columns must then be brought up to the end of the *étape;* it results therefore that the marches are necessarily shorter."†

It might appear, from the foregoing, that each evening the troops would form in line, and this construction has been put into practice; but it is admitted, and such appears to me to be the principle as enunciated at the Ecole de Guerre, that cantonments will continue to be formed in depth, even in the vicinity of the enemy, and almost until the evening preceding the battle; "it is only the evening before the battle that the necessity for concentration . . . . requires the abandonment of the custom of cantonment in depth."‡

Upon the whole, under the most ordinary circumstances, at a safe distance from the enemy or from possible contact with him, cantonments will be made in the order of march; with a depth equal to half the length of the column, and thus the following formation will result:

"Generally the head of the cantonments of the main body of the army corps of the first line, having marched on a

*Commandant Cherfils, "Cours de Tactique de Cavalerie à l'Ecole de Guerre," page 375

†Général Berthaut, "Principes de Stratégie," page 229.

‡Commandant Cherfils, "Cours de l'Ecole de Guerre."

single road, will be situated at from 6 to 8 kilometres from the cantonments occupied by the main body of the advance guard. The rear will stretch out from 10 to 12 kilometres behind the head. A corps in the second line will halt its head from 10 to 12 kilometres from the rear of the cantonments of the corps which precedes it, and will go into cantonment with a depth of from 10 to 12 kilometres; the trains will park at their proper distance in line of march."*

In this formation, which is applicable to the ordinary occasion when near the enemy, but before contact, the zone of the cantonments for an army corps has an average extent of $4 \times 12 = 48$, or, in round numbers, 45 square kilometres.

3d, Bivouac. On contact, the concentration increases still more; "the evening before the battle, marches 'at ease' are not possible, the cantonments close up still more on the front, in order to increase the concentration of the troops and their proximity to the field of battle."

"The bivouac represents the maximum state of concentration possible for an army."†

Echelonment of the Cantonments.—In the formation of the cantonment, in addition to the extent of the zone occupied, it is important to consider the écheloning of the different elements; the corps may be left in the same order which they occupy on the march, which avoids useless movements and expedites the formation of the column. (It is the arrangement which seems to be most favorably considered by the ablest authority.) It would be possible, on the other hand, to place the two divisions of each army corps in line, one to the right and the other to the left of the road. This arrangement appeared to be advocated in the provisional instructions concerning the marches in 1877, of which

*Maillard, "Eléments de la Guerre," 1st Part, page 152.

†Commandant Cherfils, "Cours de l'Ecole de Guerre."

General Berthaut was, I believe, the author. The method of échelons adopted will have its greatest advantage when the work of the trains is concerned, as we will see in the discussion of this question.

In all this analysis we will infer that, according to the development of the operation, it will be possible to bring the formation of the army to three principal types having the following characteristics:

1st. At a distance from the enemy: front extended on the average from 40 to 45 kilometres; cantonment in order of march and on a depth equal to the length of march of each column; the extent of the front will generally permit the assignment of one road to each army corps, and sometimes of marching in columns of divisions. As we will show later, during this period the length of the marches reaches its maximum.

2d. Nearer the enemy: front less extended, approaching the front of battle; the depth of the cantonments in each column is generally equal to half the length of the march, or from 10 to 12 kilometres. The march in column of army corps, and frequently by two corps on the same road, will be the general rule; the length of the marches is diminished.

3d. The third formation is that which the army assumes when a battle is imminent; it is distinguished by its extreme concentration.

These are the three principal types of formation that we will consider most frequently in the course of this discussion, and chiefly the second, which corresponds to the usual conditions of concentration and to the most customary circumstances. The drawings in Plate I. have reference to this type.

In Figure 1 of this plate there is a graphical representation of the cantonments of an army corps marching

upon a single road, the depth of the cantonment being equal to half the length of the marching column and the subdivisions retaining in cantonment the same order as when on the march.

According to a system that will be adopted throughout this discussion, at the side of the drawing, Figure 1½ shows a practical application of the same formation.

Figure 2 represents graphically the cantonments of an army corps with a depth equal also to half the length of the marching column, but on the supposition that the divisions, instead of being écheloned in the order of march, are in line, one to the right and the other to the left of the road. There is an applied example of this formation in the plate annexed to the provisional regulation relating to the marches of 1877.

Figure 3 shows a graphical representation of the cantonments of an army, showing the extent of the cantonments and of the zones of supply of each corps. The general form of the order of march adopted in this figure is that which the III. German Army had the 20th of August, 1870. Figure 3½ is the representation of this formation.

Measure of the Concentration of the Army.—Knowing the extent of the zones occupied by the cantonments, the density of the army is readily inferred; this density may be measured by the number of men and horses stationed in a square kilometre.

For this estimate we will consider 30,000 men and 10,000 horses as the average effective strength of an army corps. If we consider this effective with the extent of the zone of occupation, which we have estimated at 100 square kilometres in the first type of formation and at 45 in the second, we will find that:

In the first case the density corresponds:

	300 men	
to	and	to a square kilometre.
	100 horses	

And in the second case:

	680 men	
to	and	to a square kilometre.
	225 horses	

It is also possible to measure the concentration of the army by comparing the number of men and horses with the number of the inhabitants. This comparison is readily made by comparing the effective force occupying a square kilometre with the number of inhabitants per square kilometre given in the statistical tables. In France the population per square kilometre being 70 people, this comparison will give a ratio of 4 to 5 men and 1 to 2 horses to each inhabitant in the first type, and of 8 to 9 men and 4 to 5 horses per inhabitant in the second type.

If, instead of taking for comparison the average of the total population (70 inhabitants), the rural population were taken, which is only 45 inhabitants (60 per cent of the total population), the comparison would give different ratios as follows: in the first case, 8 to 9 men and 2 to 3 horses per inhabitant; in the second case, 15 men and 5 horses per inhabitant.

We have made the comparison by considering a single army corps, and the ratio thus obtained corresponds, properly speaking, to the density of the cantonments; if the entire zone occupied by an army were considered, different figures would be obtained. By referring to Figure 3, Plate I., and assuming 40 kilometres for the front and 50 for the depth of the army, the entire zone occupied would have an area of 2,000 square kilometres. The population of this zone is $70 \times 2{,}000 = 140{,}000$ people, nearly equal to the effective strength of the army; from which it may be stated that the

presence of an army in a country, under ordinary circumstances, doubles the number of the inhabitants, a fact which must be considered in connection with the exhaustion of the resources. But this concentration of the army, at the rate of one soldier for each inhabitant, is not uniform in the occupied zone; the army, on the contrary, forms there in separated groups, of which the density is for each group that previously obtained. Figure 3 shows very clearly the representation of this grouping. All these points will be of importance in connection with the methods of utilizing the local resources.

V. Length of the Marches.

As we will see later on, the distance to be covered by the trains bearing supplies (for instance, the administrative trains), in order to reach the cantonments of the head of the column, is equal to the distance in rear these trains were parked the night before, increased by the depth of the cantonments and by the length of the march made by the column. The length of the march is therefore an important factor in the problem under discussion, and we must consider this question, so as to obtain all its factors.

The average length of the marches is estimated at from 22 to 24 kilometres, but this average will often be surpassed. In reality this figure, 22 kilometres, represents the length of the *étape* which it will be possible for an army corps to make under ordinary circumstances marching on a single road when, being concentrated at the commencement, it must still be so at the termination of the march. The *étape* which a column can cover under such circumstances—that is, when starting out and arriving in a state of concentration—depends upon the strength of the column. In reality, the stronger the column, the more time is required for the move-

ment, time lost as far as the general advance is concerned. We agree with Colonel Maillard, that the normal *étape* that a column can thus cover and under the usual conditions is:

For a regimental column. .42 kilometres.
For a brigade column....40 kilometres.
For a division column....33 kilometres.
For a corps column.....22 to 24 kilometres.

The custom of cantoning in depth makes it possible to increase the length of the marches, by decreasing the time necessary for moving off; if the depth of the cantonments is equal to the length of the marching column, the column halting as a whole and starting out in the same manner the following day, there is no time lost and it is possible to require each unit to cover the maximum *étape*, or about forty kilometres. When the depth of the cantonment is not equal to the length of the marching column, the actual advance, measured by the *étape* covered by the rear subdivision, is equal to the ordinary *étape*, above pointed out, increased by the depth of the cantonments, since the time required in moving off is diminished by the time corresponding to that depth of the cantonments.* For an army corps cantoned,

*When the column is cantoned in depth and in the order of march, each subdivision can take the road when the head has advanced a sufficient distance to allow between them a space equal to the distance that it should have on starting out from the head of the column. The rear subdivision, for instance takes the road when the head has advanced a distance A D, so that B D will be equal to the total length of the column (Fig. 7: A is the cantonment of the head, B that of the rear; A B is the depth of the cantonments) The hour at which the rear leaves its cantonments is equal to the hour fixed for the departure of the subdivision cantoned at A increased by the time necessary to cover the distance A D. If we represent the length of the column by L, and the depth of the cantonments by l, A D will be equal to $L - l$; if, to simplify, we assume that the rate of march is 4 kilometres an hour, the time necessary for the head to cover the distance A D, the time which exactly measures that required for moving out the column, is equal to $\frac{L - l}{4}$.

on a depth of 10 kilometres, an *étape* will be obtained of 22 + 10, or 32 kilometres.

It will be possible to increase the rapidity of the movements by making a rapid or forced march; but the means of increasing the rapidity by the practice of cantoning in depth will be most frequently employed.

Generally, the marches are not made without interruptions and are broken up by halts every three or four days. These halts, necessary to husband the strength of the men, are likewise important from our point of view. In fact, despite the theoretical skill shown in the arrangement of the order of marches designed to provide the supplies, it will

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For an army corps, if we assume that L = 22 K, and l = 10 K, the above formula will give as the time required for the moving out of the column, $\frac{22-10}{4}$, or 3 hours.

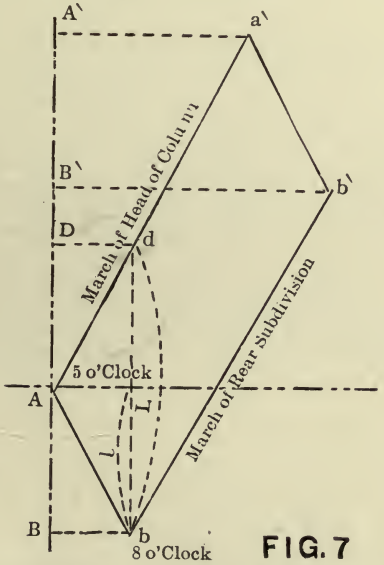

FIG. 7

AB, old cantonment. AB=l, depth of cantonments.
A'B', new cantonment. AD=L, length of column.

often happen that only during these halts will it be possible to establish contact between the troops and the trains.

However, the necessities of a campaign sometimes compel these halts to be omitted, thus rendering more difficult the task of the administration. History gives more than one example of marches continued from 8 to 10 and even 15 days; these instances are well known: we will not quote them here.

If H is the number of hours a day available for the march (that is, the interval comprised between the departure of the head of the column and the hour at which it is desired the rear bodies of troops should arrive at the cantonment), the number of hours required for the movement of the rear subdivision is equal to H less the time required for the moving out of the column; that is, to

$$H - \frac{L - l}{4};$$

and the distance covered by this sudivision will be equal to

$$4\left(H - \frac{L - l}{4}\right);\ \text{that is, to } 4H - L + l.$$

If the depth of the cantonments was nothing, or $l = 0$, this formula would give the normal length of march obtained by supposing the column concentrated on departure and upon arrival. This formula also shows very well that the possible length of march, when the depth of the cantonments is l, is equal to this normal march $(4H - L)$ increased by the depth (l) of the cantonments.

By giving to L, in the formula $4H - L$, values equal to the length of march of a regiment, brigade, division, and corps, and by assuming 11 hours as an average value for H, we would find for the normal march the figures given above. For an army corps, for example, with $L = 22$ K, we find:

$$4H - L = 44 - 22 = 22 \text{ kilometres.}$$

We will have occasion to apply these different formulas to calculate the hour of departure and arrival of the various trains, and to ascertain also the time available for supplying the different subdivisions.

CHAPTER II.

I. General Methods of Subsistence.

There are two general methods of subsisting an army: to live upon the country by making use of the local resources, or to obtain the supplies from a distance, when it is impossible to obtain them in the country occupied.

The question has sometimes been discussed as to which of these two methods should be given the preference, but all discussion on this subject is idle. The Regulations of January 11, 1893, have closed the discussion, for Article 49 of these regulations has wisely decided the conditions for applying these two methods in these words: "The country will be turned to account as if nothing can be expected from the rear, but at the same time the trains and the supply from the rear will be organized as if nothing can be obtained from the country traversed."

The order for supply establishes for each day the method of subsistence. The general decides this by considering at the same time the reasons for the military formation and the administrative necessities, which are at times antagonistic. This is an example that we have already encountered of the possible opposition between the military requirements and the administrative necessities. To increase the rapidity of the movements it is necessary to make, whenever possible, the cantonments in order of march and on a depth equal to the length of the marching columns; whereas, on the other hand, the depth of the cantonments must be reduced to make it possible for the supply-trains to arrive at the proper time. When the military requirements and administrative necessi-

ties are thus opposed, it is the province of the general to decide the matter and give to each its proper place. The administrative considerations should never take precedence over the military considerations, but it is not possible to get rid of the necessity of living; it is not possible to go beyond this without imposing increased privations upon the troops, and the commander alone is able to decide whether the success of the operations and the importance of the end to be attained require it. But the duty of *intendance* service, and what the commander should require of it, is a complete and true exposition of the administrative possibilities, principally of the state of the resources and the facility of utilizing them; in a word, only the actual necessities should be shown. Thus, in the preceding example, the obligation of closing up the cantonments to facilitate the workings of the trains of supply constitutes an administrative necessity only when it is absolutely impossible to live upon the country.

II. Preliminary Study of the Resources.

The selection of the method of subsistence will always depend upon the information concerning the local resources, since, in accordance with the principle above enunciated, one should always live upon the country when it will afford sufficient resources. Every operation should then be preceded by a complete study of the resources of the country, of the facility of using them to the best advantage, and of a comparison of the resources with the necessities to be provided for. Such an investigation is of practical interest only if it relates to a particular hypothesis; it could be made in a work on an especial subject.

In this work, which does not permit us to enter upon the discussion of a definite subject and of a particular theatre of operations, we cannot make this preliminary investigation.

We will substitute for it the comparison of the wants of an army, in each of the formation types described in the preceding chapter, with the resources of any region whose resources are equal to the average resources of France. We can in this way apply the methods and obtain a general idea of the matter, enabling us to appreciate some of the difficulties which will be encountered in the subsistence of an army, depending upon its degree of concentration, in a country of average richness.

"Averages," says a military writer,* "by eliminating the extremes, destroy the notion of reality and ruin the sentiment of things."

It will be advisable, then, not to put much dependence upon a work based on averages; but, with these reservations, averages form an excellent basis. It is necessary to know how to make use of them as a tailor uses a pattern, the lines of which he does not follow exactly, but which he adapts to all figures, enlarging one side, shortening the other, according to measures.

Knowing the effective strength and the weight of the daily ration of provisions and forage, it is easy to calculate the quantity of stores required at a given point. When it is a question of drawing from a given point the provisions for a known effective strength, and of having them transported, the total only need be considered; but, if the question is simply to estimate the possibility of providing the subsistence in a particular section of country, the comparison can be made in a convenient way, by reducing the wants and the resources to the superficial unit. In paragraph II. of the preceding chapter we have expressed the degree of concentration of the army by the number of men and horses stationed in a square kilometre; we will also express the wants

*Colonel Maillard, "Eléments de la Guerre."

by the quantity of provisions and forage required for the sustenance of the men and horses in a square kilometre, and we will likewise express the resources by the averages in a square kilometre. By bringing down the coëfficients thus obtained, it is at once known whether the resources are or are not sufficient.

The purpose of the following two tables is the determination of these coëfficients.

Table No. 1 is formed by taking as a basis the normal army corps with an average effective strength of 30,000 men and 10,000 horses. The coëfficients for the wants per square kilometre are calculated for the two degrees of concentration, one corresponding to a superficial area of cantonment of 100 square kilometres, and the other to a superficial area of cantonment of 45 square kilometres; these are, it will be remembered, the cantonments of an army corps on a depth equal to the length of the column of march in the first case, on a depth equal to half this length in the second; the basis for the provisions is the large field ration, and for the forage the average weights of 4 kilos of hay, 4 kilos of straw, and 5 kilos of oats.

The figures in Table No. 2 are those of the average production for 1891, taken from the results of the inquiry relating to agricultural matters published by the Minister of Agriculture. By dividing the totals by the total superficial area of France (536,408 kilometres), the average coëfficient per square kilometre is obtained.

TABLE No. 1.

PROVISIONS.	Number of Rations.	Weights of the Ration.	REQUIRED.		
			Total.	Reduced to Square Kilometres.	
				For 100 Kilometres.	For 45 Kilometres.
		Kil.	Qx.	Qx.	Qx.
Bread	30,000	750	225	2.25	5
Or Biscuit	30,000	600	180	1.80	4
Or Pain Biscuité	30,000	700	210	2 10	4.66
Equivalent in Flour	30,000	540	162	1.62	3.60
Or Wheat	30,000	6975	210	2 10	4.66
Fresh Meat	30,000	500	150	1.50	3.33
Or Salt Bacon	30,000	300	90	.90	2
Or Canned Meats	30,000	250	75	.75	1.66
Equivalent in Beef on hoof	30,000		Head 90-100	1 head	2 head *
Ewes or Sheep	30,000		1132	12	25†
Rice or Dried Vegetables	30,000	100	Qx. 30	Qx. .30	Qx. .66‡
Salt	30,000	020	6	.06	.14
Sugar	30,000	31	9.30	.10	.21
Roasted Coffee	30,000	024	7.20	.08	.16
Lard	30,000	030	9	.09	.20
		Lit.	Lit.	Lit.	Lit.
Wine	30,000	25	75	75	166
		Kil.	Qx.	Qx.	Qx.
Hay	10,000	4	400	4.	8.88
Straw	10,000	4	400	4.	8.88
Oats	10,000	5	500	5.	11.11

The transportation will require about 150 carts and 15 wagons, at the rate of 6 quintals to a cart and 6 tons to a wagon.

Instead of canned meats, the cattle must be transported; about 8 to 10 more wagons will be required.

*Calculated on an average weight of 300 kilogrammes and yield of 58 per cent.

†Average weight, 25 kilogrammes; yield, 53 per cent.

‡*Note.*—The provisions entered in italics are those usually included in the load of the trains to form a day's ration. Their total weight is:

Bread	225
Meat	75
Small Articles	61
	361
Oats	500
Total	861

TABLE No. 2.

PRODUCTS.	Production (Stocks in hand for the Cattle).	Coëfficient per Square Kilometre.	REMARKS.
	Qx.	Qx	This coëfficient is obtained by dividing the production by 536,408, the superficial area in square kilometres. If, instead of taking the production of 1891 as a basis, the calculation were made on the average production during the ten years from 1882 to 1891, somewhat different coëfficients would be obtained.
Wheat	58,792,693	109	
Meslin	2,710,993	5	
Rye	15,397,583	29	
Barley	16,261,097	30	
Oats	49,669,925	93	
Total for all Cereals	142 832,291	266	
Artificial Meadows.			
Clover	43,340,869		
Lucerne	36,217,493		
Sainfoin	22,006,060		
Total in Artificial Forages	101,564,422	190	
Natural Meadows.			
Hay	158,843,128	277	
Second Crop	31,043,404	58	
Total of Forages	291,450,954	525	
Straw	.....	532	
Working Cattle	1,408,836		
Beef Cattle	504,139	*	
Cows	6,557,632		
Total of Horned Cattle	8,470,607	15 head	
Ewes	3,990,865		
Sheep	8,903,864	†	
Total	12,894,729	24 head ‡	
Hogs	6,096,232	11 head	
Goats	1,480,229		

	Average Production, Qx.	Coëf in Sq. Kil.
Wheat,	82,205 662	153 qx
Meslin,	3,818 391	7 qx.
Rye,	17,329,846	32 qx.
Barley,	11 901.521	2 qx.
Oats,	40 323,220	75 qx.

Calculated at the rate of two quintals of straw to one of grain, 532 = 266 × 2.

*Not including the bulls, bullocks, heifers, breeders, and calves.

†Not including the rams, lambs, and ewe lambs.

‡Representing the equivalent in rations of two beeves.

Comparison of the Wants and the Resources.

The figures in Table No. 2, being those of the annual production, represent only the actual resources on hand at the time of harvest, before exportation or consumption have used up a portion of the products; consequently only at that time is it possible to directly compare the coëfficients in the two tables, in order to ascertain if the wants expressed by the coëfficients in Table No. 1 can be satisfied. To make an analogous comparison, relating to another period of the year, it would be necessary to make a correction of the coëfficients in Table No. 2, taking into account the exportations, the amounts consumed, and in general all the causes of variation which may have occurred since the harvest. The studies entered upon in connection with this subject have not yet embraced a sufficiently long period of time, and are not altogether conclusive, to make it possible to give accurate conclusions to bring about these corrections. But if it intended to establish in a general way the probabilities as to whether or not it would be possible to provide the subsistence of the army from the local resources, these coëfficients are sufficient, as we are about to show, when considering the principal foods, such as meat, forage, bread, etc.

III. Possibility of Directly Securing the Supply.

Meat.—The wants in the way of cattle are expressed in accordance with Table No. 1, by 1 animal in the case of the large cantonments (100 square kilometres), and by 2 animals when the cantonments are of the average size (45 square kilometres). Table No. 2 shows, as the resources per square kilometre, 15 steers or cows, to which it would be necessary to add the number of the other animals given by the table. These figures are those of the resources on the 31st of December, 1891, but they vary very little in a year; we can use

the coëfficients without making any corrections in them, and the comparison of these coëfficients with that of the wants shows that in general it will not only be possible, but very easy, to find in the country the cattle necessary to provide the meat.

This conclusion should not be considered as absolute; we have already said so, but it is worth while to repeat it; our deductions, precisely because they are based upon averages, are not exact for any particular section; it is evident that if, for example, the foregoing conclusions were applied to certain sections of Provence where there are no cattle, a grave error would be committed. But it would be enough to make sure, which can be readily done, that a section is an average one, permitting us to apply our conclusions to it.

We will say, then, in short, with the foregoing exceptions, that in general the supply of beef will be provided from the local resources, unless for expedient reasons or by military order it should be otherwise arranged.*

Forage.—Regarding hay and oats, the coëfficients in Table No. 2 can no longer be used without correction. The comparison of these coëfficients with those in Table No. 1 would only prove what is evident at a glance, that at the time of harvest, or a short time afterwards, the resources are greatly in excess of the wants, and consequently it will be an easy matter to obtain supplies from the country. As regards the oats, the coëfficient of production (93 q-m.) is equal to more than 8 times the wants in closed-up cantonments (11 q-m.), and to 18 times that of the requirements in the extended cantonments (5 q-m.).

As far as forage is concerned, the proportion between the production and the wants is even more favorable, since,

*We have not included in our calculations the stores and commercial stocks, because we have more especially in view the exploitation of the local resources in the cantonments and in agricultural sections.

the wants being expressed by the coëfficients 4 q-m. and 8.88 q-m., the production is represented by the number 277 q-m. for hay alone, and by that of 525 q-m. if the second crop and the artificial forage are included.

Agricultural statistics do not furnish direct data concerning straw, but an estimate of the production of this article can be made, if we admit as an average that the yield in straw is about 200 kilos for each 100 kilos of grain. The total of the coëfficients in Table No. 2 for cereals being 266 q-m., the coëfficient for straw would be about double, or 532; that is, nearly the same as the natural and artificial forage taken together. The inference for straw should then be identical with that which relates to the facility of supplying the wants at the time of harvest.

This favorable situation changes in proportion as the time of harvest becomes more remote; for want of more exact data and to have, however, an approximate idea of the facts, we will admit that the greater part of the oats and forage is consumed on the spot* to provide for the wants of

*As far as the whole of France is concerned, this fact is established by the figures of the imports and exports, which are insignificant, as the following list shows:

	1889.	1890.	1891.
OATS.	QUINTALS.	QUINTALS.	QUINTALS.
Imports	2,046.846	1,493,210	978,735
Exports	26,322	30,243	185,502
Difference in Imports	2,020,514	1,462,967	793,233
Proportion of the Harvest	$\frac{1}{22}$	$\frac{1}{30}$	$\frac{1}{95}$
FORAGE.			
Imports	18,620,155	16,550,058	17,321,442
Exports	66,254,527	71,711,375	60.209,568
Difference in Exports	47,634,372	54,269,707	42,888,126
Proportion of Harvest			$\frac{1}{7}$

the country, that they are almost entirely consumed in the interval between two harvests, and that the consumption takes place in a continuous and regular manner during this same interval. This would amount to saying that the monthly consumption is about one-twelfth of the production, or, again, that this one-twelfth may be considered as the maximum amount that could at all times be found.

The coëfficient of production for forage being 525 q-m., one-twelfth of this is 44 q-m., which would represent the minimum amount which may be relied upon to insure the supply by the exploitation of the local resources. If this number, 44 q-m., is compared with the number of animals in a square kilometre, which is 20 (15 steers or cows and 5 horses or mules), it is seen that it represents the daily nourishment of these animals for a month, at the rate of 7 kilos a day (20×7 kg. $\times 30 = 42$ q-m.). This remark confirms our deductions and shows that the production of forage is just about equal to the requirements for the supply of the animals in France.

A similar calculation enables us to take the number 7 q-m. ($= \frac{84}{12}$) for the oats, as the coëfficient for the minimum amount probably existing at the most unfavorable time of the year.

The comparison of these corrected coëfficients with the wants shown in Table No. 1 brings us to the following conclusions:

1st. As relates to forage, this minimum amount is equal to about ten times the requirements in extended cantonments, and to only four times the requirements in average cantonments closed up.

The conclusion will be the same regarding straw.

2d. Regarding oats, this minimum amount is a little

in excess of the requirements in the extended cantonments, but is below it in the closed-up cantonments.

In short, it can be said, as the conclusion of this entire analysis, that the supply of hay and straw will probably nearly always be assured by the local resources, but that regarding oats this supply will be very different if the number of horses is great and they are crowded together and at a time just preceding the new harvest.

Wheat, Flour, Bread.—It is not possible to argue concerning wheat as we have done regarding forage, for it is a mistake to say that the resources vary each month by a quantity equal to one-twelfth of the harvest. It is necessary, indeed, as far as concerns wheat, to take into account the shipments, the industrial occupations, and especially the fact that the production is below the necessary amount required for consumption. At a given time, the resources should include a large proportion of wheat obtained by importation,* of which it will be necessary to take account.

The deficit of the production compared with the total consumption is considerable; if in good years it may only be from one-eighth to one-tenth, it may likewise rise very much above this in bad years, as the preceding table shows. The

*The figures below give an idea of the magnitude of the importations of wheat and similar products:

	1889.	1890.	1891.
	QUINTALS.	QUINTALS.	QUINTALS.
Imports	11,417 592	10,552,014	19,605,084
Exports	11,048	5,874	6,793
Difference in Imports	11,406,544	10,546,140	19,598,291
Yearly Production	83,230,671	89,733,991	58,508,807
The Imports compared with the Harvest represent	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{3}$

commercial stocks which we did not consider in our calculations regarding forage and oats are very important considerations in those relating to wheat.

But it is necessary to state that wheat, not being in general directly used by the corps, will only very rarely be the object of requisitions in the cantonments; there is, consequently, no reason to make for this commodity a comparison between the coëfficients given in Tables Nos. 1 and 2. The supply of wheat will be provided by the administrative services, by extending the field of exploitation as much as will be necessary, and by sending, undoubtedly, to the rear and to the general trade for a large portion. The question of the supply of wheat is, then, especially a question of general economics, a little beyond our discussion, and with which we will not further concern ourselves, notwithstanding its great importance.

But, on the other hand, it is pertinent to this subject to ascertain if it will be possible to find in the cantonment either bread, directly to provide this component of the ration, or flour; which would render it possible to bake in the local ovens all or a part of the bread required.

It is well to observe the sections of country where the custom is retained of baking the bread in the households, either in a domestic oven or in a common oven, and the sections where this practice is lost and in which the bread is furnished by bakers. In this last class belong the cities and large towns.

In places where the bread is furnished by bakers the latter make it evidently each day; a troop arriving in the place unawares would not find there any bread, or, at all events, would only find a very inconsiderable amount. How much bread would it be possible to obtain from these bakers in the time usually available—that is, between the arrival

at the cantonment and the departure of the trains the following day? If we consider the difficulties of organization, the disturbance that war causes everywhere, it appears difficult to obtain from each baker a yield exceeding double the amount which he furnishes daily. The population being 70 inhabitants to the square kilometre, the average production being undoubtedly sufficient for the requirements of this population, it would be possible to obtain, from a square kilometre, in accordance with this rule, twice as many rations, or 140, or, in round numbers, 150. But, if we refer to the averages given on page 26, we ascertain that the number of men to be supplied per square kilometre is 300 or 680, depending upon the degree of concentration; it would then be possible to obtain bread for only one-half or one-fifth, depending on the circumstances, of the effective strength. The same conclusion is reached by considering that the capacity of places, as far as cantonment is concerned, varies from 4 to 10 men to each inhabitant;* if it is only possible to obtain a number of rations equal to double the number of the inhabitants, that is equivalent to 2 rations for 4 to 10 men, or to one-half or one-fifth the effective strength.

In places where the custom of household baking is retained the inhabitants bake usually each week, sometimes even only every fortnight; it may be assumed in general that each family has its week's supply of bread. Therefore, if it is considered that women, children, and old men consume less bread, we may estimate the daily consumption per inhabitant at 500 grammes, and consequently at 4 kilogrammes, as the supply of bread per inhabitant that we can expect to find in the cantonments. For a population of 70

* "Aide-mémoire l'Officier d'Etat-major," page 192, and Colonel Maillard, "Eléments de la Guerre," page 158.

inhabitants per square kilometre. the resources of bread would be 2.8 q-m. for the square kilometre. This coëfficient, compared with the wants indicated in Table No. 1, shows that the resources are in excess of the wants for the extended cantonments and are only about half of those necessary in cantonments closed up to an average degree. As the bread disseminated in the various households can evidently only be used for the supply of the troops billeted upon the inhabitants, it is possible to state the foregoing conclusions by saying, that the supply of bread by the inhabitants can generally be ordered only in the case of extended cantonments, and that in the case of closed-up cantonments, if the subsistence is ordered to be furnished by the inhabitants, this will be, for at least a considerable part of the troops, subsistence without the bread, the latter being supplied by the regular issues.

Each baker or each household possessing, no doubt, flour sufficient for several bakings, the deficiency in the case of the bread above ascertained certainly does not exist for the flour, but here the difficulty will be of another kind, and will consist especially in collecting and working up the flour; this question will be discussed later.

Forage, meat, and bread forming the principal features of the supply, we can, by what precedes, ascertain how scattered these supplies are and to what extent it will be possible to procure them directly. As to the other provisions —that is, those comprised under the designation "small articles of the ration," and which are imported products, it will be possible to procure them only from the merchants and in rather important localities; as to the household supplies which exist only in small quantities and which are easily hidden, it is useless to think of obtaining them by requisi-

tion; they can only be made use of when meals are demanded from the inhabitants.

IV. Administrative Reconnaissances.

The preceding analyses prove that the knowledge of the production of the last harvest is an important fact, which suffices generally to aid in estimating the resources of a country and the possibility of living there. This knowledge may be obtained by means of the official statistics, which may generally be a most sure and easy means. It is of interest, however, to ascertain by what other means it would be possible to supply the place of the statistical information, and to make in some way, without losing a moment, administrative reconnaissance of the country. The problem consists in calculating the production of a given country, or, if it is desired to keep the same terms, the production of this country with reference to a superficial unit—a square kilometre, for instance. It evidently would be enough for that purpose to know the portion of lands under cultivation of which it is desired to estimate the production and also the yield.

It may be admitted that the proportion of lands under cultivation with different crops varies little from one year to another. A portion of these lands are devoted to the cultivation of vines, prairies, woods, etc., which are permanent; it will thus be possible to determine approximately, by information or by the examination of the country, what proportion of the general superficial area these permanent cultivations include. It will thus be possible, it seems, to establish the fact that all these fixed cultivations and the wild (uncultivated) portions represent a quarter, for instance, or one-half or one-third of the country; it naturally will follow that the tilled grounds are three-fourths, one-half, or

two-thirds of the total area. It remains to be determined how the various crops are distributed over the tilled grounds; it can be admitted, as we have already said, that this distribution varies little from one year to another; for it depends above all upon the customs of the local cultivation, and principally upon the rotation of the crops practiced; it is then chiefly by informing one's self concerning these customs that it will be possible to arrive at a solution of the question; the knowledge of the rotation of the crops is particularly very important, and this information will nearly always enable the proportion of the crops to be determined. The following examples will make this more clear:

1st. Let us suppose that in the country under consideration the customary rotation of the crops would be the following:

1st year, wheat;
2d year, barley;
3d year, oats;
4th year, fallow ground or different crops.

It is easy to conclude from this that the tilled grounds are sown one-fourth in wheat, one-fourth in barley, and one-fourth in oats.

If, on the other hand, we have ascertained that the tilled ground represents only half the country for example, it will be easy to conclude that in a square kilometre or a hundred hectares there are fifty hectares of tilled ground, of which

12½ hectares are in wheat;
12½ hectares are in barley;
12½ hectares are in oats; and
12½ hectares fallow ground or different crops.

It will be sufficient, finally, to know the average yield of a hectare in order to know the production of a square kilo-

metre—that is to say, the coëfficient analogous to that of Table No. 1 above; for example, an average yield per hectare of 11 q-m. for oats would give to the square kilometre a production of $11 \times 12\frac{1}{2}$, or $137\frac{1}{2}$ q-m.

2d. In another country the following rotation of the crops is generally observed:

1st year, wheat;
2d year, barley;
3d year, artificial forage;
4th year, wheat;
5th year, oats.

From this it is deduced that the proportions of the crops on the tilled grounds are the following:

Wheat, two-fifths;
Barley, one-fifth;
Oats, one-fifth;
Forage, one-fifth.

If, for example, the tilled grounds are three-fourths the total surface (one-fourth being in vines, prairies, meadows, moors, etc.), there will be, per square kilometre, or 100 hectares:

$\frac{2}{5} \times 75 = 30$ hectares in wheat;
$\frac{1}{5} \times 75 = 15$ hectares in barley;
$\frac{1}{5} \times 75 = 15$ hectares in oats;
$\frac{1}{5} \times 75 = 15$ hectares in forage.

By applying to this surface the average yield per hectare in wheat, barley, oats, etc., we obtain for these supplies the coëfficient for the square kilometre.

Without information relating to the distribution of the crops and the rotation of the same, it will be necessary to endeavor to obtain this by an inspection of the country. It is sufficient to examine the country from an elevation, for example, to see the proportion of vines, woods, moors, etc.,

and also that of the tilled grounds; that is to say, the first element of the calculation; attention will finally be given to the tilled grounds to estimate the distribution of the different crops, such as wheat, oats, barley, etc. This second investigation is undoubtedly more difficult.

If at the time of harvest it is easy to recognize a field of wheat from that of oats or from a field of barley, the determination of the question presents some difficulty when it is desired to distinguish one of these cereals from the other while green; it is possible, however, to determine this after a little experience, and thus obtain an approximate idea of the proportion of the crops.

One of the officials of the Intendance in crossing the section where the troops are being cantoned in the evening would thus be able, quite approximately it seems to me, upon the march each day, to estimate the production, and consequently the resources of the country; he would thus be able, without more precise information, to have the necessary elements for the preparation of the order, which should, whenever possible, be given before the arrival; that is to say, before it was possible to procure the information from the local authorities near at hand.

The yield, the knowledge of which is equally necessary, is more easy to determine, as it varies in small limits. It will not be going far wrong to make use of an average yield; it can, moreover, be corrected, somewhat depending upon whether the country appears fertile or arid, or whether the season has been propitious, average, or bad.

Table No. 3 gives the averages and extreme yields, from information which can fix the ideas and serve the terms of comparison of the kind of reconnaissance that we have just been discussing. This table contains also other information

which may be useful, especially on the proportion of the surface devoted to each crop in the whole of France.

As a verification, and as an example of the method, it may be remarked that the figures in column 3 represent the number of hectares cultivated with each food supply on the basis of 100; that is to say, by a square kilometre. By multiplying these by the yield given in column 5 we obtain the coëfficients given in Table No. 2; that is to say, the production for each year per square kilometre. Oats, for example, by multiplying the number of 7.9 hectares by the yield per hectare, 11.71 q-x., we obtain for the production of 100 hectares, or 1 square kilometre, 92.6 q-x., or, in round numbers, 93 q-x., which is the coëfficient for this supply.

TABLE No. 3.

Products.	Area Cultivated. (Hectares.)	Proportion of the Area of France.	Production in 1891. (Quintals.)	Yield in 1891, per Hectare. — Average Yield. Quintals.	Average Yield. Hectolitres.	Least Productive Department.	Quintals.	Hectolitres.	Most Productive Department.	Quintals.	Hectolitres.	Yield per Hectare Decennial Period 1882–1891. Decennial Average. (Hectolitres.)	Minimum. Years.	Minimum. Hectolitres.	Maximum. Years.	Maximum. Hectolitres.	Remarks.
1	2	3	4	4	5	6	8	9	7	11	12	13	14	15	16	17	18
	In 1891.	Per Cent.															
Wheat	5,759,599	10.5	58,508,807	13.41	10.21	Aveyron	4.63	6	Seine	18.98	25.31	.....	.....	.....	.....	.....	Average below 5 quintals, 3 departments: Aveyron, 4.63; Haute-Marne, 4.76; Meurthe-et-Moselle, 4.90. 37 departments have a yield of 5 to 10 qx.; 41 departments from 10 to 15 qx. 6 departments above 15 qx.: Ainse, 15.22; Seine, 18.98; Nord, 16.42; Seine-et-Oise, 17.21; Pyrénees-Orientales, 16.38; Seine-et-Marne, 15.35.
	Decennial Ave.		Decennial Ave.														
	6,848,267	12.7	82,205,662	.....	.....	.....	.....	.....	.....	.....	.....	15.64	1891	13.41	1882	17.70	
Meslin	270,?90	.5	2,270,993	10	13.65	Aveyron	5.18	7	Nord	18.40	25.56	.....	.....	.....	.....	.....	
	Decennial Ave.		Decennial Ave.														
	329,240	.6	3,818,391	.....	.....	.....	.....	.....	.....	.....	.....	15.73	1891	13.65	1882	18.83	
Rye	1,498,570	2.8	15,397,583	10.27	14.40	Nièvre	5.68	8	Seine	16.07	22.97	.....	.....	.....	.....	.....	
	Decennial Ave.		Decennial Ave.														
	1,656,331	2	17,329,845	.....	.....	.....	.....	.....	.....	.....	.....	14.61	1886	13.83	1882	15.76	
Barley	4,242,704	2.1	35,420,447	13.29	20.78	Alpes-Maritimes	4.87	7.50	Nord	23.35	38 03	.....	.....	.....	.....	.....	Yield below 3 qx. 6 depts.: Alpes-Maritimes, 2.35; Ardèche, 4.83; Hérault, 4.38; Landes, 4.80; Lozère, 4.30; Var, 3.99. 37 depts. have a yield of 5 to 10 qx.; 42 depts. have a yield of 10 to 20 qx. 2 depts. above 20qx.: Nord, 25.10; Seine, 21.60.
	Decennial Ave.		Decennial Ave.														
	982,268	1.1	18,596,174	.....	.....	.....	.....	.....	.....	.....	.....	18.93	1888	17.68	1891	20.78	
Oats	4,242,704	7.9	106,145,172	11.71	25.01	Alpes-Maritimes	2.35	5	Nord	23.10	32.50	.....	.....	.....	.....	.....	
	Decennial Ave.		Decennial Ave.														
	3,760,100	9	89,607,155	.....	.....	.....	.....	.....	.....	.....	.....	23.83	1887	21.54	1882	25.50	
Potatoes	1,492,756	2.7	111,672,583	74.81	.....	Gers	20.70	.....	Vienne	1.65	... ..	.. .	.....	.....	.....	.. ..	11 depts. have a yield less than 50 qx. per hectare; only 9 yield more than 100 qx.
	Decennial Ave.		Decennial Ave.														
	1,439,620	2.1	106,629,292	.....	.....	.....	.....	.....	.....	.....	.....	74.06	1882	63.60	1887	78.68	
Buckwheat	623,958	1.	6,456,163	10.34	16.51	Alpes-Maritimes	5	3	Eure	14.74	23	.....	.....	.....	.....	.....	Not cultivated in 16 dpts.
Corn	557,617	1.	6,776,085	12.15	16.76	Aveyron	6	4.02	Aisne	25,72	35	.....	.....	.. ..	.....	.....	Not cultivated in 32 dpts.
Millet	50,811	.1	384,328	7.56	11.38	Nièvre	3.25	5	Pyr.-Orient.	19.81	28.31	.....	.....	.....	.....	.....	Not cultivated in 50 dpts.
Clover	1,046,392	1.9	43.340,869	41.41	.....	Var	26	.....	Mayenne	70	.....	.....	.....	.....	.....	.....	
Lucerne	771,493	1.4	36.217,493	46.94	....	Morbihan	30	.....	Hautes-Pyr's	75	.....	.....	.....	.....	.....	.....	
Sainfoin	625,895	1.	22,006,060	35.16	.....	Côte-d'Or.	19.57	.....	Mayenne	66	.....	.....	.....	.....	.....	.....	
Hay from Natural Meadows	5,075,452	9.3	158,843,128	31.29	.....	Ardèche	11.77	.....	Vaucluse	54.37	.....	.....	.....	....	.....	....	7 depts. produce less than 20 qx.; 29 depts. produce more than 35qx.
Vineyards	1,763,453	3.3	30,166,915	.....	17	Ardennes	.....	2.26	Bouches du Rhône	.....	57	....	.....	.....	.....	.....	Aude, 49 hectolitres per hectare; Gard, 42; Hérault, 45; Charente-Inférieure, 17; Gironde, 20; Loire-Inférieure, 30; Vendée. 25 hectolitres.

CHAPTER III.

I. Application of the Different Methods of Subsistence by the Local Resources.

We have studied in the preceding chapter the distribution of the resources and their relation with the necessities for the subsistence of the army depending upon its degree of concentration. We must now concern ourselves with the means of utilizing these resources; that is, with the general methods to be employed to turn them to advantage. The methods of profiting by the local resources and of living upon the country may be classed in the following manner:

1st. To have the subsistence provided directly by the inhabitants;*

2d. To entrust to the troops themselves the duty of procuring the provisions by turning to account the cantonments occupied or the surrounding zones;†

3d. To turn the country to account by means of general requisitions; the work in connection therewith will fall more especially upon the administrative services.‡

II. Billeting upon the Inhabitants.

The simplest and most convenient method of providing the subsistence of the troops is to billet them upon the inhabitants; by such means the details for the distribution are done away with; the trouble of preparing the meals is avoid-

*This method is usually termed "billeting upon the inhabitants."

†The term "foraging upon the country" expresses this more correctly.

‡This method is succinctly expressed as making "requisition upon the country."—*H. G. S.*

ed; it is the best method, or, to speak more accurately, the only one, of profiting by the small provisions scattered in the households. The method is the one which distributes more uniformly, if not in the best way, the burden of the subsistence among all the inhabitants; it is consequently the method of supply which should yield the best results and make it possible to subsist the greatest number of men in a given section of the country.

We do not have to explain here the detailed arrangements and administrative order peculiar to this method of operation. The Regulations of January 11, 1893, and the Instructions of April 12, 1889, to subsistence officers, contain all necessary information on this subject. We will inquire only in what limits it is possible to make use of billeting upon the inhabitants as a general method of subsistence.

Billeting upon the inhabitants can only be ordered for troops in cantonments, and consequently its employment is limited by the impossibility even of cantoning the troops when the concentration is too great.

As we have seen in the first chapter, the two formation types to which we are limited in order to represent the concentration of the army, far from the enemy and during the ordinary period of operations, correspond, as far as density is concerned, to the following figures:

1st Type.—4 men to each inhabitant, if we assume a population of 70 inhabitants to the square kilometre; 8 to 9 men to each inhabitant in agricultural sections where the population is only 45 inhabitants to the square kilometre.

2d Type.—8 to 9 men to each inhabitant in the first case, and 15 men to each inhabitant in the second.

In accordance with the Regulations, the capacity of the cantonments should be estimated at 6 or 7 men in agri-

cultural countries, and 4 to 5 only in towns and manufacturing districts. From this it appears that even in the first formation it would not always be possible to quarter the entire column; but this conclusion should not be regarded as absolute: it may be possible in reality, especially in the country, to increase the number of men quartered to 10 men to each inhabitant. It is necessary also to take into consideration the fact that the distribution of the inhabitants is not uniform throughout the country, and that the roads and their approaches show a population higher than the average. For these reasons we can admit that it will always be possible to quarter all the troops in the first case—that is, when the depth of the cantonments is equal to the length of the column.

But such will not be the case when the depth of the zone of the cantonments is diminished. In fixing the capacity of the cantonments as 6 men to each inhabitant for the towns, and 10 men to each inhabitant in the country, which is the maximum, it can be seen that it would be possible to quarter only two-thirds, at most, of the column, when the depth of the cantonments is not equal to more than half the length of the column—that is to say, in our second formation type.

Although, as certain authors maintain, it may be possible to still further close up the cantonments, it is an opinion which can be supported, for the worst cantonment would frequently be much better than the bivouac; but, however that may be, it would not then be possible to have the men subsisted by the inhabitants in a cantonment so much closed up. We will stop, then, at this conclusion, that the subsistence by the inhabitants can be employed as a general method of subsistence only in the case of extended cantonments, and will rarely ever be applicable except to the

period of marches at a distance from the enemy, when it is possible to give to the cantonments a depth equal, or little inferior, to the length of the marching columns.

It is, moreover, during this period that this method of subsistence offers the greatest advantage and that it is even made almost obligatory, on account of the difficulty of employing the others.

During this period the marches are longer, the start made early in the morning, the arrival at the place of cantonment often does not take place until very late; time would be lacking to proceed to turn the local resources to account by means of purchases or requisitions. It would also be impossible to make use of the trains for the supply; if reference is made to our former remark, that the march to be made by the supply trains is equal to the march made by the column increased by the depth of the cantonments, one will be convinced that it will be out of the question to use the trains in the period of the long marches during which these two factors attain their maximum.

If billeting upon the inhabitants is not always practicable in so far as the general method of subsistence is concerned, its employment is always advantageous to provide the subsistence of detachments, advance guards, and separate commands.

We will close this brief account with a few remarks concerning the application of this method of subsistence.

The subsistence is exacted from the inhabitants under the form of a half-day's ration, or meal, with or without bread. It will be necessary to recall the remarks we have made in the preceding chapter, regarding the possibility of exacting the supply of bread from the inhabitants; bear in mind that our conclusions were that the supply of bread can be easily exacted, in case of extended cantonments, from

the inhabitants of agricultural sections where the custom of domestic baking is retained, but that this supply would be difficult to provide in all other cases.

Billeting upon the inhabitants will generally be prescribed for several days; when it should cease, the necessity of making an issue of rations the evening before the day on which the new method of subsistence is to begin must not be overlooked. Let us suppose, for instance, that billeting upon the inhabitants has been ordered from the first to the eighth day; the evening of the seventh day, although the subsistence for that day is provided for, it will be necessary to make an issue of rations for the eighth day, to conform with the requirements of Article 41 of the Regulations of January 11, 1893. Conversely, when, after a period in which the subsistence has been assured by regular issues, there is a return to billeting upon the inhabitants, the issues will be discontinued the evening preceding the day on which billeting on the inhabitants will be enforced; otherwise the rations issued with the meal furnished in quarters would make a double supply of rations for that day.

Billeting upon the inhabitants will especially be applied, in addition to the detachments, to the period of rapid marches generally arranged several days in advance; it will then be possible, and should be done, to give notice in advance to the municipalities, informing them of the number of men to be quartered and subsisted; this notice will be sent to them by the cavalry preceding the columns, or at least by the advance guard. This precaution is absolutely indispensable to assure the success of the operation.*

*It does not seem to me that this suggestion concerning the notice to be sent to the municipalities in advance is one which should ever be adopted; for the reason that the information regarding the strength of an advancing column and the time it is expected to arrive at certain places may very easily be communicated to the enemy by some one who is able to pass through the cavalry screen; and may thus render the particular operation abortive.—*H. G. S.*

III. Utilization of the Local Resources by the Corps; Supply from the Regimental Trains.

The second method of providing the subsistence, by turning to account the local resources, consists in entrusting to the troops themselves the duty of procuring the necessary provisions in the cantonments which they occupy or in the neighboring country. It is to the application of this method that the appointment of the supply officers corresponds more particularly.

This system, by confiding to the troops themselves an operation in which they are greatly concerned, both gives more guarantees for its success and at the same time divides the work. But the return is less than that by the first method of billeting upon the inhabitants.

Clausewitz says:* "It can be readily understood that this method of proceeding would not be able to provide for the support of a body of troops of considerable size; by operating in this way, that which will be possible to obtain from a country will always be less than that which the troops when quartered on the inhabitants would obtain; for in the latter case, where 30 to 40 men will impose upon a peasant by their presence in his house, they will certainly know how to obtain everything which will be necessary to them, while an officer sent with some men into a section of country to demand the provisions has neither the time nor the means to search for all the supplies."

"This method of procedure causes the greatest waste; a large proportion of the resources are lost without being of use to anyone."

In accordance with the foregoing, if the zone of exploitation should not extend beyond the zone of the canton-

*Clausewitz, "Théorie de la grande Guerre," Vol. I., page 352.

ments, there would be no reason for resorting to this second method.

Then, in fact, where it would not be possible to provide the subsistence by billeting upon the inhabitants, there would be still less opportunity of employing the second method, which is much less productive; and wherever it would be possible to purchase or requisition the provisions it would be possible to require the inhabitants to prepare the meals themselves, and it would be to their advantage to do so. Thus in the period of marches at a distance from the enemy, when the cantonments are separated, it would generally be possible to find by the second method the necessary supplies in the cantonments; but as it is also possible, as we have just seen, to demand the supply by the inhabitants, this method will be preferred. In the same way, in the case of the cantonments reduced to half the length of the march, where generally it will no longer be possible to provide the subsistence by billeting upon the inhabitants, it would likewise be impossible to find provisions in sufficient quantity in the cantonments even to buy or requisition.

What then makes it possible to provide the subsistence is that the exploitation can be extended, outside of the cantonments, in the localities which have been excluded from the zone of occupation for military reasons, but where it is possible to send detachments to requisition provisions. The possibility of thus providing the subsistence will depend upon the extent of the zone of exploitation and also upon the time available.

Zones of Supply.—In the period of marches at a distance from the enemy the halting-places are generally farther apart; they may reach 40 kilometres if the column is cantoned on a depth equal to that of the marching column. The length of the march and the short time available, on account

of the early hour of departure and the late hour of arrival at the cantonment, will hardly admit of extending the exploitation beyond the zone of the cantonments. In this case the zone of supply which coincides with the zone of cantonment would have an area of 100 square kilometres for the main column of an army corps. We have seen in Chapter II. that the same area generally makes it possible to find all of the necessary supplies for the subsistence; it would then be possible to provide the subsistence there by means of purchases or of requisitions enforced by the corps themselves, if it would not be preferable to subsist the men there by billeting on the inhabitants as has been said.

When the column closes up in the average formation corresponding to the cantonments with a depth equal to half the length of march, the zone of the cantonments is only from 40 to 45 square kilometres in area. But the exploitation may extend over a much greater area. During the period to which this formation corresponds the marches are necessarily shorter; it would then be possible, if absolutely necessary, to push the cantonments further to the right and left of the road; besides, if the possibility of thus extending laterally is limited to a distance of 3 kilometres at most, so as not to impose upon the majority of the men too great fatigue, the same reasons do not prevent sending small detachments to a greater distance to turn the resources to account; but in reality the distance to which the exploitation can be extended laterally is limited by the presence on the flanks of troops belonging to other columns; it depends consequently upon the extent of the march front. The distance apart of the lines of march is, on the average, from 8 to 10 kilometres; each corps being able naturally to extend to the middle of the interval which separates it from the neighboring corps, its zone of supply will extend then to 4 or 5

kilometres from each side to its main road, having thus a total length of 8 to 10 kilometres. This distance of 4 to 5 kilometres, which represents a journey of 10 kilometres going and coming, is, moreover, a limit beyond which the exploitation can rarely be pushed without imposing too great fatigue upon the men and teams, and also on account of the short time at disposal. It is consequently also the limit to which it would be possible to extend the zone of supply in advance of the front or in rear of the column, although the space should be open on these two sides.

We have represented in accordance with these principles, in Plate I., the extent of the zones of supply of the different columns, the cantonments of which are there represented. For an army corps in single column cantoned with a depth equal to half the length of the march, the zone of supply forms a rectangle from 8 to 10 kilometres in width, with a length of 20 to 25 kilometres from the point where the advance guard is located to 5 kilometres beyond the cantonments of the rear of the column. The area of this zone is from 200 to 250 square kilometres.

From our conclusions in Chapter II., a zone of this extent generally contains more resources than are necessary; it seems then at first that the subsistence can always be provided by foraging, if it is possible to obtain all the resources, but this is not always so. Clausewitz* says: "How can it be admitted that a corps of 30,000 men camped in a circle of 1 mile [1600 metres] radius can be able to find its daily subsistence in an area of 3 or 4 miles square [about 200 kilometres]? It may be concluded that it is possible to derive fair results from this method of supply only when the body of troops is not large (for example, for a division of 8,000 to 12,000 men at the maximum), and that, in this

*Clausewitz, "Théorie de la grande Guerre," Vol. I., page 353.

case even, recourse should be had to it only as a necessary evil."

It is necessary, however, to note whether the unfavorable conclusions of Clausewitz will be always true as far as concerns the provisions, properly so called, and the oats; it seems to us that, on the contrary, it will very often be possible to obtain, without great difficulty, cattle and forage, hay and straw.

Moreover the success of the operation does not depend entirely upon the resources of provisions in the zone of supply; it depends particularly on the manner in which the operation is conducted and the time available.

Time Available for Collection of the Local Resources.—There is not the same urgency for all the kinds of provisions which are to be provided from the local resources to satisfy the necessities.

Regarding bread, the small articles of the ration, and oats, the evening meal is provided by means of the day's ration carried in the haversack or nose-bag; the issue to be made for the following day is provided by drawing upon the load of the regimental trains. The proceeds obtained by turning to account the local resources are then necessary only to provide for the reloading of the regimental trains, and to accomplish this all the time is available until the moment when the train should begin its march.

The cattle should be slaughtered, distributed, and loaded on the special wagons, which start out at the same time as the troops; it is necessary then to find the cattle readily, in order to have time to do all these things. The time available is then more limited than in the case of the provisions and oats; it seems necessary, as far as the cattle are concerned, that the searches should be terminated before evening.

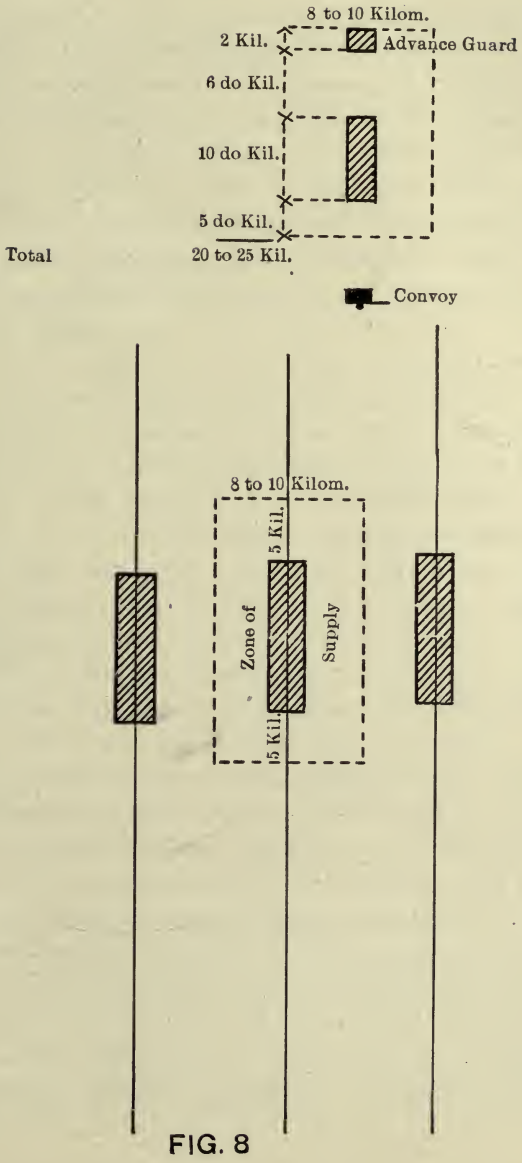
8 to 10 Kilom.
2 Kil.
Advance Guard
6 do Kil.
10 do Kil.
5 do Kil.
Total
20 to 25 Kil.
Convoy
8 to 10 Kilom.
5 Kil.
Zone of
Supply
5 Kil.

FIG. 8

It is the same as far as hay and straw are concerned; if the oats carried in the bag are sufficient to give the horses the first feed, it is necessary to expedite the collection of hay and straw, which should serve to complete the evening feed and should be consumed before starting.

The collection of fuel is still more urgent, since it is necessary immediately upon arrival to prepare the soup.

The order of urgency for the collections to be made is then the following: fuel, hay and straw, cattle, and then the provisions for the regimental train, bread, small articles of the ration, and oats.

As regards the first of these supplies, fuel, hay, straw, and cattle, the collections should be made by evening; as regards the supplies for the regimental train, which are, moreover, the most difficult to find, a longer time is available, until the moment the train begins to march.

The time available for these different operations will depend upon the hour of the arrival at the cantonment and the hours of departure the following morning, which are announced in the order for the movement; under ordinary and usual conditions, these hours will approach the following:

1st. When the cantonment is made in the order of march and when the depth of the cantonments is equal to the length of the column, all the subdivisions begin the march at the same hour and halt in the evening at the same time. If the departure is set for 5 o'clock in the morning, to make the maximum march of 40 kilometres with a long halt of one hour, about eleven hours would be necessary and the cantonment would be reached between 4 and 5 o'clock in the evening. Early departure, late arrival, consequently but a short time is available in which to turn to account the local resources; thus during this period it is preferable

to billet the troops upon the inhabitants, following the conclusions of the preceding sections.

It is well to remark that during this period of long marches, if it is desired to assemble the regimental trains at the rear of the column, they would be able to join their respective corps only at a very late hour; thus it is necessary to have each corps followed by its regimental train.*

2d. If the depth of the cantonments is reduced, the hour of departure and arrival is not the same for the different subdivisions.

For a column of an army corps in cantonment with a depth of 12 kilometres and making the maximum march of 32 kilometres, if the hour of departure of the advance subdivision is fixed at 5 o'clock in the morning, it will be able to complete its march between 1 and 2 o'clock in the afternoon. The rear subdivision B should leave its cantonment at 8 o'clock,† and would arrive at its new cantonment at 4 o'clock in the afternoon. The hours of departure and arrival of the intervening subdivisions are between these extremes. The train of the rear subdivision B can start out on the march almost at the same time as that subdivision; it is necessary for it to leave the necessary space in which to insert the trains of the other subdivisions, which should precede it in the column of the regimental trains.

The train of the rear subdivision should then start out about 8 o'clock and arrive at the cantonment B′ about the

*Colonel Maillard, "Elements de Guerre," 1st Part, page 66.

† These figures are readily obtained by referring to the first note on page 28. The rear subdivision starts out after an interval of time, elapsing from the departure of the advance subdivision, equal to $\frac{L-l}{4}$, or in this case $\frac{24-12}{4}=3$ hours; consequently, if the advance starts at 5, the rear subdivision starts at 8 o'clock. The same conclusions can readily be arrived at by an inspection of the figure in Plate II.

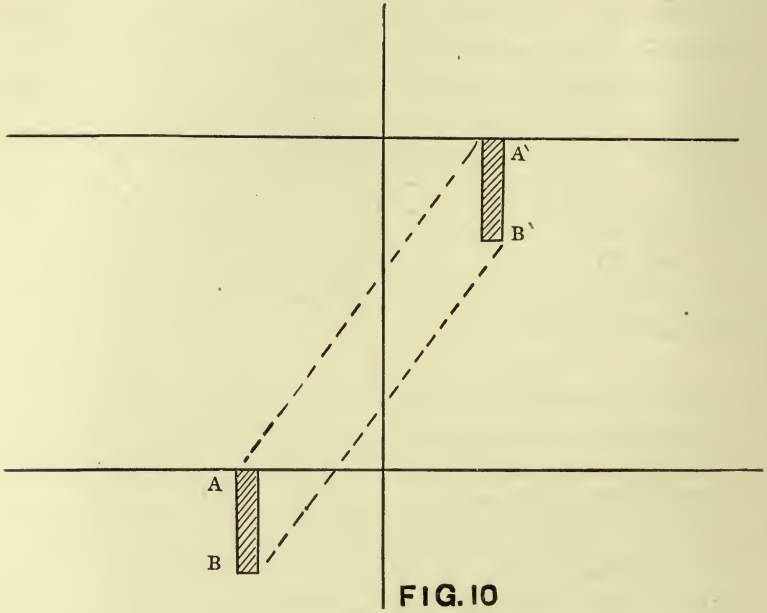

FIG. 10

same time as the corps, or about 3 or 4 o'clock at the latest. As for the train of the advance subdivision, it cannot leave A until the entire column has passed that point—that is, about 11 o'clock, and it will not arrive at its new cantonment A′ until about 5 or 6 o'clock in the afternoon. The hours of arrival and departure of the intervening trains are between these extremes.

We have considered a maximum march of 32 kilometres, but if it is less, the hours of arrival at the cantonment will be earlier, and consequently the time available for turning to account the local resources will be increased.

However that may be, it is evident that for the forward subdivision all the afternoon is available for making requisitions for cattle, hay, and straw, and until 10 or 11 o'clock

in the morning of the following day for the resupply of the regimental train. For the rear subdivision this time is somewhat diminished in the evening and morning, but it has all the night and a part of the morning to complete the resupply of the regimental train.

Order for the Operations.—The remarks which precede should serve as a guide to the supply officers to regulate the order of their operations so as to provide for the wants in their order of urgency. They generally will not have to concern themselves with the fuel, the supply of which is restricted to the cantonment, but they will hasten to commence the search for hay and straw. They indicate then without delay the grain dealers; if none are known, it will be sufficient to find out two or three large farms in order to obtain there the necessary supplies. The supply officer, after having placed a value upon these supplies, will remove them and have them carried to the place appointed for the issues, by even making use of the farm wagons, if his train has not yet arrived. It will generally be quite an easy matter to find the necessary cattle on one or two farms. For all these foods the resources are generally in excess of what is required. The quantity of these supplies is very large; the importance of a farm is indicated at once by the size of the ricks of straw which surround it, by the extent of its buildings, and if the civil authorities have not taken the initiative of collecting the supplies, it is easy to relieve the possessors of their supplies.

The operation is more difficult as far as provisions and oats are concerned, the resources of which are sometimes insufficient, and for which it will be necessary to resort to a larger number of holders. As, moreover, that requires more time, it is better to apply to the civil authorities. The supply officer will then forward to them as soon as possible the

orders for the requisition, indicating the place where the supplies should be collected and the hour at which they should be ready.

While leaving to the local authorities the care of regulating the distribution of the requisition, the supply officer should superintend the operation; in case of bad faith or of want of success, he should act himself with all needful energy. The desire for an equitable distribution of the burden among the inhabitants concerns the army only by the fact that it increases the number of the sources from which the supplies are derived and consequently affects the yield. But this is, however, of secondary importance; this idea should not be an obstacle to the rapidity and success of the operation, nor a pretext for hesitation. As soon as a number are known, even a limited one, of holders to provide the amount demanded, the matter will rest there without in any way considering if the portion they will have to furnish is too large; in case of resistance and of bad faith, force would be used; but this, however, is an extreme measure, which is useful only on account of the moral effect it produces.

Operations of the Intendance.—We have supposed that all these operations were performed by the supply officers, but nothing would be modified of what we have said if the operation should be directed or executed, in whole or in part, by the divisional administrative services. The regulation enumerates the cases where the Intendance service should itself assume the work of turning the local resources to account; the fact of the intervention of the administrative services in this case does not constitute a new method, but only a means for the execution of the same method. The operation always has as its object the exploitation of the same halting zone, and differs entirely, as well in the results as in the means of

operating, from the method of exploitation by general requisitions that we will study in the third part.

It is only necessary to glance over Plate I., in which are represented the cantonments of an army corps in various formations, to see that the zones set apart for the different portions of the column are too extensive to be turned to account by the divisional *sous-intendants.* How, for example, would the *sous-intendant militaire* of the advance division, divided into the advance guard and main body, be able to direct at the same time the service in these two subdivisions? The 2d division is more closed up, but it has a depth, however, of 4 to 5 kilometres, and its zone of supply is from 40 to 60 square kilometres in extent. The subdivisions under the charge of the headquarters staff are scattered: the headquarters properly so called at the head of the column, the corps artillery in the center, the sections and parks in rear, forming the column of the fighting train, which includes also the subdivisions belonging to the two divisions. It is then necessary to entrust to the corps the duty of turning the resources to account, as the *sous-intendant militaire* cannot be everywhere.

The rôle of the *sous-intendant militaire* will be more one of preparation, direction, and regulation than of execution. As regards preparation, the *sous-intendant* will at first have to study the resources; this will enable a decision to be made as to which mode of supply preference should be given. When this study shows the possibility of living upon the country, the *sous-intendant* will have to distribute the zones of supply among the various units. At all times when the march is regulated for several days and when the cantonments are assigned in advance, he should prepare the instructions informing the municipalities of the requisitions which will be imposed upon them. It would not be possible

to assign to the corps and to the supply officers the duty of preparing these instructions. If the division of the work is advisable as far as the execution is concerned, it only causes disorder in the preparation and conception; moreover, the supply officers are too far from the staff to assist effectively in the work of preparation, which requires a constant exchange of views with the general commanding.

The *sous-intendant* will intervene as a moderator by placing the means he has at command at the disposal of the corps, if unforeseen circumstances create special difficulties for them; it is well understood that the military requirements will not always permit of assigning the cantonments in the most advantageous manner as far as the supply is concerned; tactical necessities will require that the troops be taken to the district where the resources are very small, and it will happen that one locality without resources will be invaded by a considerable force, while another locality which is very rich will be scarcely occupied. It can thus be seen, as in Plate I. (Fig. 1), that the zones for the various subdivisions are not necessarily proportional to their effective strength: for example, the corps artillery occupies a zone only 1500 metres in depth for an effective of 1450 horses, while the second division, with just about the same number of horses, occupies a zone of 4000 metres in depth; thus, also, the leading division is divided into two columns having a depth of 10 kilometres. Under such conditions the resources will be insufficient in one zone, and in another be in excess of the requirements. In such case it will be the duty of the Intendance itself to turn to account all or part of the zones where the resources exceed the wants in order to issue the products to the subdivisions not so well provided for. Under such circumstances the regulation prescribes that the Intendance will turn to account the districts

occupied by several corps and also the localities affording considerable resources. In this last case, however, the intervention of the Intendance would be useless, if the resources, although in excess of the wants, were not necessary elsewhere, for, as it has already been said, the direct exploitation made by the first line should not, nor would not, have for its object the collection of all the resources of the zone to form a large stock of supplies, but only to find what is necessary for the immediate wants.

IV. General Requisitions Imposed by the Administrative Services.

The advance movement of the army causes the passage through the same section of country by troops belonging to the successive échelons of the formation; first the cavalry scouts, the cavalry of the army corps, then come the advance guards, the main columns, succeeded the next day or the day after that by the parks and trains; each of these columns during its passage has provided for its immediate wants by making use of the local resources, and taken away a part of the resources of the country; but this exploitation can only be superficial; notwithstanding the theoretical possibility of extending the researches further, only in the cantonments will the corps be able to turn the resources to account—that is to say, on the main road and its approaches, leaving in the centre of the interval between the lines of march of the columns a large zone which has hardly been drawn upon.

It is the duty of the administrative services to complete this exploitation and to collect the resources not made use of for the immediate wants of the column, by thorough searches and by general requisitions regularly and methodically imposed. Clausewitz says: "That is the simplest and most productive method of supply; it has also served

as the basis in all modern wars."* But since Clausewitz's time, the development of railroads has modified the conditions under which the supply can be provided. If the employment of general requisitions even in the theatre of operations was formerly the easiest method of supplying an army, on account of the length and the difficulty of cartage on the wagon roads, it seems that at the present time it will be just as easy by means of railroads to supply the dépôts by consignments from the national territory, where can be brought into operation to procure the supplies all the administrative methods that far-seeing organization has created in time of peace and all the resources of commerce. It will be advantageous from an economical standpoint, and it is probable that all the supplies will be obtained at much lower prices, which will offset the excess of cost resulting from the transportation from a greater distance. It would not be the same, however, if the supplies, instead of being supplied directly by the administration, were entrusted to contractors, as has been and still will be done. As, for instance, regarding the fresh meat. In this case, in fact, the contractor, not possessing the same advantages as the Government in its relations with the railroad companies, is concerned in having his theatres of supply near the points of delivery. The exploitation of the zone occupied by the army may then in certain cases be more advantageous, and it would become a necessity if the railroads were cut. It is well known to what extent the supply of the Germans in 1870 was hindered by the obstruction of the Saverne tunnel, which was not cleared until the 18th of August; then by the resistance offered by the Toul fortifications, which blocked the railway line from Nancy to Châlons. The same embarrassment would have resulted from the destruction of the

*Clausewitz, "Théorie de la grande Guerre," Vol. I., page 354.

Fontenoy bridge if it had taken place later. Similar circumstances may arise which will render it necessary to resort even to the theatre of operations to procure the necessary supplies.

It must also be considered that, as the railroads do not extend to the interior of the cantonments, it will be necessary, in order to carry the provisions from the terminal station of the railroad to the centers of distribution, to organize a series of trains: administrative trains, auxiliary trains, contingent trains connected with the service of the line of communication. The working of these trains is rather a complicated matter. If it were possible to resupply one of these trains by turning to account the local resources, the necessity of drawing upon the following échelon would be avoided; if, for instance, the direct resupply of the regimental train cannot be provided, it will be necessary to send forward a section of the administrative train, the supplies in which will be turned over to the regimental train. If this section of the administrative train can be resupplied from the country, recourse will not be had to the auxiliary train; unless this is possible, it will be necessary to send forward a section of this latter train. The auxiliary train should in its turn be resupplied from the local resources, if possible, in order to avoid drawing upon the contingent trains carrying the provisions taken from the station magazines.

It can be seen from the foregoing that the turning to account of the local resources by the administrative services may be for the purpose of providing successively, either the resupply of the administrative trains, or that of the auxiliary trains, as well as stocking the station magazines when they are not supplied by consignments from the rear.

Resupply of the Administrative Trains from the Local Resources.—Let A, B, and C designate the successive points where the column halts the first, second, and third days. If the second day at B, for instance, it has not been possible to directly provide from the local resources the resupply of the regimental train, a forced march will have to be made by the section of the administrative train which will come to resupply the regimental trains.

The meeting of these trains with the administrative trains will take place at a designated place, which is in the zone of the cantonment B. It follows that, if it is desired to attempt to resupply in its turn the administrative trains from the local resources, it will be by turning to account the resources of zone B, where, according to the supposition we have made, it has been impossible to effect the resupply of the regimental trains; if it was on account of the lack of resources that the operation had failed as far as relates to the regimental trains, it would be impossible to succeed any better as far as the administrative train is concerned: it will be necessary then to abandon this idea and to have the latter resupplied in turn by the auxiliary train. But the failure of the first operation may be for other reasons than the lack of resources: to want of time, for example.

We know, in fact, that the only time available for resupplying the regimental train is the evening of the second day and part of the morning of the third day. The time available, as far as the administrative train is concerned, can be prolonged until the evening of the third day; it is sufficient, in fact, to start out the section of the train on the evening of that day, so as to take its place in the rear of the column with a view to the resupply in which it would have to coöperate on the fourth day. These additional hours will often make it possible to manage the operation well, for,

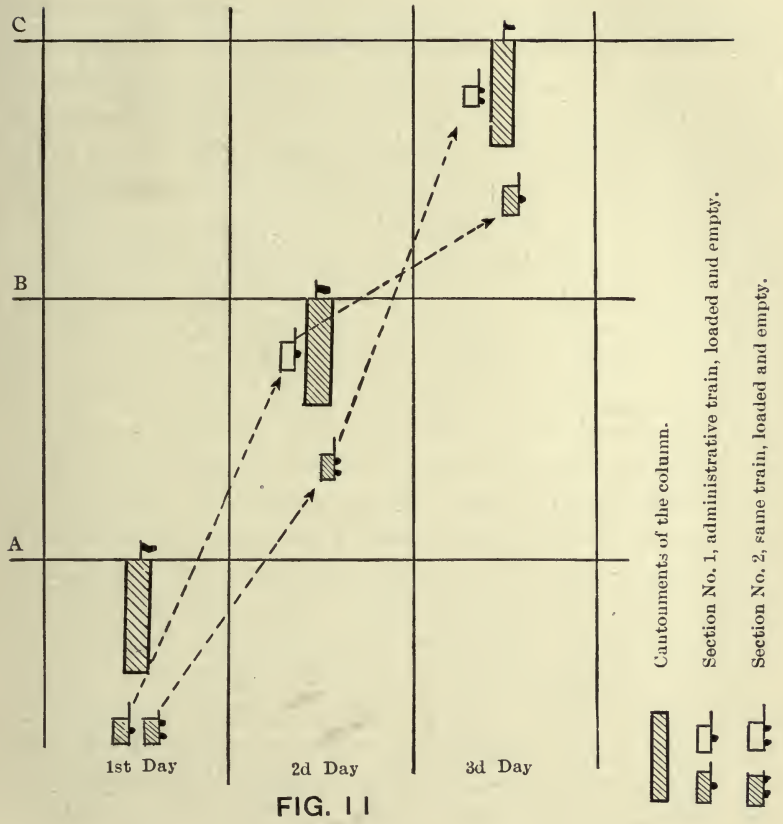

FIG. 11

Clausewitz says, "here the question of time is important: the greater the number of hours available, the greater the number of inhabitants who will be able to participate in the deliveries, the contributions thus distributed will be less of a burden for them, and the results will be more satisfactory."

The duty of providing for the collection of the local resources in order to resupply the administrative trains falls upon the administrative services of the army corps; this

operation will be directed by the *sous-intendant* of each division or of headquarters for his own train, if the administrative trains are not grouped together in units of army corps, and in this latter case by the *sous-intendant* assigned to the administrative trains. (January 11, 1893, Art. 37.)

Article 65 of the Regulations of January 11, 1893, indeed says, that the resupply of each train is provided through the instrumentality of the administrative staff which is attached to it. But this evidently does not mean to say that, on his arrival in the cantonments, the *sous-intendant militaire* should not arrange, without delay, for turning to account the resources of the zone, even if he foresees that the regimental trains will not have time to collect the resources, and that these will serve only for the resupply of the administrative train. On the contrary, it would seem that, on his arrival in the cantonment, and without waiting until the administrative train has come up, the *sous-intendant militaire* should proceed to ascertain the resources, to learn if it is possible to obtain the supplies by amicable means, or else make the distribution for the supplies among the inhabitants and send out the order for requisitions. As the length of time available is rather limited, the radius of the circle of exploitation cannot be very great, but we will show later on that a zone having a radius of 4 to 5 kilometres should be sufficient in most cases to assure the requisition for a day's complete ration for the resupply of the trains of an entire army corps. When the train has arrived, its staff is employed in receiving the provisions and in loading them; it continues in all cases the operation that the *sous-intendant* cannot superintend until completed, being obliged to start out in the morning to follow the column. If necessary, the *sous-intendant* will leave one of his assistants near the administrative train, who will be able to rejoin the

column in the evening, when he will be convinced that the resupply of the train is completed.

Resupply of the Auxiliary Trains by the Collection of the Local Resources.—If the section of the administrative train has not been resupplied at B, by the collection of the local resources, it will be necessary to resupply it by a section of the auxiliary train. The meeting of these two trains takes place at a designated place, but which is, however, in the zone B, and it is also in this zone B that the resupply of the auxiliary train, by the collection of the local resources, should be attempted. As we have already remarked in the preceding paragraph, it is only when the particular circumstances, and principally the lack of time, have caused the failure of the operation as regards the regimental and administrative trains, that it will there be attempted for the auxiliary trains; if the first two operations have failed on account of the lack of resources in the country, the same thing would eventually happen in the third case; but, in this case, a much longer time is available and the conditions are very much more favorable. The resupply of the regimental trains should, in fact, be concluded the morning of the third day; that of the administrative trains, before the evening of the same day. For the resupply of the auxiliary trains there will be available the whole of the fourth and a part of the fifth day; it is sufficient, in fact, if the auxiliary train leaves B at such a time on the fifth day as permits it to march to C to take its place in the train, at a distance of two marches in rear of the column. Moreover, the work is performed under more favorable conditions, since it is executed after the columns have moved entirely away, when quiet has been restored among the inhabitants, who are always somewhat disturbed and alarmed by the first arrival of the troops.

The duty of turning to account the resources of zone B, to provide for the resupply of the section of the auxiliary train, falls upon the administrative services of the line of communication. The advance dépôt is not formed at B until the fourth day, but as B has been entirely unoccupied since the third day, the *sous-intendant* of the advance dépôt can have the work commenced there, or at least arrange for it, from the evening of the third day. These arrangements are in accord with the instructions contained in the 3d paragraph of Article 51 of the Regulations of November 20, 1889, expressed thus: "The official belonging to the Intendance connected with the advance dépôt turns to account as soon as possible the resources of the zone; he replenishes the auxiliary trains either from the country or by means of the supplies in the dépôt." The foregoing considerations determine the meaning of this requirement of the Regulations and the conditions of time and place in which the resupply of the auxiliary trains is provided by the administrative services of the advance dépôt.

Finally, whenever it will be impossible to resupply the auxiliary trains at B by turning to account the local resources, it will be necessary to resupply them by means of requisitioned trains carrying supplies drawn from a dépôt in rear.

The only thing which remains in order to conclude this study of the successive exploitation, regular and methodical, of the country, is to see in what way it can be made use of in the formation of the dépôts on the line of communication.

Employment of the Local Resources for the Formation of the Dépôts on the Line of Communication.—Without entering into the details of the organization of the service in rear and the employment of the supply-trains, which will be studied in the following chapter, it is necessary to refer here to the

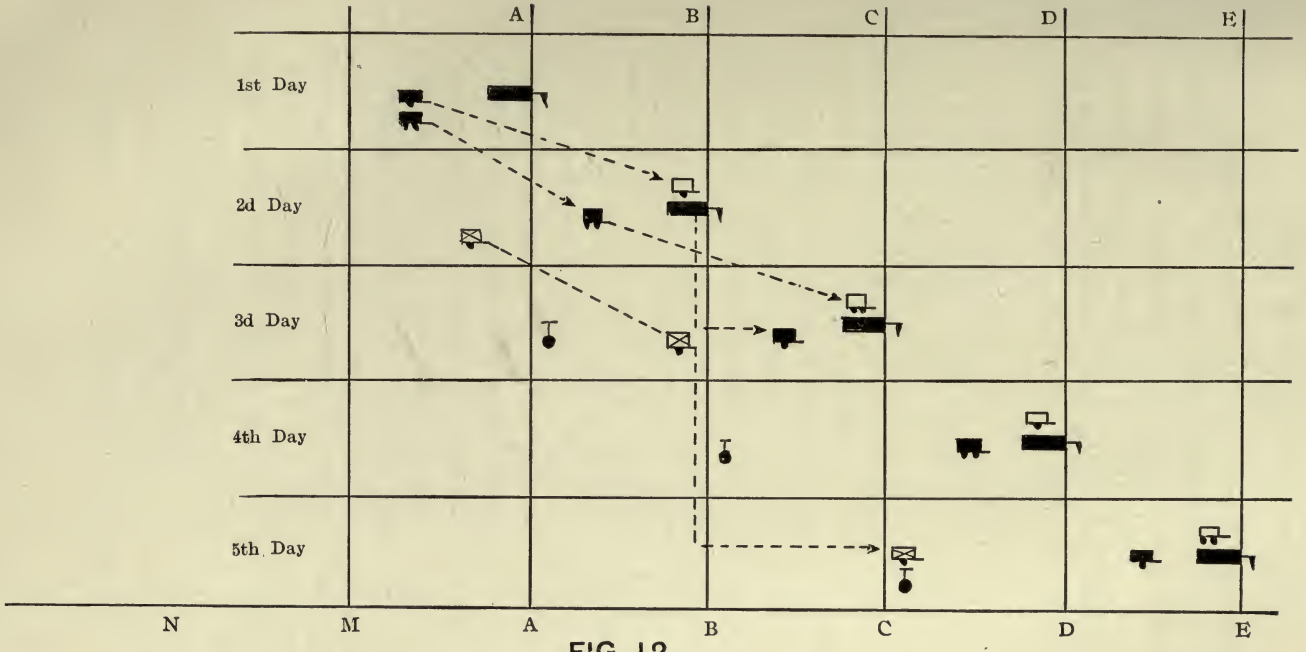

FIG. 12

Administrative train (sections 1st and 2d).

Section of auxiliary train.

Main auxiliary train (terminal station).

Cantonment of the column.

general conditions under which the dépôts of supply are established along the line of communication. These dépôts are écheloned in rear of the army at distances of about four marches apart. The farthest advanced of these dépôts, advanced or principal dépôt, should send out the necessary requisitioned trains to form a junction with the auxiliary trains, when the resupply of the auxiliary trains has not been provided for by turning to account the local resources. If we refer to Figure 12 above, we see from it that the section of the auxiliary train to be supplied should advance the fifth day only to C; we then have the morning, or even some hours of the afternoon, in order to await at B the requisitioned train, which should make a junction with the auxiliary train. In order that the movement of the requisitioned trains should not give rise to too many complications, it is important that the dépôt from which they start should not be more than four stations from the point B; this dépôt will therefore be in one of the points A, M, N, or P. If the point is at A, the requisitioned train will be able to start out even on the fifth day very early in the morning, and overtake at B the section of the auxiliary trains in time to enable the latter to make by evening the march from B to C; if the dépôt is at one of the points M, N, or P, the requisitioned train should start out on the fourth day; it arrives at B the fourth day in the evening or during the night of the fourth and fifth, and the auxiliary train can still set out on the fifth day to retake its place; it is evident from the foregoing that if a dépôt has been organized at A, it will be used in sending forward requisitioned trains to resupply the auxiliary trains.

At B, the 5th day: The requisitioned train being in this case started the morning of the fifth day.

At C, the 6th day: The requisitioned train is able in this case to start very early in the morning of the sixth day, or the evening of the fifth day.

At D, the 7th day: The requisitioned train starting out on the sixth day.

At B, the 8th day: The requisitioned train starting out on the seventh day.

To provide for the resupply beyond that point, it would be necessary to organize a new advance dépôt (at E, for example), which would be able on the ninth day to send forward requisitioned trains as far as F; the dépôt to be formed at A should then furnish four trains, each loaded with a day's ration, and these trains should be collected, that for the first train before the evening of the fourth day, and for the others by the fifth, sixth, and seventh day, respectively. If we observe that the service of the line of communication is installed at A the third day, we will infer the third and fourth day is the only time available to collect the supplies for the first train—that is, within the same length of time that is available to resupply the auxiliary train at B by turning to account the local resources at that point. It may then be asked if it will ever be advisable to depend thus upon turning to account the local resources in rear, instead of doing so directly at B, for the resupply of the auxiliary train, thus dispensing with the requisitioned trains. It is evident that if the country traversed was uniformly rich, at B and at A, there would be no reason for proceeding in that way. But it may indeed happen that there are no supplies at B, and that they can be found at A. It is easy to see that the thing is possible and it is not a mere supposition.

Suppose, for example, that A is the bottom of a rich and fertile valley, beyond which the army will have to cross a plateau or a range of barren mountains and without re-

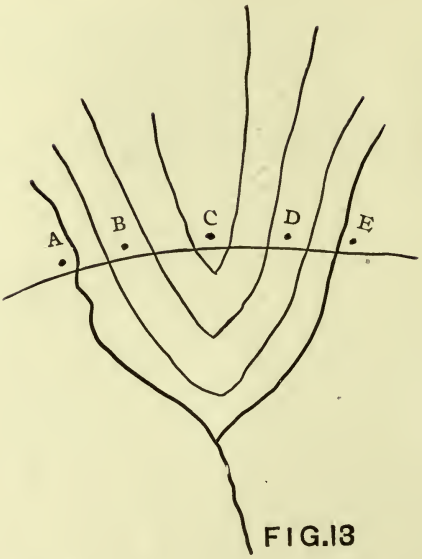

FIG.13

sources, by making halts at B, C, and D, and that then it redescends into another valley, where again supplies can be found; is it not evident in this case that the idea of providing subsistence by turning to account the local resources at B, C, and D will have to be abandoned, and that supplies must be drawn from A, where consequently it will be necessary to form a dépôt?

This necessity of depending upon the local resources in rear would also occur when, instead of being constantly on the march, as we have supposed to be the case until now, the army will remain stationary and when its stay in the same zone is prolonged for several days. In this case, the resources of the zone occupied by the army being rapidly exhausted, it will be compelled to resort to the exploitation of the zone in rear. The formation of these dépôts, when they are not intended to provide for immediate necessities,

is, nevertheless, obligatory for prudential reasons, to provide for unforeseen emergencies, and, for instance, to assure subsistence in case of reverses or of precipitate retreat.

The formation and supply of these dépôts will be accomplished in various ways, according as it is effected from the advance dépôts or, on the other hand, from the other dépôts écheloned in rear. As regards the latter, plenty of time is available and the ordinary commercial methods will be resorted to. But for the advance dépôt, in order to obtain the supplies required for the first consignment to be made to the army, it will be almost always necessary to resort to requisitions. We will now discuss the method to be employed to supply one of these dépôts; we will suppose, in conformity with what we stated at the beginning of this section, that it is necessary to provide immediately at M the supplies required to make four consignments, of which the first should be made the day following, or, at the latest, the morning of the second day after, that on which the service of the line of communication is installed at M. Theoretically, the most rational manner of organizing the work of turning to account the local resources in the vicinity of the dépôt for this purpose will be to form around it four concentric zones, the area of which should be calculated so that each zone can supply the provisions necessary for one of the consignments. The first zone furnishes the necessary rations to the first train, the second zone relates to the formation of the second train, and so on, in such manner that the time available to cause the provisions to flow into the dépôt may be proportionately longer as the distances from which they are drawn are greater.

Immediately upon arriving at M, the service entrusted with the duty of turning the resources to account proceeds to make a rapid investigation of these resources.

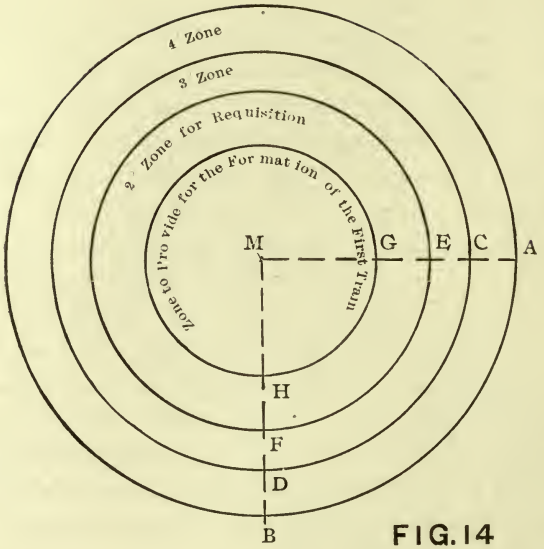

FIG. 14

The principles laid down in Chapter II. will still be applied here.

The distribution of the requisitions among the inhabitants of each zone is made then proportionately to the resources of those inhabitants; the orders for the requisition, as soon as drawn up, are addressed to the local authorities, beginning with those in the first zone; to this is added a notice indicating the hour and place where the provisions should be delivered. Each inhabitant must provide himself with the means of transporting the provisions to the point of delivery. It will be possible to retain the wagons and drivers who have brought the stores to the dépôt and to make use of them for the formation of the requisitioned trains to be sent towards the army. It is evident that the district M would not be able alone to provide all the wagons required to form these trains; it is consequently indispens-

able to collect them and to demand them from the neighboring inhabitants. By proceeding in the manner indicated, the provisions and the wagons to transport them to the troops are procured at the same time.

The notice addressed to the local authorities should inform them of the number of wagons which will be held and the probable length of time during which they will be retained; instructions will be given to select only well-horsed wagons and those capable of doing good service. If it was intended to organize alternate or successive relays of wagons, as this method of transport necessitates the employment of wagons of the same pattern, it would be necessary to specify in the notice to the inhabitants of what pattern the wagons should be, taking into consideration the customs of the country.

The concentric form of the zones around M has the advantage of multiplying the roads by which the trains will gain access. A hurried reconnoissance of the country should be made for that purpose; arrangements will be made to regulate the route by which the teams belonging to the inhabitants will enter into the district and go to the place designated for the delivery of the provisions, or, at all events, sentinels will be posted at the entrance of the main roads to preserve order and to provide guides for the wagon-trains which come along.

It is not enough to draw up and send out the orders for the requisitions; it is still necessary to assure the execution of them; for that purpose, the staff charged with the exploitation will be scattered throughout the zone to be turned to account: this staff will be distributed in detachments, each one having the superintendence of the work in a portion of the district. The best way of making this assignment, it seems to me, is to assign to each detachment a section, A M

B. The first day the detachment turns to account the resources in the part G M H of its section included in the first zone; it then turns to account the resources in the part G E H F, forming the second zone; then successively E C F D and C D A B; this arrangement prevents losing time in making useless incursions.

This method of executing the exploitation, by going from the interior to the exterior, is made under the supposition that it is undertaken in a friendly country and that the good-will of the inhabitants and the assistance of the local authorities can be relied upon. In a hostile country, by proceeding in this way it may be feared that time is allowed the inhabitants to hide, carry off, and make way with the supplies. During the time the resources of the inner zone are being collected, the inhabitants of the outer zone being warned of the operation will be able to avoid the requisition.

Sous-intendant Dufour has made known, from the translation of a German work, a method of collecting the local resources by force which does away with this objection.

In that method, in order to collect the resources of the section M A B, the staff, instead of dispersing at first in the inner zone, would go rapidly by a central road to the farther boundary of the district to be turned to account, then would disperse along the boundary line and would fall back toward the center, driving back before it the supplies. At the same time military arrangements would be made and cavalry patrols would be formed around the zone to stop all escape and all carrying away of provisions. A more detailed description of this method can be read in the *Revue de l'Intendance.**

*"Théories allemandes sur l'Exploitation des Ressources locales à main Armée en campagne."

We have only stated the fundamental principle, which is, as can be seen, to begin the exploitation in the most distant zone and to continue it by going from the circumference to the center.

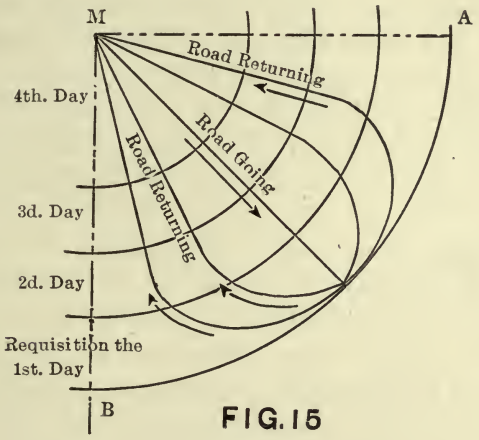

FIG. 15

But it is necessary to observe that in this second method the requisitioned supplies are not collected at M until the end of the operation—that is, on the fourth day; admitting that the first supplies collected would be forwarded immediately to M, as these come from the most distant localities, it is feared that these supplies would not reach M in sufficient time to provide for the formation of the first train, which should be formed the day after, or at latest the second day after, that on which the service of the line of communication has established itself at M.

It seems that it will be necessary to adopt the method which was first explained, except to take the necessary precautions to prevent the carrying off of the provisions; it will be possible, for instance, to have the extreme circumference

of the theatre of exploitation surrounded and watched by the cavalry. It is necessary, moreover, to consider that to obtain the necessary return and to furnish four days' complete rations, a forced requisition would prove insufficient. It will be necessary to have the assistance of the local authorities. The surest means is, however, to inspire in these a salutary fear by suppressing with the utmost promptness all resistance. It was in this way that the Germans operated in 1870, and their orders for requisitions were executed with an exactness that we have never been able to obtain.

It remains for us to consider the extent of the zones the resources of which are to be utilized. This extent evidently depends upon the numbers to be provided for and the richness of the country. The coëfficient of the resources is not the same for all the supplies, and it will be possible, for instance, to find cattle in a much smaller circle than it will be to find oats. We will calculate what radius the zone of supply should have in order to furnish a day's forage of oats for an army composed of five corps, the total number of horses in which is about 50,000. The quantity of oats necessary being in that case 2500 quintals, the problem consists in finding the area of a zone of which the resources of oats will be the above named amount. At the time of harvest it would be possible to consider 90 q-m. as about the resources of a square kilometre (Table No. 2), and the area of the zone of supply would then be only from 28 to 30 square kilometres; a circle with a radius of 3 to 4 kilometres would be sufficient.

If we were at the most unfavorable time of the year, and if we take 7 q-m. as the resources per square kilometre, the area of the zone of supply would then be $\frac{2500}{7}$, or 357 square kilometres. The radius of a circle of this area is, in

round numbers, 10 kilometres;* which is that of the circumference of the first zone in Figure 16. The radii of the circumferences of the outer boundaries of the other zones would then be:

For the 2d zone, 14 kilometres;

For the 3d zone, 17 kilometres;

For the 4th zone, 20 kilometres.

The extreme distance to which the zone of supply would be extended would be, in the case we have considered, 20 kilometres. If, considering it would never be possible to collect all the resources of this zone of supply, it were desired to cover double the area which is theoretically sufficient, the radius of the zone of supply would be 28 kilometres; or, in round numbers, about 30 kilometres ($R = 20\sqrt{2} = 28$).

*The radius M G of this zone is obtained by the formula:

$$\pi\overline{MG}^2 = 357.$$

The radii of the other circles are obtained by considering that they bound surfaces respectively equal to 2, 3, and 4 times that of the inner circle; the following therefore results:

$\overline{ME}^2 = \pi\overline{MG}^2 \times 2$, or $ME = MG\sqrt{2} = 10\sqrt{2} = 14$.

$\overline{MG}^2 = \pi\overline{MG}^2 \times 3$, or $MG = MG\sqrt{3} = 10\sqrt{3} = 17$.

$\overline{MA}^2 = \pi\overline{MG}^2 \times 4$, or $MA = 2MG = 10 \times 2 = 20$.

In making the calculations as above, and considering a total of 1000 horses to each army corps and a coëfficient of 7 q-m. of oats to the square kilometre, we find:

	For 1 Corps.	For 2 Corps.	For 3 Corps.	For 4 Corps.	For 5 Corps.
Extreme radius of the zone of supply in kilometres.....	7	9	12	14	20
Radius when the zone of supply is made double the area in order to provide for the case when the yield is below the resources.	9	11	14	18	28

It would then be possible without extending the zone of supply over a circle of too great area, to provide in a single dépôt for the collection of rations required for four days; that is to say, to form the four trains which that dépôt should forward to the army. But in practice several centers of supply will be established for an army; one dépôt will then have to supply not more than two or three army corps. This limit is made necessary not so much to diminish the extent of the zone of supply as to facilitate the work by dividing it, and particularly for the purpose of decreasing the crowding in the centers of supply. We will also see in the following chapter that the establishment of several lines of communication has the effect of shortening the length of haul which the trains will have to make to reach the points of supply; under these circumstances the extreme radius of the zone of supply around the advance dépôts which provides for the first four consignments to be made by them would be on the average 12 kilometres if the dépôt is to supply two corps, and 20 kilometres if it is to supply three corps.

We have considered the case as if all the supplies can only be obtained by requisition. But it is evident that other advantageous circumstances will occur which will permit of simplifying the operation; there will always be found in the zone important places containing commercial stocks which will do away with the necessity of extending the requisitions as far as the foregoing theoretical discussion seems to require.

V. Comparison of the Different Methods of Utilizing the Local Resources.

In short, the exploitation of the country for the supply of the army can be made, according to circumstances, in the following manner:

1st. The exploitation can be made in the cantonments, and, in most cases, by the corps. There are then established, in order to facilitate the search for provisions, as many central stations as there are units; in other words, one for each supply officer. It is readily seen that in this way the search extends over the entire area of the zone of occupation, and that this method makes the greatest division of the work. The time available for the operation extends from the evening after the arrival in the cantonments until the hour the following morning which has been set for the departure of the regular trains.

2d. The exploitation, instead of being made by the corps in order to provide the resupply of the regimental trains, can be employed to provide the resupply of the administrative train. The exploitation is then extended to the next day, and the time available runs to the evening of that day, the administrative train being able to delay starting to assume its place in the column until a later hour. The exploitation is effected by means of the divisional administrative services; it is made in the same zone in which the exploitation by the corps themselves would have been made, but it is effected only around the three central stations: one for each of the administrative trains belonging to the divisions, and one for that belonging to headquarters. The diffusion is then necessarily less and the utilization of the resources of the zone not so well distributed.

3d. If the circumstances are such as not to permit of using the resources of the zone of occupation for the resupply of the regimental trains, nor for that of the administrative trains, it is possible to use them for the resupply of the section of the auxiliary train which has been obliged to go forward in order to resupply the administrative train. The operation, however, takes place in the zone in which

the army is cantoned, but it is extended to the second day; moreover, since the auxiliary train is not divided like the administrative train into separate sections for each division and the headquarters, the contact of this train with the administrative train is made at one point; the exploitation for the resupply of this train is made by the administrative services of the advanced dépôt, and is enforced throughout the zone from a single center of supply. The dispersion is then still less than in the preceding case.

4th. Finally, the exploitation, instead of being made in the different zones successively occupied by the army, can be made in rear at a point from which the rations necessary for three or four days are obtained and from where they are forwarded to the army by means of requisitioned trains. They reach the army after having been transferred from the requisition trains to the auxiliary trains, from the latter to the administrative trains, and then to the regimental trains, by which, finally, they are brought to the troops. As generally a line of communications serves for at least two army corps, it is evident that, in this fourth method, the exploitation is made for two or more corps from a single center of supply.

This summing up makes it possible to indicate the advantages and disadvantages of these different methods of effecting the exploitation of the country. In the order in which they are pointed out, each possesses over the one following the advantage of a greater dispersion, of a greater division of the work. We know also that each of these methods has the advantage over the one following of requiring the employment of a less number of successive trains.

The first, for instance, does not exact the employment of any trains; the second necessitates the introduction of

the administrative train; the third, the introduction of the administrative train and of the auxiliary train; finally, for the fourth method, it is necessary to add to the administrative and auxiliary trains the employment of requisitioned trains for the service of the line of communication. But, in following these methods in the same order, it is seen that the time available for the application of the first is less than for the second, and for the latter less than for the third. Moreover, if the division of the work is of advantage in facilitating the operation, it does not possess equal advantages when the husbanding of the resources is considered. This last consideration has led some authors to regard unfavorably the use of requisitions imposed by the corps themselves, and to advocate, except in special cases, only the use of general requisitions—that is to say, the last of the methods above enumerated. We have already mentioned the opinion of Clausewitz concerning the advisability of entrusting the exploitation to the troops. He says:* "This manner of proceeding causes the greatest waste; it is the exception that, when given the opportunity, the men do not take more than is moderately necessary for them, so that a large portion of the resources are thus lost without benefiting any one."

General Pierron says the same:† "Concerning requisitions, it is the fundamental interest of the army to make use of them as little as possible, for they are the most rapid means of wasting and destroying the resources of the country, for which resources the army moreover has the greatest need in the long run. . . . . To make requisition to exhaustion is to deprive one's self of the rations for the future."

*Clausewitz, "Théorie de la grande Guerre," page 353

†Général Pierron, "Stratégie et grande Tactique," Vol. I., p. 331.

In this question, as in everything in war, the choice to be made will depend upon circumstances and the end to be gained, before which all other questions should give way.

It is thus that "at the outset, when the troops or detachments are on the march and arrive for the first time in a place, it is almost unavoidable to have recourse to the systems of requisitions.* The subdivisions of troops which are immediately confronting the enemy, such as the advance guards and pickets, can in case of a forward movement only make use of this single method of assuring their subsistence."† When it will be necessary to move quickly and with rapid marches, "the time is most frequently limited, it is understood that it may often be necessary to have recourse to requisitions enforced directly by the troops, because they yield unquestionably the quickest returns."‡

VI. Maximum Length of Time during Which It Will be Possible to Subsist an Army from the Resources of the Same Region of Country.

That the country offers ample resources is the necessary condition in order to be able to apply the methods of exploitation of the country to provide for the subsistence. From the discussions we made in Chapter II., we can conclude that it will generally be so, when the army traverses the country by a rapid and continuous march; but it certainly would not be the same if the army were stationary and if its stay in the same section were prolonged. It is important to consider the time during which it is possible to subsist an army under such conditions without being obliged to have recourse to consignments from the rear.

*Général Pierron, "Stratégie et grande Tactique," page 331.

†Clausewitz, "Théorie de la grande Guerre," page 353.

‡Clausewitz, "Théorie de la grande Guerre," page 354.

The investigation will constitute a natural conclusion to the present chapter, devoted to the question of subsisting on the country, and also as an introduction to the following chapter, which will discuss the question of resupply by means of trains forwarded from the rear.

It is evident that the time during which an army will be able to live upon the resources of a country will depend upon the richness of the country; it will also depend upon the time of the year during which the operation is made; moreover, the time during which it will be possible to find the resources in the country will not be the same for all the supplies. Therefore the conclusions stated by the different authors are very contradictory. We are going to attempt to express an opinion from the facts by making use of the conclusions recorded in Chapter II. and by making use of the coëfficients obtained in Tables Nos. 1 and 2 of that chapter.

At the outset we will admit, as this results from an inspection of Figure 3 of Plate I., that under the conditions of average concentration the army can directly turn to account the resources of a zone having a front of about 40 kilometres and a depth of 50 kilometres. The area of this zone is then about 2000 square kilometres. It is an easy matter to calculate the resources of this zone by means of the coefficient for a square kilometre given in Table No. 2. Regarding the requirements, Table No. 1 gives them for an army corps; it is only necessary to multiply them by 5 to obtain the requirements for an entire army. The comparison of the two results will show the time during which the resources will provide for the wants.

For meat, for instance, the requirement for a corps being 100 head of cattle, 500 head will be required for the entire army. The coëfficient of the resources per square kilometre being 15, the resources of the zone occupied will

be $15 \times 2000 = 30{,}000$ head of cattle, which is 60 times the requirements. It seems then from this that it will be possible to find sufficient meat in the country to last 60 days.

The requirements of oats is 500 q-m. for an army corps, and 2500 q-m. for the entire army. The coëfficient from Table No. 2 for this supply is 93 q-m., which represents the resources only at the time of harvest; at that time the total resources in the zone occupied by the army would be $93 \times 2000 = 186{,}000$ quintals, about 74 times as much as required. The zone occupied by the army would be able to supply the oats required for 2 months in round numbers. If we now refer to the most unfavorable time and adopt the number 7 q-m. as the coëfficient per square kilometre, as we have already done, the resources of the zone will be more than 14,000 quintals and will only provide a sufficient amount for 5 or 6 days. Similar results would be obtained for the forage and the straw.

It is of importance to make a calculation concerning potatoes, a food supply more generally cultivated than beans, and which can be issued in lieu of rice and vegetables at the rate of 750 grammes. The requirement would be 1115 q-m. The coëfficient from Table No. 2 is 207 q-m. per square kilometre, and the resources at the time of harvest, in the zone occupied by the army, would consequently be 414,000 quintals, or more than 300 times the amount required. The consumption by the inhabitants and the animals quickly reduces the stock, but it is an important supply, which should not be overlooked.

The following lines, which we take from a letter of Napoleon's to M. Petiet, the *intendant général* of the Grande Armée, shows that it is important to recognize the necessity of thus utilizing all the resources: "We have marched without magazines; we were constrained to do so by circum-

stances; we have had an extremely favorable season for it after the harvest [October, 1805]; but, although we have been constantly victorious and we have found vegetables in the fields, we have, however, suffered very much. In a season when there were no potatoes in the fields, or if the army experienced some reverses, the lack of magazines would have cost us the greatest misfortunes."*

But bread being the most essential food, wheat is the most important supply to be investigated. For this supply we cannot make the calculations as we have just made for the other products of the soil, because the production all throughout France is less than the consumption, which is consequently provided in part by importation; consequently it cannot be said that towards the end of the year the resources can be considered as equal to one-twelfth of the production, and deduce from this, with sufficient accuracy for the present subject, the resources of the most unfavorable time of the year. But if this reasoning cannot be applied to the whole of France, it can be to the regions where the production is equal to the requirements for the consumption of the inhabitants. In the departments where the production is greater than the consumption, it is possible also, after deducting this surplus, to consider it as immediately exported (although in reality it will only be so in the course of the year), and calculating then, as we have done above, to take as the smallest stock one-twelfth of the figure thus obtained; this amounts to saying that the minimum stock is equal to one-twelfth the requirements for the population, which could at once be expressed in that way; that being so, the average population being taken as 70 inhabitants to the square kilometre, it is evident that the zone occupied by the army corresponds to a population of ($70 \times 2000 =$) 140,000

*Général Pierron, "Stratégie et grande Tactique," Vol. I, page 23.

CHAPTER IV.

I. General Methods of Supply.

We have studied in the foregoing chapters the means of assuring the supply of rations to an army at a fixed point, and thus to dispense with, or, at any rate, to retard or reduce as far as possible the employment of trains. Under similar conditions, we must now study the means necessary to assure the supply by the exclusive use of trains and of transportation from the rear.

One may under this hypothesis render certain the provisioning of an army by various means.

1st. The necessary supplies can be carried in trains immediately behind the army, thus constituting a species of movable dépôts, from which would be issued these supplies as needed.

2d. Dépôts of supplies can be established at the rear of the army, and the rations necessary for the subsistence of the army be obtained from these dépôts by wagons attached to the army.

3d. In place of sending teams from the army to seek the rations at these dépôts, one might, on the contrary, cause these supplies to be hauled from the dépôts to the army by means of trains formed as necessity required and which would not be attached to the army in a permanent manner.

4th. One might employ each one of the foregoing methods separately and each independent from the others, but, in fact, it is by a combination of these three methods that the continued supply is secured. There is attached to

the army regular trains carrying a specified number of days' rations; it is by drawing upon these trains that the daily issues are secured. Then these army trains, thus emptied, are sent to meet the special wagon-trains which are bringing to them supplies drawn from the dépôts that have been established at the rear.

II. 1st Method: Transports of Supplies in the Rear of the Column.

The first method would suffice to secure the rationing of the army if it were possible to haul with it all of the supplies which would be necessary during the entire period of the projected march. It can easily be seen that this procedure is impracticable, and that it would require the formation of enormous wagon-trains for a numerous body of troops, if the operation were to be a long one, and especially when its duration was unknown.

Transports of Supplies in Movable Columns in Countries Other than Europe.—One is nevertheless forced to adopt this means of supply for distant expeditions, out of Europe (in Africa, for instance), when one cannot find supplies along the route of march and the unsettled condition of the country, or any other cause, prevents the creation of a line of communications to connect the column with its base of operations. Although these notes are based particularly on European wars, it will not be without interest to say a few words upon the organization of a supply-train for an expedition of this kind.

When the expedition is an important one, the supply-train must be enormous; if it consisted of an army corps, and if one estimates at 150 only as the number of wagons required to carry 1 day's provisions, there would be required

1500 wagons for 10 days, 3000 for 20 days, and so on; furthermore, it is rare that in countries where such expeditions would occur that wagons can be found, and it is only by the means of pack-animals that the supply-trains can be organized. I will borrow from a recent publication the following example, which gives some idea of what supply-trains are under these conditions. During the Abyssinian campaign of 1867-68 the British, to keep supplied for a march of 16 days a column consisting of 13,000 men only, were compelled to organize a train of 16,000 mules.

One more example, which I have taken from an article by M. l'Intendant Coulombeix (I think) upon the organization of an expedition in Algeria. The column, composed of 3000 men and 1260 horses, was required to carry 30 days' supplies.

The train was to consist of

144 mules belonging to the train;
325 mules which were requisitioned;
3130 camels.

It is proper to remark that it is only by the use of camels that it is possible to organize a train for so great a number of days. If one were compelled to employ pack-mules only, the limit to which one could maintain the supplies would be much more restricted. In that case, in fact, the weight of the stores required for the food of the animals and their drivers constitutes a dead weight, which reduces by so much the quantity of supplies usefully carried by the trains for the provisioning of the column. Each pair of mules requires 1 driver, and one can estimate at 15 kilogs. at least the weight of the forage necessary each day for these 2 mules and the rations of the driver. The amount of dead or lost weight is equal, therefore, to the number of days' march multiplied by 15 kilogs.; thus, for instance, 15×17

On the other hand, after deducting the harness of the mules and the kit of the driver, one can consider 200 kilogs. as the weight that these 2 mules ought to carry; the actual weight of supplies for the rationing of the column is therefore reduced to

$$200 - 15 \times N,$$

and that weight would become zero when

$$15 \times N = 200,$$

from whence, in round numbers, N is equal to 14 or 15 days.

That is the extent to which a column could be subsisted by means of pack-mules. One can also see from this that if the command had to make the entire trip, going and returning, with no other means of subsistence during the trip, it could not separate itself from its base for more than 8 days' march.

It is only by the use of camels, for which one has to carry but little if any forage, that expeditions of greater duration may be organized. In Tunis one obtains similar results by the use of light vehicles, called *arabas*, drawn by but 1 horse, and which can carry from 200 to 250 kilogrammes. With these wagons the theoretical limit to which the supply of rations could be maintained, calculated as above, would be from 30 to 35 days.

Organization of Supply Trains in a European War.—In the armies of Europe there is a limit placed on the amount of rations carried by the train. The number of days' rations loaded in the wagons is determined, through probabilities and experiences acquired in preceding wars, upon the time during which the army may be exposed to the chances of receiving supplies in no other way. In France 10 days has been adopted as the number, and consequently the supply-trains organized and attached to the army carry 10 days' rations and short forage (oats). But it is proper to say that

some other number might have been adopted, either less or, on the other hand, greater; it is a matter of selection, the number 10 rations for transportation being in no way imposed by the other methods of supply which it will be necessary to consider.

This train of 10 days' supplies has not been formed in a compact and undivided mass, but, on the contrary, split up into échelons so that it can be distributed to the column according to the necessities; there have thus been formed three principal échelons:

1st. The regimental trains, carrying 2 days'; these trains, as their name indicates, are separately attached to bodies of troops, regiments, groups of batteries, and so forth, and constitute the special wagons pertaining to those organizations.

2d. Four days' rations are carried by the administrative trains; these trains are distributed in groups corresponding to each division of the army corps or to troops not included in any division; there is thus in the army corps an administrative train for each division and an administrative train for the headquarters; each train is furthermore divided into four sections, each representing one day's rations.

3d. The four other days' rations are carried in the auxiliary train, which is not split up like the general train into groups corresponding with the divisions and headquarters, but forms one group for the whole army corps; it is only divided into four sections, each having one day's rations.

We shall see shortly that these divisions result rationally from the rôle assigned to each of these trains in maintaining the supply of rations.

With regard to the names that have been adopted, except as concerns the regimental trains, they answer to

nothing based either upon fact or logic; but they are well established by long usage, and it would be going too far in the love for logic and symmetry to wish to change them.

III. 2d Method: The Continued Supply by Means of Trains Forming an Integral Part of the Columns and Permanently Attached Thereto.

The second method of maintaining the supply consists in sending for the rations to the dépôts, where they have been collected, by the special army trains. We will first look into this method by itself and then in combination with other means.

Periods during Which the Command is Stationary.—If the army is stationary at A, let M represent the dépôts of supplies, the transportation between the two points will be easy to organize. The supply-train leaving A goes for new supplies to M, and, returning to A, unloads there the goods with which it was loaded, then returns to the dépôt, and so on. If the trip from A to M and return could be made on the same day, one train only would suffice to keep up a supply. If this trip, going and coming, should require two days, there would be necessary, in order that the rationing of the army be continuous, two trains. Three will be requisite if the distance A M requires three days for the round trip, and so on. The distance at which one can keep up the supply depends, therefore, upon the number of trains that are available. By this expression we understand wagon-trains capable of carrying one day's supplies for the entire command. If one wished, therefore, to employ for the continued supply of this kind the ten trains (regimental trains, administrative and auxiliary) which are attached to an army corps, it would be possible, without forced marches, to secure a supply for five days' march of the army.

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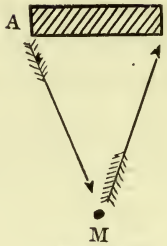

FIG.16

Let it be noted that this might be done in two ways: to send each one of the trains, after unloading at A, either a section of the regimental, administrative, or auxiliary trains back to M to be reloaded, requiring it to make the entire trip from A to M and from M to A, so that each should resume, at the expiration of ten days, contact with the army; or to make use of the different échelons of the trains in organizing relays, and thus to secure the transportation of supplies from M to A by transferring them from one train to the other; the work of regimental trains would be limited to the distance A H, one day's march, the work of the administrative trains to the distance H J, of two days' march, and that of the auxiliary trains to the distance J M, also of two days' march. It is evident that this second arrangement (preferable because of its greater uniformity and that the normal position of the trains is not changed) requires the same number of trains as the first in order to obtain a continued supply of rations at A.

Although the continued supply can thus be maintained theoretically at a distance of five marches, in practice this limit is lowered to four only; the round trips are organized in a slightly different way: the regimental trains go back and forth between the army and the station of the administrative trains to half a march in rear; the administrative

trains between the points H and I situated one and one-half days' march in rear of the place where the auxiliary trains are stationed; and these latter go back and forth between the point I and the dépôt two marches further in rear.

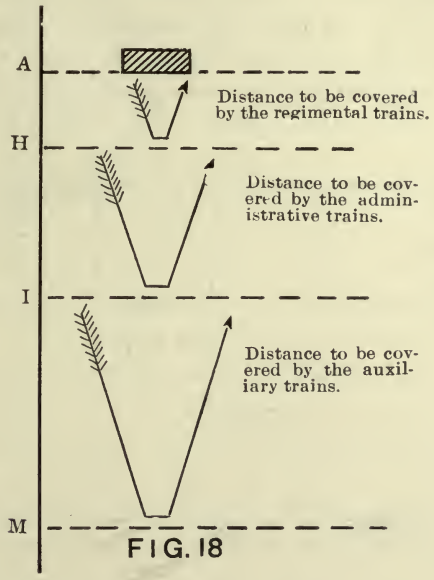

FIG. 18

Length of the Marches; General Theory of the Maintenance of Supply by Trains.—When the army, instead of being stationary at A, changes its position, its distance from the dépôt of supplies would augment each day, and it would soon exceed the limit to which the supply would be possible. It is necessary, therefore, that this dépôt (or, to be more explicit, that the furthest point at which the teams pertaining to the army could come for supplies) should change with the army. If the trains could not, each day, cover a greater distance than the column, they could evidently not be left in rear, nor, from the same course of reasoning, could they

be sent at a greater distance for supplies, because they would no longer be able to rejoin the column. But, happily, the distance marched by the trains can be made greater than that covered by the troops. If it is conceded that it will be thus possible for a wagon-train to cover one and one-half days' march each day, the train can make three marches in two days. Under these conditions, if a train makes a first delivery of supplies to the column at A the first day (see figure below, No. 19, in which A B C D are the successive

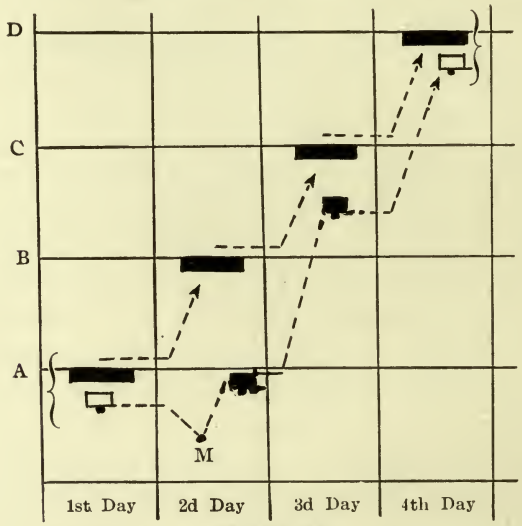

FIG. 19

positions occupied by the column), one can check during all of the second day the forward movement of the train, and this train, starting the third day, will still be able to rejoin the column at D to make a second issue for the fourth day. The second day, during which the movement of the train has been interrupted, can be used either to resupply from the country in the manner described in Chapter III., or to

take the train back to a dépôt as at M, where it can be reloaded. This point M will not in general be an actual dépôt of supplies, but simply the point at which specially organized trains fetching up supplies from the rear may arrive. Wherever the point M may be, one can see that it cannot be more than half a day's march from A in order that the train can return the end of the second day to A and start out again the third, as it is necessary that it should reach D on the fourth day.

Each train resuming contact with the column every three days, it follows from the foregoing analysis that one might establish the continuity of supply under those conditions by employing but three trains; and, in that case, the reloading of the train which has made distribution, at some point as A, would take place at only half a day's march, or two-thirds of a day's march at the farthest, in rear of that point.

One might, in place of one day only, defer for two days the starting of the train whose load has just been discharged at A; and thus have this train not return until the fourth day; by forcing the marches and completing one and one-half days' journey each day, this train could cover six days' march in four days—for instance, the fourth, fifth, sixth, and seventh; and would consequently reach, the seventh day, the column, which would itself have at that time made six marches beyond A. The halt of two days in advance of this train would permit its being sent to the rear, for a new load, one or one and one-half marches from A. The service, in order to be continuously established, would require six trains.

With nine trains it would be possible to establish the point for the resupply of the train at two days' march in rear, and so on.

This demonstration shows that in order to carry farther to the rear by half or two-thirds of a march the point where the train emptied at A will go to reload, it will be necessary to have three additional trains; that is too much in order to gain so very small an advantage. Furthermore, in actual practice it would not be possible to distribute thus the trains pertaining to the army over so great a depth; therefore, the limit of half a march to the rear is set as that which can be made by the train, as it is represented in the diagram given below, and the zone within which the trains pertaining particularly to the army operate is thus limited to two or at most two and one-half days' march.

One can well see therein the movements of the auxiliary trains which are indicated in the Regulations of November 20, 1889, to insure the continuous supply of rations, and the notes which precede have had no other object than to demonstrate that these methods are the necessary and logical consequences of the conditions required by the problem.

The conclusions which we have reached, that the constant relation of a column with its dépôt of supplies (or, to be more exact, the point of delivery of the trains from the rear) may be established with three trains only, seems a contradiction of the Regulations, which, to accomplish the same object, put in operation eight trains; for instance, two sections of the regimental trains, two sections of the administrative trains, and four sections of the auxiliary trains.

Following our course of reasoning, explained visually by the diagram which follows, it would appear, on the contrary, that the supply can be kept up with three trains; three sections only of the auxiliary trains, for instance.

But to carry into effect this arrangement without calling in either the administrative trains or the regimental trains, it would be necessary that this supply-train should

itself deliver the rations within the cantonments of each regiment. This journey, or, at any rate, this prolongation of the march to the cantonments, coming on top of the day's march, would exceed the powers of a single train. One is therefore compelled to aid in some way the maintenance

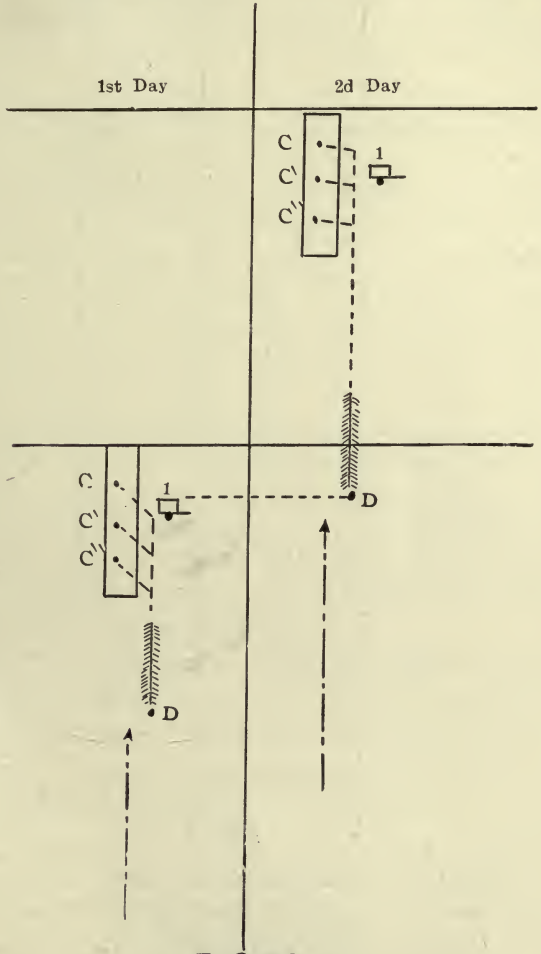

FIG. 20

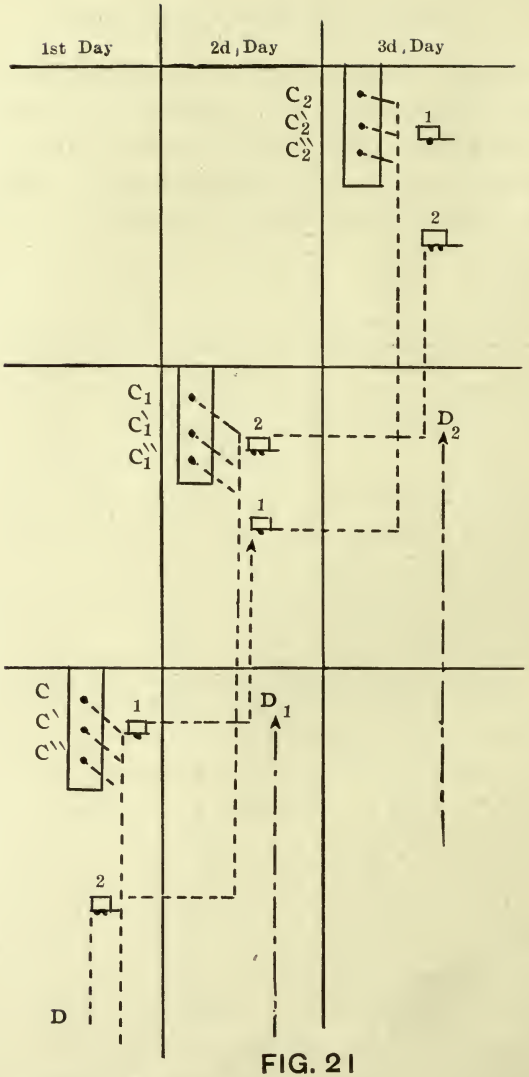

FIG. 21

Cantonments of the column.

A section of the administrative train.

Second section of that train.

March of the administrative train.

March of the auxiliary train.

of supplies by the use of the administrative and regimental trains. The administrative train, formed in three sections corresponding to the grand divisions of the army corps, prolongs the supply-train up to the zones of the cantonments of each of these grand units. The distribution of supplies is further accomplished by the regimental trains, which diverge from the centers to the cantonments of each regiment.

It would then be possible under these principles to effect the daily distribution of supplies in the following manner: Rations coming up from the rear would, each day, be carried by a section of the auxiliary train (constituting, to be accurate, a veritable supply-train) up to some central point, when they would be received by the administrative train. The three groups of that train would proceed respectively to the three centers of distribution at C, C′, and C″ assigned to each of the grand divisions of the army corps; finally, the supplies would be carried from the points C, C′, and C″ to the cantonments by the regimental trains. The next day one could begin anew with the supplies brought up by another section of the auxiliary train, and, if necessary, the same section of the regimental and of the administrative train would suffice, as can be seen, without further explanation, by an examination of Figure 20.

But, if one operated in this manner, the resupply each day would depend upon the arrival of the supply-train, and in case of any delay in its march the daily issue would be jeopardized. In order to allow some play, the two sections of the regimental trains and the two sections of the administrative train must intervene; each section, instead of distributing its supplies on the same day that they were received from the next train in rear, would not distribute them until the morrow. Each section having thus been

loaded on the day preceding that on which it is to make a distribution, the uncertainty which a delay in the arrival of the main supply-train is guarded against. We are thus led, by the force of circumstances, and of necessity even, to follow the arrangements prescribed by the Regulations for the maintenance of supplies and the functions of the various trains. Figure 21, which does not differ from Plate I. of the Regulations of November 20, 1889, represents how this is worked. In comparing it with the preceding figure, it will likewise be noted that there is no material difference between them, except that in the second an interval of twenty-four hours has been made between the operation of receiving a load by each section in rear and the issue of this load to the section in front or to the troops.

An examination of the two figures will demonstrate it sufficiently without the necessity of further explanations.

Critical Examination of the Theoretical Arrangement; Practical Conclusions.—This tedious analysis would be useless were it not that we draw from it some practical conclusions and some useful information which it will be our duty to disclose.

1st. The foregoing discussion has shown us that it is the auxiliary trains which are, properly speaking, the true supply-trains, maintaining a constant communication between the army and the trains pushed up from the rear to meet the army. In an emergency three sections of that train would suffice to secure this connection, but since in everything we must provide a reserve, the number of four sections is logically justified.

The administrative and regimental trains are only extensions in like manner of the preceding, which theoretically could not be brought into play, but are nevertheless useful and even necessary to effect the distribution of the rations

within the cantonments. Two sections of each are necessary to avoid accidents, to prepare against unforeseen delays, and furthermore to give some relief to the teams.

This determination of the true rôle for each train is of importance, because it indicates those features in the rôle of these trains which are necessary and those that are merely a matter of regulation and order. It shows to us how, in the event of the loss or capture of a certain number of trains, it would nevertheless be possible to keep up the service with a lesser number of units than that of the normal arrangement.

This contingent character, that the foregoing theory assigns to the rôle of regimental and administrative trains, is particularly marked as regards the latter. If it is not possible to cause the auxiliary trains to come up to the cantonments, and if it is necessary to continue the transportation in order to complete the distribution of the supplies to the troops, it is not absolutely necessary to employ at the same time the administrative trains and the regimental trains, and these latter would, in an emergency, suffice. One could easily, if compelled, establish a direct contact between the auxiliary and the regimental trains, and that without making any essential changes in the arrangement. This results from all that we have said, and is clearly apparent to the eye by inspecting Plate I. of the Regulations of November 20, 1889, and also Plate II. hereto annexed, where the same arrangement is graphically represented. It is possible on these two plates to entirely omit the administrative train, without changing anything else. Figure No. 22, which reproduces from Plate I. of the Regulations of November 20, 1889, the movements for the third and fourth days, shows this clearly. If one bars out all which relates to the administrative train, one sees that on

the third day, for instance, it would suffice to assure the movement that the first section of the regimental train should receive its load from the first section of the auxiliary train, which is possible, since they can meet at A; the following day it would again suffice to reload the second section from the auxiliary train at B, where these two sections would be on the same day. It will consequently be sufficient for that purpose to regulate the hour of arrival of the auxiliary train, and so on.

By acting in this manner, the four sections of the administrative train would be given the character of a movable dépôt, which in the normal arrangement is that of the two reserve sections only.

This modification of the normal order can be accomplished without any modification in the organization, at the wish of the commander, and by a simple arrangement of the order. It seemed to me useful to point out the possibility of this arrangement, although during the remainder of these notes we shall adhere to the arrangement of the Regulations.

This modified arrangement may, however, be made necessary by circumstances, and we find one instance in the grand maneuvers, during which reasons of economy do not permit the organizing of administrative trains; it is in reality the arrangement provided for in Article 51 of the Regulations of April 12, 1892, relative to the execution of the autumn maneuvers. In accordance with the requirements of these regulations, the sections of the regimental trains receive their supplies from the advance dépôts, either directly, when the distance permits it, or through the intervention of supply-trains taking the place of the auxiliary trains and filling their rôles.

2d. It is of interest to examine whether the organization of the various trains corresponds well to the rôles the

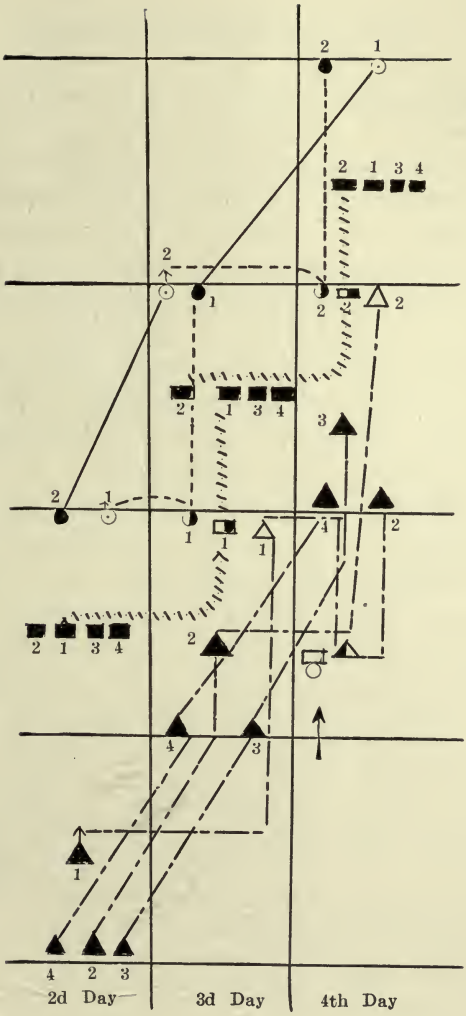

FIG. 22

Sections regimental train, empty, loaded, and when reloaded.

Sections administrative train, empty, loaded, and when reloaded.

Sections auxiliary train, empty, loaded, and when reloaded.

Requisition train.

foregoing arrangement assigns to them in the maintenance of supplies.

The auxiliary train, which has so important a rôle and which constitutes the real supply-train, is, however, not so well organized as the others, since it is formed in large part by wagons obtained by requisitions united as necessity requires. But it would be well to observe that this train will generally be required to move only on the main line of march, which without doubt will be a wide and good road; this train never is dispersed throughout the various bodies of the troops. For these reasons, it is not essential that it should be so well equipped as the others.

The administrative trains have to proceed from the point designated for meeting the auxiliary trains up to the centers of distribution designated for the units to which they belong. These centers are within the limits of the cantonments of these units; these trains spreading out among the troops need a better organization and should be under military control. The dividing of this train into divisional, or headquarter, groups corresponds well to its destination. It is to be presumed, furthermore, that it will always be practicable for these trains to operate, if not on some highway, at any rate on some adjoining roads, and that there will always be a good road to connect the general line of march with the zones of the cantonments.

But the regimental trains which must reach the very cantonments of the different regiments will undoubtedly often be compelled to proceed over difficult cross roads. It may be asked if the heavy two-wheeled wagon used for the transportation of supplies by the regimental trains answers well under the desired conditions. Would it not be preferable to replace it by a light wagon able to go everywhere? The regimental baggage-wagon being of the same model as

that of the administrative train, the renewal of supplies can be effected by an exchange of wagons. It is doubtless an advantage, but one which perhaps does not compensate for the disadvantage of not being able to follow the regiment over every road.

Application to the Principal Column Formations.

Column, Consisting of an Army Corps, Cantoned in a Space Whose Depth is Equal to Half the Length of the Marching Column.—Plate I., annexed to the Regulations of November 20, 1889, gives a very clear representation of the required arrangement for the maintenance of supplies, of the distribution of the trains and their relations to one another, but it does not permit, as would a graphical representation, of taking note of the conditions of time in which the movements are executed, or the arrangements to be made to establish contact between the échelons without checks or delays at crossings; and finally, as no note has been taken of the depth of the cantonments, certain details which result from the extent of the same will not be apparent. To fill up this gap we have represented the same arrangement of the Regulations in a graphic form in Plate II., hereto annexed, the study of which will throw light upon certain arrangements of practical utility.

Graphical representation No. 1 is applicable to an army corps marching upon a single road, in the formation which is the diagram of marching order No. 1 from the staff *aide-mémoire*. Conforming to the positions indicated in Chapter I., we assume that the advance guard camps 8 kilometres in advance of the main body, and that the cantonments of the latter are écheloned upon a depth of 10 kilometres (*vide* page 24) in the order in which it marched. We will assume also that the length of the first day's march is 32 kilometres,

which, from the principles recalled in that same chapter (page 27) is the maximum day's march which can normally be made under such conditions. For the following marches we have assumed a shorter distance, in order to be able to vary the conditions for applying the arrangement.

We will further assume that the movement begins at 5 a. m., and that the regimental trains will be able to reach the cantonments at about 4 p. m. for the head of the column and about 6 p. m. for the rear, the others at hours intermediate between these given; following the general rule, we suppose that the issue is made each evening by drawing upon one of the sections of the regimental train, and that this section must at once return to the designated center of supply, where it must receive a new load from the section of the administrative train. Depending upon the season and upon circumstances, the reloading of the regimental train may be accomplished on the same evening, or else it will have to be delayed until the following morning. In order to resupply the regimental train from the designated section of the administrative train and to cause this train to arrive at the center of distribution, one can proceed in several ways; each offers its advantages and its inconveniences. These various ways, choice between which must be made according to circumstances, are as follows:

1st. The section of the administrative train designated for the renewal of supply can be started so that it will reach the center of distribution on the same evening; its load is there transferred to the regimental trains, either at once or the following morning. It is this method which, in the drawing No. 1, is represented for the supply on the second day. The supply section is started so that it can reach, as soon as possible, the rear of the column; as soon, be it understood, as the military considerations will permit. It

can be seen from the drawing that in starting this section (which is supposed to be camped 12 kilometres in rear) at 9 o'clock, it will follow immediately in rear of the column, and that thus it would arrive in the evening about 8 o'clock. In order that it should reach that same evening the centers of distribution, the section of the administrative train should make a march which is equal, in the case of the train belonging to the leading division, to the sum of the three following factors:

The day's march,

The depth of the cantonments,

The distance which the train was from the rear of the cantonments.

Under the conditions assumed in the drawing, the day's march being 30 kilometres, the depth 10 kilometres, and the distance of the train 12 kilometres, the march to be required of the train would be 52 kilometres; this is a considerable effort, particularly if it is to be repeated every two days, which the continuity of the movement would exact. Without doubt, the day following this great effort that section of the train has only to make a very short march, and, on the whole, the total effect is equal to one moderate march per day; but, from the question of economy of forces, it is not the same thing to cover a certain distance by regular marches or to make it by alternating excessively long ones with very short marches.

2d. To avoid this inconvenience, it can be arranged that the supply-train is to arrive at the centers of distribution only the following morning for this purpose; it is halted the evening before at the proper distance, having made on that day a march only equal to that made by the column itself. The following morning this section reaches the center of distribution and replenishes the regimental train;

the evening of the second day it proceeds to its new cantonment, and has again made, on this day, but in two stages, a day's march. It is in this manner that it is represented on the drawing, for the third and fourth days, the march of section No. 2 of the administrative train charged with the duty of replenishing, on the morning of the fourth day, the section of the regimental train emptied by the issue of the third day. By this method, in order that the movement of the train should not interfere with the formation of the column, it is necessary that the train should reach the centers of distribution very early in the morning; in fact, as soon as the column begins to form, the roads are no longer free within the limits of the cantonments, and the trains could no longer ply over them. The drawing shows that, in order to satisfy these conditions, it will be necessary to have the administrative train start about 1 or 2 a. m.

3d. The necessity for causing the train to start so early would be avoided by not having it penetrate within the zone of cantonments until after the departure of the troops, as we have represented it on the fifth day for section No. 1, detailed to resupply the section of the regimental train which has been emptied by the issues on the fourth day. By this method the section of the regimental train, with its new load, can start only after the arrival of the administrative train. This section of the regimental train can therefore no longer take its normal place in the column: it will have to be formed into a distinct group, which will not reach its destination until later in the evening. This offers but few objections; the issue of the evening of the fifth day is, in point of fact, assured by the other section of the regimental train, which can start at the usual hour and can as usual arrive for that issue.

4th. The difficulties indicated for carrying out the

three preceding methods of establishing contact between the trains relate to the necessity of causing the administrative train to penetrate within the zone of cantonments; they would be avoided, therefore, if a point outside of that zone could be chosen for the contact of the regimental train with the administrative train. If the cantonments, instead of being arranged in column, were formed in line, this condition would be attained by fixing the point of contact in rear of the cantonment. One could then, without being annoyed by the movement of the troops, proceed with the work of resupply, having the entire morning available for this duty, up to the hour when the regimental train should take its place in the column. But if this method was adopted when the cantonment was made in column, the regimental trains of the leading subdivisions would be compelled, in order to reach the point of contact, selected at the rear of the zone of cantonments, to travel the entire length of this zone. This operation for these trains would make an additional march of twice the length of the column, added to the day's march of from 20 to 24 kilometres; this is too great an effort, and one which renders hardly practicable this method of operation in the case of a cantonment in column.

But in such cases one will be able, if the ground will permit, to obtain the same result by choosing the point of contact between the regimental and administrative trains upon one of the flanks outside of the cantonments. It will be necessary, to operate in this manner, to have a lateral road, not used by the columns, and over which the administrative trains can reach the points of contact so chosen.

Such are the principal means to be employed in order to maintain the supply of the regimental train by the administrative train.

Adopting the method that we have already employed

in Chapter I. and in Plate I., of giving an example along with the geometrical types in order to show how these should be modified according to circumstances, we are going to apply these various methods to a stated situation. We will take that one to which the cantonments represented in Fig. 1½ of Plate No. I. relate.

The hypothesis is as follows:

May 31st the army corps is on the left bank of the Meuse; it is broken to the rear, to the right, and to the left. June 1st it crosses the Meuse, forms in one column, and follows the road Pont-sur-Meuse—Gironville—Broussey—Beaumont—Manonville. The evening of the 1st it occupies the cantonments indicated in the above figure. June 2d it continues its march in the same formation on the road Manonville—Dieulouard.

June 1st, after reaching cantonments, the issue of supplies is secured by drawing upon the regimental trains. The sections of the regimental trains emptied by this issue will be reloaded from the administrative trains at the centers of distribution, which will be as follows:

For the 1st Division, Bernécourt;
For the Headquarters, Ansauville;
For the 2d Division, Mandres.

The operation of renewing the supplies of the regimental trains at these points can, as we have just shown, be done in several ways:

1st. It can be accomplished during the night of June 1st; in that case the regimental wagons that are to be reloaded proceed, immediately after the issue, to the points above specified, receive from the administrative train the necessary supplies, and without delay rejoin their respective cantonments. The section of the administrative train designated for the delivery of supplies marches with the

main train as far as Lérouville, where the latter is to go into camp, while the former continues its march, and each group directs itself upon the center of issue which has been assigned for its corresponding unit. It will be seen that this section will have to make, in addition to the normal march of the main train, the distance from Lérouville to Bernécourt—Ansauville—Mandres—that is, a supplementary march of at least 20 kilometres; if the march has been long, it is to be feared that it will not reach its destination until very late.

2d. The renewal of the supplies can be made only during the morning of the 2d of June. The entire train in this case would camp at Lérouville the 1st, and the section designated for making the issues would not start until very early on the 2d in order to reach the centers of distribution. If it is desired to complete the reloading of the regimental train before the hour at which it should, normally, take its place in the column, it is necessary that the administrative train should arrive at least two hours in advance, so that there will be time to transfer the loads. It would then be necessary for the administrative train to have completed its transfer by 8 o'clock a. m., at the latest, but this would in fact compel it to pull out towards midnight in order to have it arrive at 5 a. m. at the latest. The hours indicated on Fig. $1\frac{1}{2}$ opposite each cantonment are the hours at which the troops occupying them are to pull out. The examination of these numbers will readily show that from 5 a. m. the roads are no longer open, and if the train had not already reached its destination, it would no longer be able to arrive at the centers of distribution until after the rear of the column had passed beyond the highways from Beaumont and from Bernécourt, which would not be until about 10 a. m.

3d. If it is not desired to cause the section of supply to start so early, it could set out only at 4 a. m.; it would arrive at Broussey when the troops which occupied that cantonment had already left, and it could follow in rear of the column. It could thus reach the centers of distribution towards 10 a. m. The sections of the regimental trains, having reloaded, could set out between 11:30 a. m. and 12 m. to rejoin their corps.

4th. There is no lateral road available permitting the arrival of the administrative train at the center of distribution except by following the road upon which the army corps is moving; and therefore, unless the corps has passed, the fourth method indicated above cannot be employed in this case.

Let it be noted that in the formation of the halts in the order of march represented in Figure 1½ of Plate I., the ammunition sections and other elements of the combat train remain grouped at the rear, and thus find themselves separated by from 8 to 10 kilometres from the centers of distribution assigned to the divisions or headquarters to which they belong. In the method indicated above as No. 1, for effecting the resupply, the regimental trains of these sections would have to make 15 to 20 kilometres in order to reach the place of issue of their divisions and return. In order to avoid this inconvenience, it will suffice if they are reloaded from the administrative train, as this train must pass through their cantonments. If the issues are to be made in accordance with method No. 2 or 3, this inconvenience does not exist, since the regimental trains do not have to return to their cantonments and the distance traveled in order to reach the centers of distribution is in the direction of the march.

The drawing of Plate II. and the notes which precede

it are applicable to the ordinary formation of an army corps in one column, with cantonments having a depth of from 10 to 12 kilometres. The operations will not differ essentially if the formation is different, but they may become more or less difficult.

If, instead of forming but one column, the army corps had two roads at its disposal, it is evident that, each division being able to form a separate column and be followed by its own train, the difficulties of having these two trains come up would be lessened.

Application in the Case of Two Army Corps Operating on the Same Road.—The reverse would happen if, on the other hand, there were two army corps on the same road. In that case the more usual formation is that described in Chapter I., and which the following figure represents. If the trains of the two corps were left at the rear of the column, when the column makes the march A B, the distance necessary for the section of the administrative train that has been designated for the supply of the regimental trains to make, would be, for the leading division, equal to the following:

	Kilometres.
The day's march, on an average	24
The depth of the cantonments of the 1st corps	10
The interval (*i*) between the two corps	12
The depth of the cantonments of the 2d corps	12
The distance (*d*) of the train in rear of the column	12
Total	70

It would be impossible to have the trains of the leading subdivisions reach the centers of distribution during the night. Would it be possible to reduce the march to be made by the supply-train of the 1st corps by decreasing the dis-

tance *i* and *d*? The distance* *i* is intended to facilitate the formation of the column and to decrease the time lost in marching out; this interval is calculated in such a way that, the 2d corps setting out at about the same hour as the first, its leading point will reach the point *c*, the rear of the cantonments of the 1st corps, when the left of that corps will be setting out, and that thus, without delay or loss of time, the column is formed. This distance *i* cannot therefore be reduced arbitrarily. The distance *d* can, on the other hand, be reduced, but it is to be noted that if it is diminished by the marching length of the train, the hour of its arrival at destination will not for this reason be advanced, because it will not in any event be able to pass the point F before the last of the two army corps shall have left the point. From this point of view there is therefore no inconvenience in holding the train to the rear a distance (F G) equal to the distance that the train can cover during the time that the rear corps is marching out. This distance is about 10 or 12 kilometres.

If under these conditions an attempt is made to effect the movement, as we have done in drawing No. 2 of Plate II., it will be seen how very difficult it is. The supply-train of the 1st corps starting between 8 and 9 a. m., which would enable it to follow as close as possible to the rear of the column, could not arrive before about 2 o'clock in the night at the earliest. But it would not be wise to require it to make so long a trip without a rest; it can be seen, and an

*"If the movement is continued the next day in the same formation as that of the evening, the head of the 2d corps, after marching three hours, will follow immediately after the rear of the column formed by the corps in the first line. If it was foreseen, however, that the corps in the first line will march in double column, the corps in the second line is closed up upon the cantonments of the first to avoid causing an interval in the columns."—*Maillard*, "*Eléments de Guerre*," *page 152*.

examination of the drawing (Fig. 2) brings it out clearly, that if it is required that the train shall have reached its destination before 2 o'clock in the morning, this rest could not be more than two hours, which, undoubtedly, is insufficient. In the drawing No. 2, Plate II., the movement, the first day, has been represented by supposing the principal halt of this train to be made at 4 p. m., because thus it would divide the route into two approximately equal portions. This arrangement is not essential; the halt for rest could be made later, when, for instance, the train has passed the cantonments of the 2d corps, and consequently in the interval between the cantonments of the two corps; this is what has been established for the second day; in one way or another, the arrival of the train has thus been secured, but the inconvenience of compelling it to make a march of 60 or 70 kilometres with a halt of two hours at most has not been avoided. Furthermore, this arrangement is impracticable, and we have developed it only in order to show its inconveniences. The true solution of the problem is the arrangement represented by the drawing No. 3, Plate II.; it is, approximately, the arrangement indicated by General Schnéegans.* It consists in having each army corps followed by the two sections of the administrative trains that have not been reserved, and to effect the supplying of each army corps as if it were a separate corps. There is no difficulty for the

*"When two army corps follow on the same road, the supplies for the leading one are partially secured by means of requisitions. Should it be otherwise, the maintenance of supply will present serious difficulties, unless the road be wide and good, because in this case the two columns may occupy less depth than the normal one. In any case, the 1st corps will retain only such portion of the regimental train as is indispensable, the balance will follow the 2d corps; this latter will calculate its time of departure in such a manner as not to be halted by the rear of the 1st corps; the supply section for the 1st corps will pass the 2d corps during the night, and will halt between the cantonments of the two corps: it is therefore necessary that it should make a forced march."—*Schnéegans*, "*La Guerre raisonnée*," *page 234*.

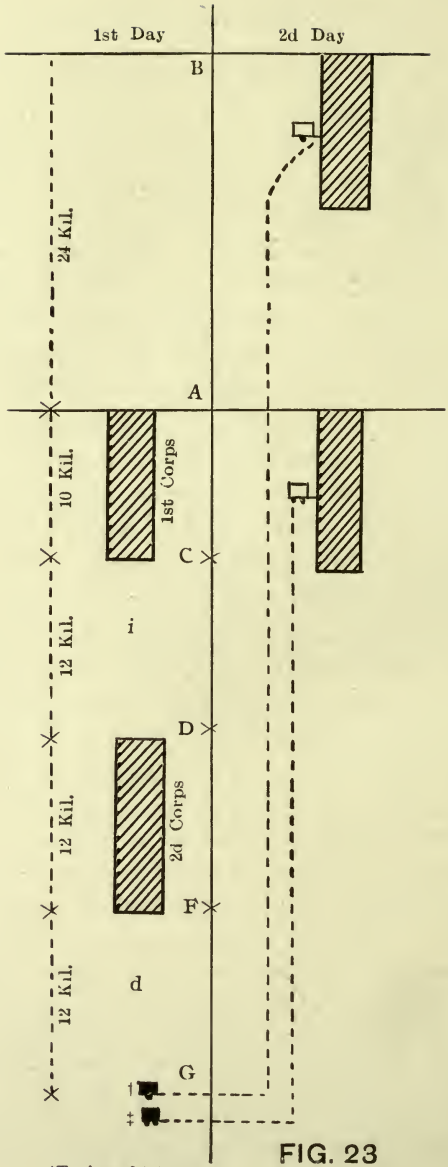

FIG. 23

†Trains of 1st corps.
‡Trains of 2d corps.

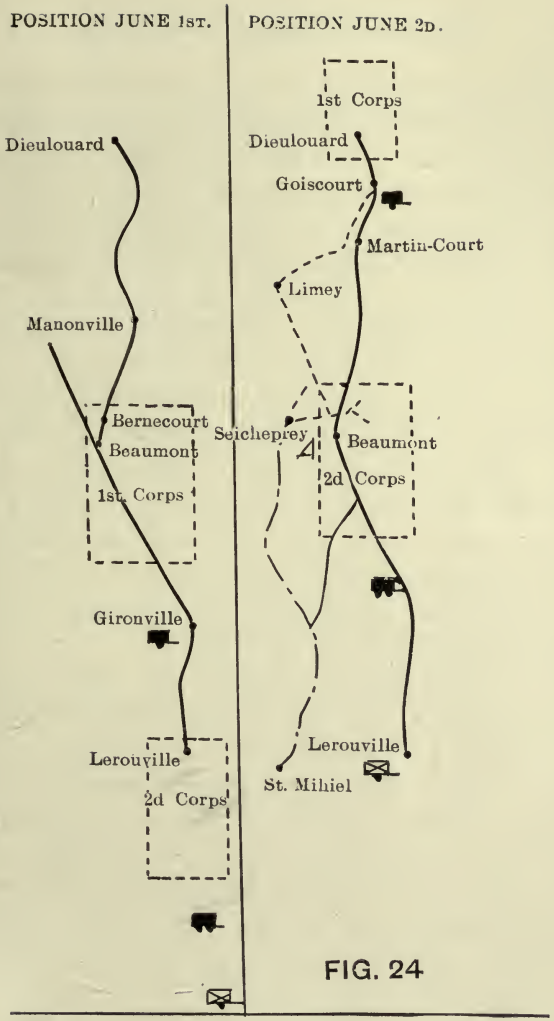

FIG. 24

Supply sections administrative train, 1st corps.

Supply sections administrative train, 2d train.

Reserve sections administrative trains of both corps, and main body of the other trains.

March, June 2d, of administrative train (supply section of 1st corps).

March of the section of the auxiliary train to resupply the preceding.

2d corps; as regards the 1st corps the trains should go into camp in the interval which separates the cantonments of the two corps. The trains of the 1st corps set out as soon as the road has been cleared by the 2d corps—that is to say, when the rear of the 2d corps has passed the cantonments of these trains; these then follow as closely as possible on the rear of the 2d corps; they pass during the night the new cantonments of the 2d corps. The reserve section halts and camps in the interval between the two corps; the section carrying the day's supplies continues to the centers of issue, which, under ordinary conditions, it is able to reach about 2 a. m. In point of fact, the issue of supplies in the 1st corps is made as if this corps were not followed by another; except that, as the trains cannot start until after the passage of the 2d corps, they cannot reach the issue centers until well into the night, and the reloading of the regimental trains will necessarily take place in the morning.

We will now give an illustration of this arrangement. For this purpose we will again take the same hypothesis as above, but we will assume that the 1st corps, which occupies, on June 1st, the cantonments represented in Fig. 1½, Plate I., instead of being isolated, is followed on the same road by a second army corps, camped June 1st at Lérouville. June 2d the two corps will be assumed to set out in a single column; the 1st corps will go into cantonments at Dieulouard, and the 2d corps will take the same cantonments which the 1st corps occupied the day previous. We will only consider the supplying of the 1st corps, the question presenting no difficulties in all that concerns the 2d corps. It can readily be seen that if the administrative trains of both corps remained together on the left, the one pertaining to the 1st could not be brought up within the zone of cantonments of that corps in time to effect a dis-

tribution of supplies; it will therefore be necessary to operate in the following manner: On the night of June 1st the two sections of the administrative train of the 1st corps which are not reserved camp at Gironville; the section designated for the supply sets out very early on the morning of the 2d, reaches the centers of distribution established at Bernécourt, Mandres, and Ansauville, and there resupplies the regimental trains; it is formed then, and halts to permit the 2d corps to pass. The section which has remained at Gironville leaves there as soon as the rear of the 2d corps has passed beyond that point; the other section also starts as soon as the road in front of it is free, and these two sections go into camp the night of June 2d at Griscourt between the two army corps.

Application in the Case of a Column Consisting of One Army Corps in Cantonment Equal in Depth to the Length of the Column. —Analogous difficulties would be experienced in keeping up the supply in the case of an army corps whose cantonments occupy a depth equal to that of the marching column, say 20 to 24 kilometres. When the cantonment is in this formation, it is for the purpose of giving to the day's march its greatest extent, say 40 kilometres; the section designated for the supply, in order to reach the head of the cantonments, would have to make a march of (40 + 24 =) 64 kilometres at least, admitting that the train follows immediately behind the column without intervals. We have observed that this difficulty must sometimes compel us to reduce the depth of the cantonments, but more often the difficulty will solve itself, since this extent of the cantonments will permit the supplies being secured without having recourse to the trains, and this would be the most advantageous solution.

From the point of view which we are now considering,

it is of very small importance whether the columns are formed of troops from one, two, or more army corps, as in the marching formation indicated by Figure 5 in Chapter I.; it is the total strength of the column which is important, and not the origin of the troops which compose it. The principal cases to which we have just applied the arrangement for resupply—the following: columns of divisions, columns of army corps cantoning on one-half the length of the column or on the whole length, columns of two army corps—include then all the hypotheses which it is worth while to consider.

In order to exhaust the subject, it is only necessary to say a few words concerning the movements of the auxiliary train, and we will do so in the following remarks.

Movements of the Auxiliary Train in the Different Types of Formation of Columns.—The general movements of the auxiliary train are not always made over the same roads as those of the columns, the regimental and administrative trains.

The auxiliary trains in reality move upon the lines of communication, which are not identical with the lines of advance of the army corps, since a line of communication generally supplies several corps. The march of the auxiliary trains then necessarily requires transverse movements in order to pass from the line of communication to the points where the contact with the administrative trains should be made. These movements can be represented in the following manner: let l and l' be the lines of advance of corps A and B, and L the line of communication; the auxiliary trains being formed by corps and not subdivided as the administrative trains are for division or headquarters, it is necessary to have, for the contact with the auxiliary train with the three administrative trains of the same corps, a single point; we will designate it by C for corps A, by C'

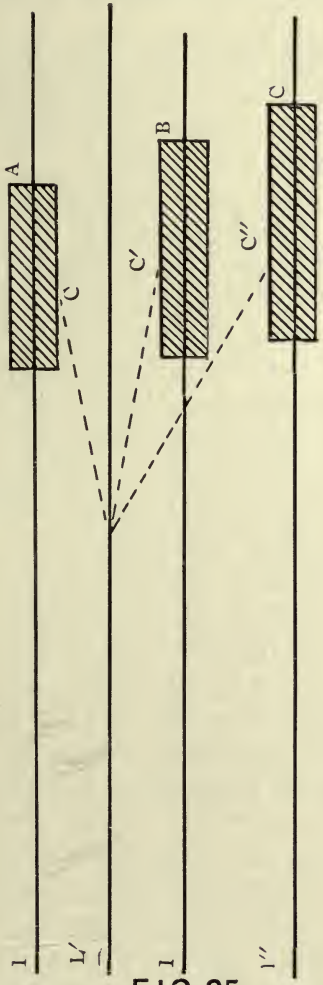

FIG. 25

for corps B. The auxiliary trains in order to reach these points will first follow the line of communication and will cut off from it by making use of the most available cross-roads. If the same line L, instead of only two corps, had to serve a greater number (D, E), the hauls across country in

order to join them would be very great and the advantage of establishing several lines of communication for every army is seen from this, in order to lessen the work required of the trains in effecting the resupply.

In order to avoid unnecessary marches for the administrative trains, it would be natural to select the point of contract with the auxiliary train as near the centers of distribution as possible, to which places the administrative train has advanced in order to resupply the regimental trains, and there will be no difficulty if there is only one army corps.

In the movement represented in drawing 1 of Plate II., section 1 of the administrative train can without difficulty be resupplied at C the third day. That place was in fact vacated by the troops about noon, and nothing prevents the arrival of the auxiliary train there.

On the other hand, when there are two army corps following each other on the same road, there will be difficulty in regulating the meeting of the administrative train with the auxiliary train belonging to the corps in the advance. By examining drawing 1 or 2 of Plate II., it is seen that it would be difficult to resupply at C the third day section No. 1 of the administrative train of the 1st corps. The point C on the third day is in the midst of the cantonments of the 2d corps. The auxiliary train cannot reach the place until the completion of the movement of that corps —that is, in the evening; the resupply of the administrative train would be made entirely too late at night; besides, this accumulation of trains in the zone of the cantonments will cause great inconvenience. We have, however, represented the movement as executed in that way, the third day, in drawing 3 of Plate II., in order to show clearly the difficulty of arranging the march of the auxiliary train so as to have it arrive at any time except during the night. But in order

to avoid, as much as possible, delaying the resupply of the administrative train, it will be necessary, whenever possible, to arrange for the junction of the administrative and auxiliary trains outside the zone of the cantonments on the flank nearest the line of communications; so that the auxiliary train being able to reach the meeting-place without making use of the road which the column does, it will be possible to have it arrive in time to effect the resupply of the administrative train without waiting until the 2d corps has completed its movement. An example will better explain the working of this operation.

In the example cited above in the case of a single army corps, nothing will prevent establishing at Bernécourt, if desired, the contact between the auxiliary train and the section of the administrative train, which made on June 1st, at Mandres, Bernécourt, Ansauville, the resupply of the regimental train. If we suppose that the terminal station is at Saint-Mihiel and that the auxiliary train comes there by the road Saint-Mihiel—Apremont—Bouconville, it will be necessary to leave the latter place by 7 a. m., the hour when the rear of the column passes there; it would reach Bernécourt then about 10 o'clock at the latest, and the administrative train, having been resupplied, could start from there not later than 12 m.

But if, as we have supposed in the second case, the 1st corps is followed by another, the auxiliary train would not be able to pass the cross-road for Bouconville until after the passage of that point of the entire 2d corps and the administrative trains of the 1st and 2d corps, which immediately follow; consequently the auxiliary train, directed to go to Bernécourt to resupply the administrative train of the 1st corps on June 2d, would arrive there only very late on the evening of that day. To obviate that inconvenience, it

will be necessary to make the meeting between this auxiliary train and the administrative train outside the zone of the cantonments, on the flank, at Seicheprey, for instance; to effect this, the issue having been made early in the morning of June 2d, the section of the administrative train of the 1st corps to be resupplied will take the road Mandres—Ansauville—Bernécourt to Seicheprey, where the auxiliary train will meet it by the side-road Apremont—Montrec—Richecourt, without waiting until the 2d corps has completed its movement. The administrative train, resupplied at an early hour, would be able to complete its movement when the 2d corps is in cantonment—that is, about 4 p. m., if it is obliged to follow the same road as the column; but in our example it will be able to start out immediately by the side-road from Flirey—Limey—Martincourt to Griscourt.

IV. 3d Method: Consignment of Rations Drawn from the Dépôts in Rear by the Requisitioned Trains.

Instead of forwarding the rations for the army by the military trains écheloning in rear, it would theoretically be possible, as we have said at the beginning of this chapter, to have them brought up by trains starting out from the dépôts where the rations are collected. But in practice this is not possible: if the auxiliary trains have been unable to enter the cantonments and carry the rations directly to the troops, and if it has been necessary to meet them by the administrative and regimental trains, such is also true of the requisition trains pushed towards the army by the service in rear. In reality, the rations carried by the trains from the rear are received by the auxiliary trains and the latter send them forward to the troops in the manner described in the preceding article.

But wherever may be the place of meeting of the trains

from the rear, the problem to be solved is presented in the same manner and can be stated as follows:

The subdivision to be resupplied, starting out and moving successively to A, B, C, D, has brought to each of these points the stores drawn from a dépôt (M).

FIG.26

When a railway or a navigable stream is available, the employment of them will be the readiest solution of the problem; when such are not available, it will be necessary, on starting from the terminus M of the railway, to organize on the line M A B C D E a system of wagon-trains, the workings of which we are about to study. We will later study the employment of railways and navigable streams.

General Theory Concerning the Organization of Transports; Different Methods of Transport.—The possibility of having the moving subdivision met by the trains starting out from M depends upon whether the trains can make a forced march and cover daily a greater distance than the moving subdivisions. The daily movement of the latter is equal to the march made by the army, the average length of which is from 20 to 24 kilometres; the trains can cover a much greater distance. The march of the army is limited by tactical and strategical considerations, by reason of the time lost in the deployment of the columns, by their installation at the cantonment, etc., none of which causes limit the march of the trains. The distance a consignment can be forwarded each day will always be greater that that the army advances and will depend upon the kind of train organized. An ordinary train—that is, one having to carry the same consignment to its destination, during several days' march, with the same teams—can make a daily march of

from 35 to 40 kilometres, or about one and a half days' march of the army. But by organizing relays it is possible to forward a consignment from 60 to 70 kilometres in 24 hours, if alternate relays of wagons are employed; by using alternate relays of teams it would be possible to extend this to 80 or 90 kilometres. In the first case the number of hours usefully employed in forwarding the consignment is from 15 to 16, and 8 hours are allowed for the various operations of taking fresh teams, loading, and unloading; in the second place, the time lost by changing teams can be decreased and reduced to 3 or 4 hours, and the time devoted to the forwarding of the consignment increased to 20 hours.

Under such conditions it is seen that, by the ordinary train, it is possible for the trains from the rear to cover daily a distance equal to one and a half days' march of the army; that by organizing relays of wagons the train can make two or three average marches of the army. By means of the relays of teams a still more rapid movement would result, and it would be possible under an emergency to make nearly four average marches.

To effect such an organization the line of communications by which the dépôt M should be connected with the successive points of supply is arranged in the following manner: Advance dépôts are located on this line distant on an average from 30 to 35 kilometres from each other.

These stations are not necessarily the same as those where the columns have halted; we know also that the columns do not occupy a point, but that their cantonments form an extended zone, and, moreover, the line of communication and the line of operations of the column are not always the same. To represent and study the movement we need not consider the column, but simply occupy ourselves with the auxiliary trains; A, B, C, D will be then the

successive points where the auxiliary trains should be resupplied; the distance between these points is an average march, equal for the column to 20 or 24 kilometres. Under these theoretical conditions, the intermediate dépôts established on the line of communications at 30 or 35 kilometres from each other should fall at G, G′, G″, for instance: G at the center of the distance A B; G′ opposite C; G″ at the center of the distance D E, and so on.

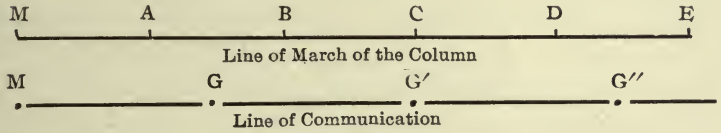

FIG. 27

If a consignment is forwarded over this line by ordinary train, it will remain at G the first night, the second at G′, the third at G″, and it is evident that such a train would take only two days to reach the point C of resupplying, when the latter has already advanced three days beyond M; to reach the point F, the train would take four days, and so on.

By organizing in the dépôts G, G′, G″, G‴ relays of wagons, it would be possible to forward the consignment to G′ the first day, and consequently reach the point C, situated three days' march in advance of M; in two days the train belonging to the line of communications would meet the auxiliary train at G‴, at six days' march beyond M, and so on.

By organizing relays of teams in the intermediate dépôts, it would be possible, even the same day, to forward the consignment three days' march, and therefore as far as G″. The train connected with the line of communication would then be able to overtake in one day the auxiliary train, as long as the distance of the latter beyond M does

not exceed four marches and even four and one-half marches in an emergency.

When the celerity in forwarding the consignment is considered, it makes no difference whether alternate or successive relays are made use of; moreover, when the trains must follow each other daily during a certain period, the two systems require the organization of the same number of units of transport. To organize by alternate relays a continued movement on the line M G′ G″, for instance, it would be necessary to establish at each dépôt two groups of teams, or six groups in all. A consignment No. 1 starting from M (Figure 28), the first day, would be transported as far as G by group 1 of the dépôt M, which we will designate by m1. The second day a second train, No. 2, would be transported from M to G by a team (m2), then from G to G′ by a team provided by the dépôt G, which we will designate by g1; a third consignment would be transported from M to G by team m1, which returned to the former place the evening before, then from G to G′ by g2, and from G′ to G″ by g′1; a fourth consignment would be transported from M to G by m2, from G to G′ by g1, from G′ to G″ by g′2; to move four consignments over a distance equal to three marches, six transport units will be employed (m1, m2, g1, g2, g′1, and g′2). If the same movement had been organized by successive relays, only four units of transport, all held at M, would have been employed. The first consignment would have been transported to G by the train m1; the second consignment would have been carried from M to G by the train m2, and from G to G′ by m1; the third consignment would be carried from M to G by m3, from G to G′ by m2, from G′ to G″ by m1, and so on. The figure below shows this movement clearly. The method of transport by successive relays requires a less number of teams. But if the movement is to continue and

it is not desired to send far from M the teams taken from that place, these teams in order to return from G″ to M will lose three days, during which it would still be necessary to equip at M two new units of transport, m3 and m6, in order to operate by successive relays, while the double relays organized at each dépôt would make it possible to continue the movement indefinitely by alternate relays. Definitely, for a continued movement of long duration, the same number of teams will be necessary in the two systems, the following: a number of teams equal to double the number of the marches to be made.

The method of transport by alternate relays of wagons or teams makes it possible to organize a continued movement by means of two transport units formed at each dépôt; it has the advantage of distributing the requisition for the teams equally among all the dépôts, but it renders it essential to have a perfect organization at these dépôts and to establish a regular service there. The preference then is for the organization of a permanent and regular line of communication.

The method of transport by successive relays throws the whole burden of the requisition on the starting-point; but it is not necessary that the line followed should be marked out by dépôts organized in advance, as required in the preceding method, where the train should find relays prepared at the changing-points. When the service requires only a limited number of consignments, the trains by successive relays require a less number of units of transport than the preceding, but that advantage disappears when the number of consignments exceeds the total number of the marches to be made by the trains. When the movement is continued and constant, the total number of units of transport is the same as in the preceding method; the

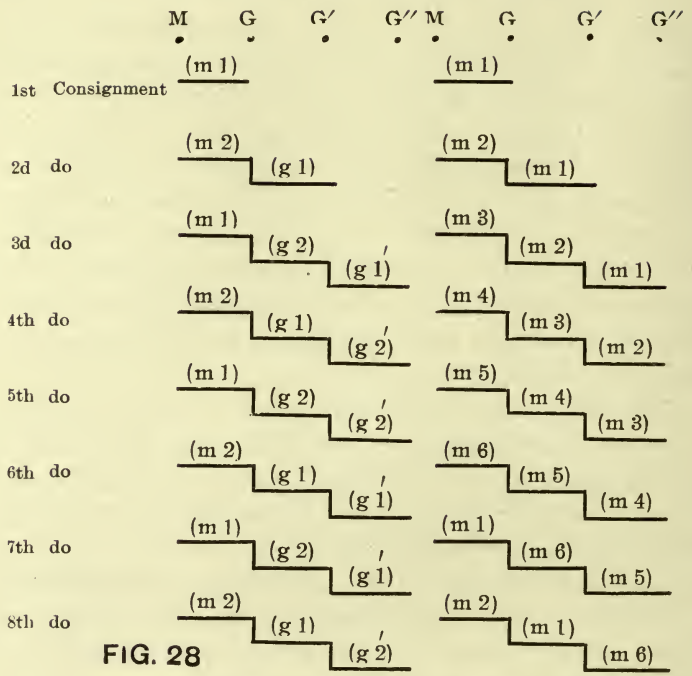

FIG. 28

Organization of the movement by alternate relays.

Organization of the movement by successive relays.

second method of transport will be particularly suitable on a temporary line, which may be used for only a few days.

In the two methods, the total number of units of transport necessary is equal to two for each dépôt, or, in other words, to double the number of stations into which the line of communications is divided. This conclusion applies as well to the transports by relays of wagons as to the transports by relays of teams; the only difference is in the rapidity of the movement obtained, which, in the case of relays of wagons, enables two stations to be reached, and three in the case of relays of teams.

Order and Echelonment of the Consignments during a Protracted Period.—If, however, by means of two transport units in each dépôt, it is possible to insure the daily consignment of rations from the dépôt M to the army and its arrival at the place of issue in the least time possible, it would be a mistake to suppose that it will always be possible to arrange for the arrival at the army every day of the consignment of rations in order to provide for the resupply of each day. We will ascertain how, in that case, the échelonment of consignments from the dépôt M should be arranged. Let us suppose a column is moving forward from M, and let A, B, C, D, E be the points where the successive resupply of the auxiliary train must be effected.* We know, from what has been said in the preceding article, that, at the time these resupplies are being made in those places, the army is already two days' march in advance of such places. Consequently, the day when the first resupply was made at A the army was already in advance of C, the day in which the second resupply was made at B the army would be in advance of D, and so on. In order to indicate this corollation, we will designate by the third day that on which the first resupply for the auxiliary train should have been made at A, by the fourth that on which the second resupply was accomplished at B, etc. The distances M A, A B, B C, which separate the points in which the resupply is successively made, are equal to an average march of the army, 20 to 24 kilometres. The dépôts established for the organization of the line of communication at G, G′, G″, etc., are distant from each other from 30 to 35 kilometres, and fall, as we have already said, the first between A and B, the second opposite C, the third between D and E, the fourth opposite

*The graphical representation of this movement is given in Figure 1 of Plate III.

F, and so on. It is evident, moreover, that the installation of the service of the line of communication can be commenced at G the third day, and that this dépôt can the following day supply a team; that the organization of the dépôt G′ can be commenced the fifth day, and that, in consequence, this dépôt can act as relay station the following day, the sixth, and so on.

These preliminaries arranged, it is an easy matter to consider the different consignments. The resupply of the auxiliary train at A can be made the third day by a train forwarded from M the same day. The teams (m1) which have drawn this load remain over night at A.

The resupply at B can also be provided by a consignment sent from M the fourth day. The load is drawn from M to G by the team m2, changed at G by a team (g) furnished by that dépôt, and which draws the load to its destination.

The resupply at C the fifth day may still be assured by a consignment forwarded from M only the fifth day. This third consignment will be drawn to G by the team m1, which returned to M the evening before, changed at G, and drawn from there to C by the team g1, which was able to return to G the previous evening.

Moreover, in order to provide for the resupply at D the sixth day, it is not sufficient to forward the consignment in the morning, for it would not be possible to send it beyond C in only one day. The consignment to provide for the resupply at D the sixth day should then be started the evening before—that is, the 5th day; to do so, it will be necessary to fit out at M a third group of teams (m3), since m1 is employed in drawing the third consignment and m2 is returning from G to M. It is not necessary to go into further details in order to be able to state the law for the movement,

as an inspection of Plate III. shows it plainly. In order to provide for the daily resupply, the dépôt at M should forward a consignment the even-numbered days, fourth, sixth, eighth, etc., and two consignments the odd-numbered days, fifth, seventh, ninth, etc.; that necessitates the formation at M and at each of the relay stations of three transport units.

It is very evident that if it were known that the resupplies would halt at F, for instance, and that there would only be six resupplies to be provided, it would be possible to stop the consignments at the VI.; but such will in general not be the case, and, not having such information, in order to provide the uninterrupted resupply and always be able to arrange that the consignments reach the point of meeting in ample time, it will be necessary to have them sent forward, and, therefore, have them écheloned as has just been said. If we do not know that the resupply will stop at F, it will be very necessary to send forward at all events, on the seventh day, the VII. consignment, although it may not be necessary until the ninth day; unless that is done, it would not arrive on time the ninth day at H.

The first three consignments forwarded from M (as I., II. and III.) can be arranged for with the two teams at M, the following (m1 and m2), and the two teams at G (g1 and g2); in the same way the first three consignments which go beyond G′ (IV., V., VI.) can be carried, from that point, with two relays g′1 and g′2 and g″1 and g″2, and so on; it would not be necessary, then, to have three relays of teams in the relay stations, if new dépôts were formed at G″ and at G‴ and the number of consignments forwarded from dépôts were limited to three. This takes it for granted that it will be possible to supply these successive dépôts directly, either from the local resources, as in the case we considered in the

fourth paragraph of Chapter III., or by means of a railway or navigable stream.

If such were not the case, there would be, however, every advantage to insure order and for regulating the movements, to divide the line of communication by intermediate dépôts established in principal stations and distant from each other at least three marches. The advance dépôt would forward directly to the points to be resupplied, and each dépôt would be supplied from the one in rear of it. But this advantageous arrangement for the organization would not make any changes either in the number of the transport units or in the movement of the trains. If the stores required for the IV. consignment cannot be forwarded directly from G′ and must be drawn from the dépôt at M, since that train should arrive on the fifth day in order to start out on the sixth, it is nearly always necessary to forward it from M the fifth day, as is shown in Figure 1 of Plate III.; the same is true of the fifth and sixth consignments; and, finally, the movement of the trains represented is that which supplies the intermediate dépôt G′ by using the smallest number of teams. If it was desired, for instance, to have arrive in succession at G′ the fifth or sixth day all the stores required for the several consignments which that intermediate dépôt should make—for the IV., V., and VI., for instance—in addition to the transport units already formed at M, as m1, m2, and m3, which are upon the road, it would be necessary to organize two more trains.

The definite conclusion of all this is: 1st, that, in order to have the stores necessary for the daily resupply brought from M to the auxiliary trains, it is not enough to send forward a consignment every day, but that the shipment should be one day by a single train and the following day by two; 2d, that the organization of this continued resupply

can be made by means of three transport units in each relay station.

These conclusions are the same, as we have already shown, when the movement is organized between each of the intermediate dépôts by alternate relays, as far as concerns the total number of equipages necessary, with this single exception, that by successive relays all the equipages would be taken from M, instead of being divided among the various intermediate stations. Therefore, the organization by alternate relays is preferable; it will be possible, however, in practice to assure, by successive relays, the first consignments from each principal station—for instance, the consignments IV., V., and VI. to start from G′, the consignments VII., VIII., and IX. to start from G‴, and so on—and to organize the movement by alternate relays only at the installation of a more advanced dépôt. But, however that may be, the movement of the trains and the representation of the same, as they are shown in Plate III., would not be modified.*

Estimates of the Importance of the Means of Transport Requisitioned in Order to Organize the Lines of Wagon Transport. —Is it likely that the hypothetical case of a movement in which the supplies will be drawn for a long time by wagon transport from a distant dépôt (M) will be met with? It is not possible, although the experience of recent wars shows that armies were deprived of the use of railways for their supplies for a considerable time. However that may be,

*We have supposed, in this entire discussion, that the marches of the trains are equal to an average march and a half of the column. If, however, the marches of the trains were equal to those of the column, the successive relay stations would be at A, B, C, D, etc.; a consignment forwarded from M would in one day only arrive at B; it would require two days to go as far as D, and so on. If Plate III. were constructed under that supposition, it could be easily seen that it would be necessary to establish in each station four transport units instead of three.

it was of interest to find the law for such an operation. We intend to use this law in order to determine what would be the means of transport necessary for the organization of the line of communication.

General Pierron* estimates at 1000 for each corps the number of necessary wagons in an unloading station serving as the point of departure for the supplies by wagon-roads—that is to say, filling the rôle of the dépôt M considered in this study: 400 of these wagons are necessary, according to this author, for unloading and carrying away the material brought daily by the railway and to thus relieve the station; 600 wagons are necessary in order to supply the subsequent dépôts which will be established on the line of communication when the army moves to a distance from that dépôt.

One would obtain an incorrect idea of the number of wagons necessary to provide the resupply if it was thought to be limited to the figure above expressed, which in reality only gives the number necessary at the discharging station. The number of 400 wagons is indeed sufficient, as will be seen later, in order to discharge the two trains which must come each day to this station to provide the resupply of the army with subsistence. But with 600 wagons it would not be possible to provide the consignments to the army or to an intermediate dépôt on the line of communication. It is necessary to estimate the number of wagons required to transport a day's rations for an army corps as 150—that is, to form what we have termed a unit of transport for a corps. Under such conditions, 600 wagons represent four units of transport; as the terminal station should, besides the subsistence, provide the transports for the *matériel* for all the other services, it must be taken for granted that it

*Général Pierron, "Stratégie et grande Tactique," page 325.

will be necessary to reserve a fourth of these wagons for these other services, and that only 450 wagons can be made use of for the subsistence service. Under these conditions, the number of wagons assigned by General Pierron to the dépôt M would make it possible to create there only the three units of transport we have designated in the preceding theoretical discussion by the signs m1, m2, and m3; referring to that discussion and to Plate III., it can be seen that that assignment would permit of arranging for three consignments to the distance of three marches beyond M if a continuous movement were not undertaken; but if the consignment beyond M were to be continuous, these three transport units would only be sufficient to organize the transport by alternate relays between M and the first station G established on the line of communication.

The number given by General Pierron represents then only what is required for the trains at the starting-point. The total number of wagons necessary for the service of the line of communication will include, then, in addition to these, all the wagons for the formation of the relays in the other stations.

At the rate of 150 wagons to a corps for a day's rations, the three units of necessary transport in each station represent a total of 450 wagons for each army corps supplied by the line of communication; if the same line must supply an army of five corps, each station should have 2250 wagons solely for the transport of the subsistence. Admitting that it would be possible to establish in each station only two units of transport, the number of wagons for an army corps would still go up to 300 and to 1500 for an entire army. The size of these quotas leads us at once to this conclusion previously stated: that it will be necessary to establish

several lines of communication whenever possible, and to assign only two or three corps at the most to each line.

The following table shows at a glance the size of the transport detachments to be formed in each station:

ON A LINE OF COMMUNICATIONS SUPPLYING:	Number of Wagons to be Fitted out in each Station in order to Form there:		
	One Transport Unit.	Two Transport Units.	Three Transport Units.
1 Army Corps	150	300	450
2 Army Corps	300	600	900
3 Army Corps	450	900	1,350
4 Army Corps	600	1,200	1,800
5 Army Corps	750	1,500	2 250

What will be the probable resources of the theatre of war in order to provide for such establishments? It is difficult to establish it with absolute certainty; it is possible, however, to make estimate in the following manner:

According to the statistics of the Minister of Agriculture (for the year 1891), there are in France a number of animals equal to:

Number of horses	2,883,460
Number of mules	250,877
Total	3,114,337

That number represents an average of five animals to the square kilometre, but the figures above include both the old and young animals; if, moreover, those which would be taken for the mobilization are considered, it seems prudent to reduce this coëfficient to 3 for a square kilometre. In default of more exact information, the number 3 can be taken for the remaining wagons per square kilometre, relying upon the following reasons: the average rural population is 42, representing 8 families; it is not far wrong to

estimate at 3 the number of those who possess a wagon suitable for the transports.

Adopting this coëfficient of 3 equipped wagons to a square kilometre, it is possible to calculate, as we have already done, the radius of the zone over which it would be necessary to extend the requisitions in order to raise the requisite number indicated in the preceding table. It will thus be found:

THE RADIUS OF REQUISITION AROUND A STATION SHOULD BE IN KILOMETRES:	TO FORM		
	One Transport Unit.	Two Transport Units.	Three Transport Units.
For 1 Army Corps	4	6	7
For 2 Army Corps	6	8	10
For 3 Army Corps	7	10	12
For 4 Army Corps	8	11	14
For 5 Army Corps	9	13	16

These estimates are evidently too small, and in practice it would surely be necessary to double these figures. Whatever may be their practical value, they show the difficulty that would be encountered in organizing a continuous resupply of some duration by wagon-trains, and the importance of railways, which alone make it possible to provide the resupply without too much complication.

V. Employment of Railways and Navigable Streams.

A railway can be used either to stock the dépôt on the line of communication and to forward the supplies from the rear as near as possible to the army, in order to shorten as much as possible the length of the haul for the wagon-trains, or to directly supply the troops, when the railway extends into the zone of the cantonments. The order of the Ministry dated August 30, 1885, does not make explicit reference to the employment of railways or navigable rivers

for the direct supply of the troops, and it may be inferred that the consignment of stores by the railways should not go beyond the advance dépôt. The order of the Ministry to ascertain certain facts or conditions as provided in that dated January 11, 1893, has removed all uncertainty upon that subject.

It is not the province of this study to explain in detail the workings of the railways; we will simply refer to some general facts which are indispensable in order to understand the method of supply by means of railways.

The transportation of a day's rations for an army corps requires on an average 15 cars. Military trains are composed ordinarily of 30 loaded cars; consequently one of these trains represents either two days' rations for an army corps, or a day's rations for two corps. The necessary rations for an army of five corps of the normal effective strength would represent the load of 2 or $2\frac{1}{2}$ trains. For an army of four corps with an increased effective strength, the transport of a day's rations would require 3 trains of the size above indicated, or, still better, 4 trains of about 20 to 25 cars.

It is estimated that it will take, ordinarily, 7 hours to unload a train of 30 cars; on this account, when the platforms do not make it possible to unload two trains at the same time, an interval of 8 hours should then be provided between the arrival of two successive trains at the same discharging station, in order to allow time to unload the first trains and move it to the rear before the arrival of the second, and thus avoid crowding the station.

Under such conditions the unloading of these two trains will require 15 hours; that is the time which would be necessary in order to unload a day's rations for an army of five corps, if the two trains required to transport these rations could be unloaded at the same station.

These are the principal facts it is necessary to keep in mind in the organization of the supply by means of railways.

The method of using railways will depend upon their situation in reference to the army.

If the two lines L and L′ (Figure 29) are available, the line L will be assigned to the corps A and B and the line L′ to the corps C, D, and E. In that case the resupply of the regimental trains will be effected at the stations G and G′. Each of these stations having to receive rations for only two or three corps, 1 train will be sufficient, the unloading of which will only take 7 hours, if in an enemy's or friendly country; but in the vicinity of the enemy, the trains will only be able to go as far as the stations G and G′ when the army has advanced as far as those points and occupied the surrounding country. That amounts to saying that in the course of the daily marches it will only be possible to send forward the supply trains into the zone of the cantonments after the arrival of the columns—that is, in the evening; but, since the unloading of these trains requires only 7 hours, everything will nevertheless be in readiness so that the resupply of the regimental trains can be made the next day at daybreak, and these trains will be able to rejoin their respective corps before recommencing their march. The distance of the cantonments to the stations G and G′ is for some corps from 10 to 12 kilometres, which would make a march, going and coming, of 20 to 25 kilometres for the regimental trains of those corps.

To avoid imposing upon the regimental trains so long a journey, whenever possible, arrangement would be made to assign a station to each army corps and even to each division. Assigning station g1 to corps A, station g2 to corps B, g′1 to corps C and D, g′2 to E, the distance from the cantonments to the stations would not exceed for any

corps 4 or 5 kilometres. The train over the line L carrying the rations to the corps A and B would leave at g2, on passing that place, the cars containing the rations for corps B, will continue to g1 and there will be unloaded, will then

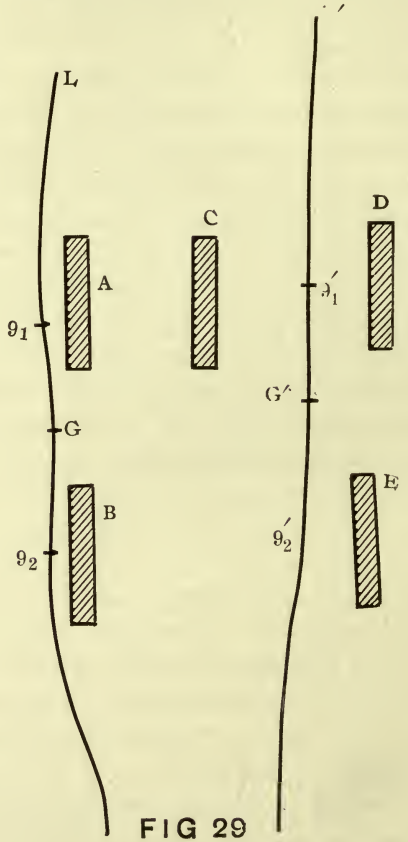

FIG 29

move back and pick up, when passing g2, the cars which it had left there; the line L′ will be operated in like manner.

If only one line (L) is available, that one having to supply the entire army, it would be necessary to dispatch

2 trains; and if the unloading must be made at a single station (G), 15 hours would be required to accomplish it. Under such conditions it would be more difficult to have everything in readiness to be able to commence the issue to the regimental trains at an early hour the following morning. However, that would not prove to be the main difficulty, for undoubtedly it will generally be possible to have at least two stations for unloading in a distance of 40 kilometres, which is the depth of the army, and thus to unload only one train at each station. But it would be difficult to send the regimental trains from the corps C, D, and E to reload on the line L at G, g1, or g2, because the distance may be from 15 to 20 kilometres. In such case it would be possible to resupply by the line L only the regimental trains of corps A and B.

The army in its movement does not necessarily retain the same situation in reference to the railway, and the corps D and E, which at first were further from it, may the following day be, on the contrary, the most advantageously situated. It may happen, for instance, that the army occupying the first day a position A B C D E, occupies the next day the position A′ B′ C′ D′ E′ (Figure 30). In the first position the corps on the right, which are fartherest from the railway, cannot be directly resupplied by it; in the second position the corps on the left are farthest off. In the latter case it will be possible to postpone the reloading of the section of the regimental train of corps D and E, emptied by the issue on the first day; that section will be reloaded the following day at the same time as the second section of the train of these same corps, emptied by the issue of the second day; thus both sections of the regimental trains of the corps on the right would be reloaded at the same time at the stations g′1 and g′2. In the example represented in

the figure below, there will be resupplied the first day (or rather, the morning of the second day) at g1 and g2 only the corps A and B; the next both sections of the train of the other corps will be reloaded at the same time at g'1 and g'2.

But the conditions will not always favor this combination; and it will happen that the same corps are during several days too far from the railway to permit of their regimental trains being able to go there to reload. In that case, if the distance from the railway is not more than 20 to 25 kilometres, it will be possible to empty the auxiliary trains in order to directly effect the resupply. We know in reality that each section of this auxiliary train, after having assisted in the resupply of the administrative trains, can interrupt its forward movement for one day; this interruption will be made use of in order to send that section to reload at the advance dépôts or the adjacent stations; that day will be sufficient if the railway is not too far away.

The rate of speed upon the railways will always be sufficient to allow the supply trains formed at the main dépôt or at a station further in advance to be held at the advance dépôt until such time as they will be able to enter the zone of the cantonments of the army; a few hours will be sufficient to forward them to the discharging stations, where they will be able to arrive at the latest by the evening of each day.

It would not be an easy matter to bring the stores there if, instead of a railway, it should be necessary to make use of a navigable stream, in the general case a canal. Upon the canals, in fact, the rate of march is often very low; it depends upon several conditions: method of traction, form of the boats, number and kind of the locks. The rate of traction by man-power is 6 centimetres a second, by horses 50 centimetres to 1 metre a second, or, respectively, 216,

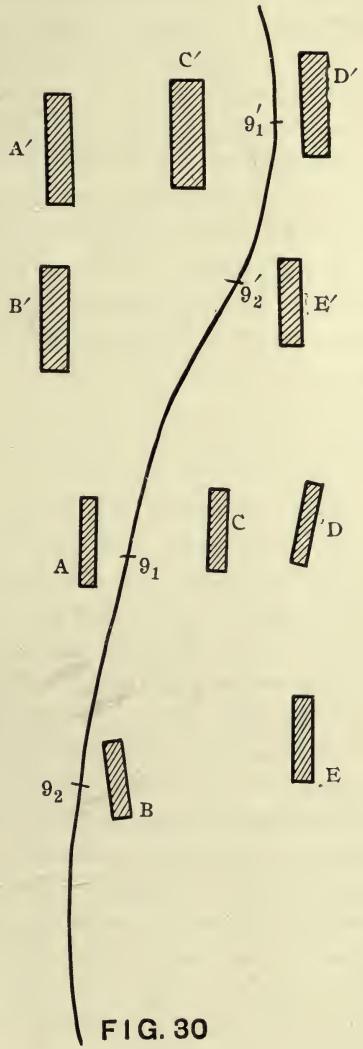

FIG. 30

1800, or 3600 metres an hour. But the real rate is diminished by the time lost in passing through the locks, which may require from 20 to 30 minutes for each lock; as, on some canals, locks are encountered every 4 or 5 kilometres, it results that the rate of movement of the supplies is there very small and does not exceed 40 kilometres in 24 hours. Under such conditions, the flotilla of boats carrying stores, to be in a position to be made use of in the daily resupply, should be kept at the head of the columns, so that this method of transport is not so available for the direct resupply of the columns as for the formation and supply of the dépôts on the line of communication.

VI. Modifications of the Arrangement in Accordance with the Kind of Formation to Which It may be Applied.

As we have seen in the preceding article, effecting the junction between the regimental train and the administrative train, between the latter and the auxiliary trains, is more or less easy, depending upon whether it is for columns of divisions, for a column of an army corps, or for a column of two corps on the same road. The formation is of less importance, as far as relates to the consignments of supplies from the rear, either by means of the railways or by the requisitioned trains.

As far as relates to the consignments of stores by railway, the only thing which may be of importance, as far as the success of the operation is concerned, is, we have seen, to be able to assign stations for issues to each corps and that these stations are not too far off. The satisfaction of that condition depends in no way upon the formation of the army, but simply upon the topographical situation of the lines.

Concerning the consignments by the requisition trains

and the junction of these trains with the sections of the auxiliary train to be supplied, no more difficulty will be encountered in the case of two corps following on the same road than in the case of a detached corps. We know, in reality, that in the case of a column of two corps it will be necessary in most instances to establish beyond the zone of the cantonments, on the flank which is nearest the line of communication, the point of meeting of the administrative trains and the auxiliary trains, which is also the place to which the requisition trains should go to resupply the auxiliary trains. The requisition trains in such case will not be obliged to enter the zone of the cantonments and their movement will in no way be dependent upon the deployment of the column. But if, as we have represented in drawing No. 3 of Plate II., it was necessary to send the auxiliary trains across the cantonments, there would be no difficulty in having them met by trains from the rear. Let us suppose, for example, by referring to that drawing No. 3, that we desired to resupply at C the auxiliary train which came to that place to resupply the administrative train (section No. 1) of the 1st corps; we have the entire third day available for that; now, on that day, the 2d corps, in the zone of cantonments in which C is situated (which was the cause of the difficulty experienced the second day to resupply the administrative train of the 1st corps and also to have the auxiliary train come up to it), the 2d corps then leaves that zone and thus permits the trains from the rear to come up immediately after its deployment. The resupply of the auxiliary train, which could moreover be done without inconvenience only the evening of the third day or the morning of the fourth, can be accomplished the morning of the third day, both for the 1st corps at C and the 2d corps at C′; an inspection of the drawing will show this at a glance.

VII. Application to a Particular Case.

One can, as an example of the organization of the lines of communication and supply from the rear, study the march of the 3d German Army, in August, 1870, from Wörth to Nancy. Figure 2 of Plate III. represents it. We have shown there the lines of march of the different corps (except the VI., which, left at first in rear, did not rejoin until later), as well as the lines of communication which were established; until the 18th of August, the Saverne tunnel was obstructed, it was necessary to organize lines for wagon-communication; two lines were established: the one on the right, for the two Bavarian corps, started from Wissembourg and went from there by way of Niederbronn and Puberg to Marsal; the other, serving the Prussian corps, started from Haguenau, going from there by way of Petite-Pierre and Fenétrange to Sarrebourg. On the 18th communication was opened by railroad as far as Nancy. This place became the starting-point for a new line of communication, which it was necessary to establish for the second period of the advance, as the resistance of the fortifications of Toul did not permit the use of railroads beyond there; this new line of communication went from Nancy to Bar-le-Duc, by way of Colombey, Vaucouleurs, and Void.

By way of applying the foregoing theories, we are going to attempt to sketch how they would have been used for the supply of the two Prussian corps (V. and XI.) on that march. We will assume that from Wörth to Lunéville it was impossible to obtain subsistence from the local resources, and that everything had to be brought from the advance dépôt, Haguenau fulfilling the rôle of the dépôt designated as M in the theoretical drawing No. 1 of Plate III. As in the drawing, and in Article IV. of this chapter, we will especially study the march of requisitioned trains and the resupply

of the auxiliary trains, the examples that we have previously developed concerning the workings of administrative and regimental trains being sufficient.

We will commence the operation on August 8th. That day the V. corps is at Uhviller, the XI. at Pfaffendorf. In order to conform to the conditions of our regulation and to our hypothesis, we suppose that that day's issue is provided for by drawing upon a section of the regimental train. This section should be reloaded the evening of the 8th or the morning of the 9th by a section of the administrative train, which will, in its turn, be resupplied the evening of the 9th, by a section of the auxiliary train. We have the entire day of the 10th in which to resupply that section of the auxiliary train.

Likewise on the 9th, the two corps occupying Weiterviller (V.) and Hattmatt (XI.), a section of the regimental train must be resupplied at those points on the 10th by the administrative train, the latter by the auxiliary train, the resupply of which should finally be accomplished during the day of the 11th of August.

And so on; by referring to the table showing the stations of the corps* it is possible to form the following table, indicating the consignments of rations to be made from the advance dépôt. The date indicated in this table is that of the day during which the auxiliary train should be resupplied. In the following column the points are shown to which the section of the auxiliary train which is to effect the resupply should be sent forward in order to make a junction with the administrative trains; the detail of the march of the requisitioned trains is given in the third column.

*See the following tables.

STATION OF THE DIFFERENT CORPS OF THE 3d ARMY.

Dates.	5th Corps.	11th Corps.	Würtemberger Division.	1st Bavarian.	2d Bavarian.	General Headquarters of the Army.
Aug. 6	Fröschviller	Wörth	Engelhoff	Fröschviller	Reichshoffen	Soultz
" 7	Engelshoff	Wörth	Fröschviller	Fröschviller	Niderbronn	Soultz
" 8	Uhviller	Pfoffendorf	Ingviller	Börental	Egelshand	Mezviller
" 9	Werterviller	Hattematt	Meisenthal	Enchenberg	Lemborg	Mezviller
" 10	Weger	Mittelbronne-Meetting	Adams-Willier	Diemeringen	Montbronn	Petersbach
" 11	Lixheim	Sarrebourg	Rauwiller	Pistorf	Diemeringen	Petersbach
" 12	Lixheim	Sarrebourg	Rauwiller	Betbar	Fenéstrange	Petersbach
" 13	Maizières	Avricourt-Blamont	Fribourg	Guermange	Dieuze	Sarrebourg
" 14	Einville	Lunéville	Arracourt	Maizières	Moyenvic	Blamont
" 15	Saint-Nicolas	Bayon	Sommerviller	Einville	Marcet	Lunéville
" 16	Saint-Nicolas	Bayon	Sommerviller	Einville	Nancy	Lunéville
" 17	Saint-Vincent	Vezelize	Basse Flavigny	Saint-Nicolas	Nancy	Nancy
" 18	Blenod	Colombey	Ochey	Pont-St-Vincent	Devant-Toul	Nancy
" 19	Vaucouleurs	Epiez	Septvigny	Colombey	Ley-Saint-Remy	Nancy
20,21&22	Treveray	Gendrecourt	Houdelaincourt	Void	Menil-la-Horgne	Vaucouleurs

Date of the Resupply.	Point where the Section of the Auxiliary Train designated to make the Resupply met the Administrative Train in the evening and where it should be reloaded by the Requisitioned Trains.		March of Requisitioned Trains.
	V. Corps.	XI. Corps.	
Aug. 10	Uhviller.....	Pfoffendorf.	As the distance is short, the auxiliary trains go to Haguenau to reload.
11	Weiterviller	Hattematt...	The stores for this resupply are forwarded from Haguenau by train (H^1); the auxiliary trains can meet it half way, which allows the relay trains (H^1) to return in the evening to Haguenau.
12	Weyer.	Mittelbronn	The stores for this resupply start out from Haguenau very early on the 12th; carried to Petite-Pierre by team (H^1); relay at Petite-Pierre; load carried from Petite-Pierre to destination by relay teams (P^1)—(H^1) returns the next day, August 13th, to Haguenau. The auxiliary trains having been able to meet half way, the latter can return the same day to Petite-Pierre.
13	Lixheim....	Sarrebourg.	The stores for this resupply start from Haguenau early on the 13th; carried as far as Petite-Pierre by relay teams (H^2)—relay at Petite-Pierre—load carried from there to destination by relay teams (P^1)—(P^1) and (H^2) return on the 14th to Petite-Pierre and to Haguenau.
14	Lixheim....	Sarrebourg.	The stores for this resupply start from Haguenau early on the 14th; carried to Petite-Pierre by relay teams (H^1)—relay at Petite-Pierre—load carried from there to destination by relay teams (P^2)—(H^1) and (P^2) return on the 15th to Haguenau and Petite-Pierre.
15	Maizières...	Blamont....	The stores for this resupply should also start from Haguenau early on the 14th; carried as far as Petite-Pierre by relay teams (H^3)—relay at Petite-Pierre—load carried from Petite-Pierre to Fenéstrange by relay teams (P^3)—remains over night at Fenéstrange; the load starts again early on the 15th—drawn by relay teams (F^1) as far as Sarrebourg—transported from Sarrebourg to destination by relay teams (S^1). (H^3) and (P^3) return on the 15th to Haguenau and Petite-Pierre—(F^1) and (S^1) return the 16th to Fenéstrange and Sarrebourg.

It would be possible to continue the resupply in this manner, but it is useless to press this example further, which well confirms the correctness of the conclusions of the theoretical study, particularly as it relates to the necessity of forming three trains in each station. Although the movement studied only covers a period of six days, we have necessarily supposed the establishment of three relays of horses at Haguenau (h1, h2, and h3) and at Petite-Pierre (p1, p2, and p3). If the supply were to be continued by the same line of communication, it would be necessary to create three relays of horses in the other stations: Fenéstrange, Sarrebourg, etc.

Terminating here the description of the supply by this line of communication, we in fact are conforming to what actually occurred, for, upon the arrival of the army at Lunéville and Nancy, it may be taken for granted that the necessary supplies would be found there, since it would be possible to bring them up by the railroad, the traffic over which was reëstablished on the 18th.

Summary and Conclusion.

In the foregoing we have only considered the movement of the trains, and it would be necessary to apply the same principles in order to study the special arrangements which would be necessary in order to provide the supply of meat and bread. We will avoid, however, entering into greater details on this subject, so as not to further extend this study. Moreover, all we have said on the subject of trains in general can be adapted, almost without any modification, to the resupply of meat, by assigning to the successive trains of the cattle and herds the rôle which the trains play in the foregoing discussion. As concerns the resupply of bread, we will also be brought to the same conclusion, and, on the

other hand, the development of this question in a former study of the workings of a field bakery column* relieves us of the necessity of entering into further details on this subject.

We will confine ourselves to close this study to a single remark, which will serve as the conclusion.

When examining Plate I. annexed to the Regulations of November 20, 1894, or Plate II. hereunto annexed, both of which give the theoretical plan of the movements of the trains, it seems, at first sight, that the arrangement is very complicated; it may be thought that it forms a too elaborate mechanism, a kind of wheel mathematically set up which the least unforeseen circumstances will derange and which could be put into practice only by providing in advance and ordering from the beginning of the operation all the movements which should bring each section of the various trains to the point where it should resupply the preceding train.

In fact it is not so, and, on the contrary, the arrangement is the simplest; it is resolved into two movements:

1st. A general movement of the different trains conforming to the general advance of the army, so that the different trains always keep their proper positions, as follows:

The main body of the administrative trains at half a march, or 10 to 12 kilometres from the columns;

The main body of the auxiliary trains at the advance dépôt, about two marches from the columns, and sending forward a section half a march to be more within reach, so as to make, when necessary, a junction with the administrative trains.

*"Etude sur le Fonctionnement de la Boulangerie de Campagne d'un Corps d'Armée," par O. Espanet, sous-intendant militaire de 3e classe.

The supplies from the rear collected in dépôts and écheloned on trains in conformity with the arrangements shown in Plate III., Figure 1.

2d. Each train sending forward—when a requisition is made upon it by the preceding train which must be resupplied—a section which goes to the place where the train to be resupplied has been emptied. This section, after having turned over its load to the train which it is to resupply, is resupplied itself from the local resources or otherwise, and retakes its place in the main train from which it had parted when the general advance of the latter brings it up to the former.

The orders for these two movements will be given as follows:

The order relating to the general advance may be given at the same time as the order for the advance of the main columns. As a general rule, omitting the accidents resulting from the military incidents, the order for the movement is given each evening for the following day's march. If, for instance, it is a question of the march represented for the second day in diagram I. of Plate II., the order for the movement given the evening of the first day will give the cantonments of the column for the second day and also the points A1, B1, H1, where the main body of the various trains would be stationed.

It will be possible now, from the preliminary study of the theatre of operations and the information gathered by the cavalry or the advance guards, to know if it will be practicable to subsist the troops by billeting them upon the inhabitants. In that event, the order for the movement given in the evening should state whether this method should be applied as a general means of subsistence, or if it is to be used only by the detachments of the army. We

know, moreover, that for the success of this method of subsistence it is necessary that the order for it should be given in advance and that the municipal authorities should be likewise informed.

When the troops are not to be billeted upon the inhabitants, the order for the movement will indicate that an issue of rations will be made upon arrival in the new cantonments, by drawing upon the regimental train; for example, the evening of the first day the order for the second day's march will state that the issue for the evening of the second day will be provided by the regimental train; it will state undoubtedly, once for all, that the hay and straw will be bought by the corps in the places where required; as we have already shown, this will generally be easily accomplished, and, moreover, when this method is impossible, those stores must be dispensed with on account of the impossibility of transporting such bulky supplies.

But to conform to the condition imposed of calling upon the rear trains to resupply the one in advance only when it has been impossible to resupply it from the country, the order given the first day cannot state whether the administrative trains should send forward a section for the resupply of the section of the regimental train emptied by the issue in the second day's cantonments. The divisional *sous-intendants* and the supply officers upon arriving in these cantonments will proceed to make a careful reconnaissance. If the results of this reconnaissance show the impossibility of providing for the resupply of the regimental train from the local resources, then it becomes necessary to order the advance of a section of the administrative train, and such instructions will then be sent to it. If the *sous-intendants* and the supply officers have been able to precede the column under the protection of the advance guard, their reconnais-

sance can be made sooner and the order perhaps sent in time to A1 to the administrative train so that the designated section can advance in the evening even to the centers of distribution if necessary; the order sent to the administrative train will indicate which one of the three methods, numbered 1st, 2d, 3d, described on pages 118, 119, and 120, it is desired to make use of upon the arrival of the section of that train at the centers of distribution: 1st, if the section of the auxiliary train should arrive the same evening (as is shown the second day in the drawing), the order indicates the hour fixed for the issue; 2d, if the section of the administrative train is only to arrive the following morning before the formation of the column (as represented for the fourth day), the order for it need not be sent until evening, and it should indicate the latest hour the section should arrive; 3d, if the section of the administrative train is not to make the junction until after the deployment of the troops (as is represented for the fifth day), it will be likewise sufficient for the order to reach it in the evening of the preceding day, and that order should state by what hour the roads will be unobstructed by the deployment of the troops; practically this information can be given by indicating the hour the train will pass the cantonment of the rear of the column. It is understood, whatever may be the time fixed for the junction of the administrative train and the regimental train, the order will always designate the centers of supply and the roads to be followed to reach them.

In like manner, only when it is seen to be impossible to provide for the resupply of that section of the administrative train from the local resources should an order be issued to send forward a section of the auxiliary train. If, for instance, it is a question of resupplying at C section 1 of the auxiliary train, an inspection of the drawing shows that it

is sufficient to issue that order the morning of the third day, so as to make it possible to effect a junction with section 1 of the auxiliary train.

It would also appear that for the resupply of this section 1 of the auxiliary train the order for the dispatch of a requisitioned train bringing stores from the rear can be deferred until the fourth day.

The issue of rations from a section of the regimental train, made in the cantonments the second day, brings successively into action section 1 of the administrative train, section 1 of the auxiliary train, then a requisitioned train; the foregoing analysis shows that it is not at all necessary to foresee and order in advance all these movements at the same time that the order for the second day's march is issued. On the contrary, the order for the particular movement for each section to provide for the resupply can be issued whenever it is seen to be necessary, without these special movements interfering in any way with the general advance of the column and of the main trains of the various échelons.

These results, concerning the manner in which the orders relating to the subsistence service should be given, are in conformity with the directions of Articles 76 and 77 of the Regulations of January 11, 1893. They point out, however, it seems to me, the conditions of time in which these orders are given, and when they are necessary, better than Article 77 before cited, which gives the impression that all these orders may be incorporated in the general order for the day.

If it is interesting to know what are the orders that the operation of the subsistence service will necessitate and the time when these orders should be given, it is also important to ascertain positively upon whom will fall the duty of preparing, publishing, and issuing them.

At the commencement of the operation, a general order of the army will undoubtedly fix the number and composition of the columns, the assignment of the lines of march of each—in short, the general formation of the army such as we have defined in paragraph 11 of Chapter I.: upon this order is afterwards arranged the general movement of the trains which form the first of the movements in which, we have said above, the general system of resupply is divided. The movements of the regimental trains, of the administrative trains, the herds, the field bakery column when it is attached to the army corps, are in accordance with these general instructions ordered for each column by the officer commanding the column. It is also upon the general outlines prescribed by this principal order that the director of communications will determine the direction and assignment of the lines of communications—that is, the general movement which relates to the service of the line of communication and the auxiliary trains.

The duty of informing the headquarters of the possibility of adopting such method of subsistence, of providing the resupply of the regimental trains or of the administrative trains from the local resources, falls upon the *sous-intendants* of the divisions and the *intendants* of the army corps, who draw up for the headquarters and afterwards transmit the necessary orders for the movement to the administrative train when a section of the latter must participate in order to resupply the regimental train. The centers of supply where these two trains should meet are determined by the generals of the division or by the army corps commanders, according to circumstances.

When it is necessary to draw upon the auxiliary train for the resupply of the administrative train, the movement should be regulated in accordance with an agreement be-

tween the headquarters and the service of the line of communication. There are, in reality, two movements to be regarded: that of the administrative trains, which should be ordered by the commander of the unit to which the train is attached; and the movement of the auxiliary train, which should be directed by the authorities of the line of communication. Regarding the points where the two trains should meet, their designation is made by the commandants of the columns. As we have said before, the movement of the auxiliary train is directed by the proper official attached to the service of the lines of communication in accordance with the request of the commandant of the column, a request which, in addition to the kind and quality of the stores to be forwarded, should state the center of supply where the delivery will be made to the administrative train.

These arrangements are in conformity with the terms of the order of January 11, 1893, and with the Regulations of November 20, 1889, which, perhaps, are, however, not explicit in indicating the official to whom the request should be addressed. Article 57 of the regulation for the service of the lines of communications indeed declares in effect that, for one day's rations and forage, the administrative trains are supplied by the advance or temporary dépôts without requests or previous notification; but, on the other hand, Article 11 of the same regulation says that the requests for stores are made in conformity with the regulation or without the authority of the army commander, by the corps commanders to the chief of the line of communication, and that in concert these two authorities settle upon the means relating to the deliveries to be made to the army trains. These arrangements do not seem to me to be compatible with the urgent conditions which will generally accompany the demands made by the columns upon the auxiliary trains. It

would be better to say that when the corps commanders—or, better still, the commanders of the columns—have recognized the necessity of calling upon a section of the auxiliary train for the resupply of their administrative trains, they will address the necessary order direct to the commander of the advanced section of the auxiliary train which it will be the duty of the service of the line of communication to constantly maintain in position one march or one and one-half marches in rear of the columns. The chief of that section should comply immediately with that order, which the headquarters, whence it emanates, should forward in duplicate to the military commander of the advance dépôt, in order that the latter can at once send another section forward to take the place of the preceding.

The order in question will always indicate the points designated as centers of supply where the section should repair. When these points, as will generally be the case (for instance, the point C in Figure 1 of Plate II., and particularly the points C and C1 of Figure 3 of same plate), are in the zones of cantonments still occupied by the troops, the above order should always indicate the hours at which the communicating roads will be cleared by the completion of the movement of the columns, and therefore the hour the auxiliary train can make use of them.

The columns being composed of troops of two army corps and often of subdivisions belonging to several army corps—as in the example given in the formation represented by Figure 5—it is taken for granted that the above order must be given by the same authority which directed the movement of the column and not necessarily by the corps commanders, since to reach a subdivision the auxiliary trains may have to traverse the zones of subdivisions belonging to other corps.

O. ESPANET,

Sous-Intendant Militaire de 2e Classe.

PRIZE ESSAY.

The Art of Supplying Armies in the Field as Exemplified during the Civil War.

BY CAPTAIN HENRY G. SHARPE,
Subsistence Department.

From the *Journal of the Military Service Institution of the United States*, Jan'y, 1896.

The art of supplying armies in the field comprises all those means essential to procure the supplies, to store them in dépôts located at advantageous points, and to transport them to the troops. The methods of operating the lines of communication so as to expedite the transportation of supplies, materials, and troops passing along them, either going to the front or moving to the rear, are also parts of the art of supplying troops in the field.

In war a well organized, armed, and trained force should be always ready to move in any direction and prepared to give battle upon any locality that may have been selected by the commanding general, or to oppose the advance or check a flank movement of the enemy. Mobility is thus a factor of great consequence, and it follows that an army can only be endowed with equipment and supplies up to such an extent as will not impede or hinder this important factor. To make the best possible use of a force in the field it must therefore be provided with efficient and sufficient means of transport and with a practical and well-arranged system of supply.

To provide for the wants of the troops every army has

a number of administrative* departments charged with the procuration, custody, and distribution of certain description of supplies which are essential to keep the troops in health and strength, and which provide them at all times with everything that is indispensable for the furtherance of the plan of the campaign. The supply departments in our army are the Quartermaster, Subsistence, Ordnance, Pay, and Medical Departments.†

The work performed by the administrative departments of an army is divided into two distinct and separate spheres of action: 1st, the service performed in rear of the army; and 2d, that whose province is confined to the troops in the field. These two services are entirely separate, but work in conjunction with each other to carry out the main object for which they are created,—the supply and maintenance of the army.

SUPPLY SERVICE WORKING AT THE REAR.

The service in rear has two distinct duties to perform: 1st, the procuration and custody; 2d, transportation and distribution. The supplies are procured or manufactured in the national territory, or abroad, and experience proves that in order that the procuration should be more successful it should be located permanently in some place remote from

*"Men brought together in large numbers have wants; the talent to satisfy these with order, economy, and intelligence, forms the science of administration." (Marmont.)

†The duties of the different supply departments, as prescribed by laws in force during the war, are set forth in the following sections of the Revised Statutes, U. S., viz.:

Section 1133—Quartermaster's Department.
" 1141—Subsistence "
" 1164—Ordnance "
" 1188—Pay "

And an Act passed in the 2d Session of the 37th Congress and approved April 16th, 1862, prescribed the duties of the Medical Department.

the theatre of war, because it is only at a distance from such locality that commerce is able to be entered upon with advantage. These reserve supplies that are accumulated by the service in rear are intended to replace those carried with the army, and are located in such parts of the national country as are most accessible to the fields of operation, and such section of the country or place is known as the base of operations of the army.*

The base of operations of an army being that portion of a country from which it obtains its reinforcement and supplies, its selection necessarily has an influence upon the strategy of a campaign. Jomini says that it is a principle to establish the base upon those points where it can be sustained by all the resources of the country, and at the same time provide a safe retreat for the army. The dependence of an army upon its base of operations increases in proportion with its size, and therefore the influence of the base on the operations of an army is magnified as the numbers of the same are increased.

"The value of a base of operations will seldom determine the choice of an undertaking in the first instance. Mere difficulties which may present themselves in this respect must be put side by side and compared with other means actually at our command; obstacles of this nature often vanish before the force of decisive victories."†

While the selection of a base of operations should not, in general, interfere with the plan of campaign, the location and configuration of a base will affect the readiness with

*"The base of operations is most generally that of supply." (Jomini.)

"The base of operations of an army is composed of the country which it covers, which furnishes its wants, which sends to it every day the supplies of every kind which it consumes,—and which receives its sick and wounded, etc." (Marmont.)

†Von Clausewitz.

which the supplies can be procured and forwarded to an army. A base should rest on many points, as it is both difficult and dangerous to collect all the supplies in one dépôt.

The extent of the Federal base gave its armies an advantage; not only had they a variety of lines of invasion to select from, but when defeated in Virginia it was almost hopeless to attempt to intercept them. In 1862, Jackson's flanking movement cut off Pope from the upper Potomac, but could not prevent him from reaching Alexandria; and if cut off from Alexandria, he could still have retreated on Acquia and the flotilla. And in 1863, when Grant was baffled on the line of the Rapidan, he changed his base as he moved around Lee's right successively to the Pamunkey and to the James.

The supremacy at sea, and the fact that the theatre of war was largely bounded by coast line, gave the Federal Government an immense advantage. The capture of the forts at Hatteras Inlet, of Roanoke Island, Newberne, New Orleans, Fort Fisher, and Fort Pickens, the Peninsula Campaign, and the supply of the armies operating against Richmond in Grant's campaigns, were feasible mainly because of the Government's supremacy at sea.

The facility of procuring the supplies depends upon the richness and financial resources of the country and the number of men available to raise the crops and prepare the needed supplies. During the Civil War the population of the North was largely in excess of that of the South, and while it was at first considered that the slaves at the South would prove a source of anxiety and apprehension, it turned out actually that they were trusted to take care of the families where the able-bodied white men had gone to the war, and they never betrayed their trust. They were largely

engaged in building fortifications, and raised the crops upon which the entire South subsisted during the whole war. Both sides had to depend to a considerable extent on Europe for supplies of arms and ammunition. This was, of course, more true of the South than of the North, for the principal arsenals for the manufacture of arms were situated in the Northern States, but it was very much easier for the North to obtain the importations than it was for the South, as vessels containing the cargoes were obliged to run the blockade and were often captured when they attempted it.

The South, at the commencement of the war, was able to draw upon the supplies stored in the arsenals located in that section, and which had been "well stocked by the provident treason of Buchanan's Minister of War."* But when these resources were exhausted, replacement was difficult, the blockade having been established, though extraordinary efforts to manufacture the military supplies were made.

The Confederate Government enacted a law providing that a certain portion of the cargo of every vessel entering its ports must consist of arms or ammunition, otherwise vessel and all would be confiscated. This insured a constant supply; and though the soldiers were often barefoot, ragged, and hungry, they never lacked arms, nor were they defeated for want of ammunition.

Procuration.

The principal points of supply for the Federal armies for the supplies furnished by the Quartermaster's and Subsistence Departments were in the cities of Boston, New York, Philadelphia, Baltimore, Washington, Cincinnati, Louisville, St. Louis, Chicago, New Orleans, and San Francisco, and in each of these cities there were one or more

*Goldwin Smith—"The United States."—Mr. Floyd.

officers in charge of the dépôt belonging to each department, provided with ample force of clerks, laborers, and mechanics. There were large establishments at Cincinnati, Louisville, Jeffersonville, and Alexandria, in which hard and soft bread were baked by the Subsistence Department, but the greater part of the bread supplied was furnished from New York, Baltimore, and St. Louis. There were also large pork-packing establishments located at Louisville, Ky., operated by the Subsistence Department.

The principal dépôts for the purchase and manufacture of clothing were at Philadelphia, New York, Boston, Cincinnati, Louisville, Indianapolis, St. Louis, Detroit, and at Springfield, Ills. When the Rebellion first compelled the Government to call out a large force, the stock of clothing on hand in the dépôts, being intended only for the supply of the regular army, about 13,000 strong, was inconsiderable. The manufacture of cloth for army clothing was engaged in by few factories throughout the country, and the stock of clothing was at once exhausted; there was also great scarcity of suitable blankets and undergarments.* The troops being received generally through State authorities, these authorities were engaged to assist the Quartermaster's Department to provide the necessary supplies. Large impor-

*"Under these circumstances, and to supply the immediate and absolute necessities of the suffering troops, large quantities of such materials as could be found in the market in the hands of the dealers and manufacturers—materials manufactured for the ordinary clothing of the people—were purchased and made up. In some cases these articles were redyed, of the uniform colors, light and dark indigo blue; but the greater part of the gray, brown, and black cloths purchased were made up in those colors. * * * * When the troops came in contact with the enemy on thickly wooded fields, mistakes occurred. The rebel forces were generally clothed in gray, and our own troops, in some cases, fired into each other. This caused orders to be issued, both by the Eastern and Western commanders, prohibiting the issue or use of clothing of any but the established uniform colors, light and dark blues." (Report of the Quartermaster-General, November 18, 1862.)

tations were made by merchants, and the goods thus imported were bought by the State authorities and by the Quartermaster's Department, and manufactured by contract, or in the establishments of the department, into clothing.

A very large proportion of the ordnance supplies was manufactured in the arsenals, foundries, and armories throughout the North, of which there were twenty-eight in number. The most important ones were located upon railroads or water-ways. Some of these arsenals were devoted to special work, as, for instance, iron gun carriages were manufactured at Fortress Monroe, Va., and Watertown, South Boston. Wood carriages were manufactured at Watertown, Watervliet (Troy, N. Y.), Allegheny City, and Washington, D. C. Harness was made at Watertown and Watervliet. The principal repair shops, especially for small arms, were at St. Louis, Mo., and Washington, D. C. Compressed bullets were made in the arsenals at St. Louis, Washington, and Allegheny City, and large quantities were also furnished by private factories. Ammunition was prepared at all the arsenals except that of Fortress Monroe. Guns were cast in the foundries at Pittsburgh, Reading, Cold Spring, South Boston, and Providence. The armory at Harper's Ferry having been destroyed to prevent its occupation and use by the rebels, the Government was compelled to rely upon the single armory at Springfield, and upon private establishments for a supply of arms. The capacity of that armory was largely increased until it was capable of producing several thousand stands of arms per month. The demand for arms caused the establishment of numerous manufactories throughout the Northern States, and these were encouraged by the Government.

Combinations among manufacturers, importers, and

agents, for the sale of arms, caused a great advance in prices, and to prevent advantage being taken of the necessities of the Government, the Customs officers were directed to deliver to Government agents all arms and munitions that were imported into the country.

The Ordnance Department likewise furnished all the horse shoes and nails used in the army during the war. The powder was furnished by private manufacturers, the Ordnance Department being charged with the duty of making the necessary proof upon its receipt. The purchase of arms abroad continued until 1863, by which time the manufacturers of Pennsylvania succeeded in furnishing suitable iron and steel for the purpose of manufacturing arms.

Prior to the war the production of minerals at the South was insignificant—in fact, the great mineral wealth of that section was not then known; and no manufactories or foundries were situated in that region, as the institution of slavery was more particularly concerned with agricultural pursuits, and the South was supplied with machinery and everything that it required from factories and mills in the Northern States. The establishment of the blockade cut off the possibility of supply from European markets, and thus compelled the Confederate States to rely upon the ingenuity and skill of their inhabitants to produce the supplies of all kinds required. The iron mines in Georgia and Alabama were operated on an extensive scale and yielded all the iron used in the manufacture of guns and projectiles. The Tredegar works, near Richmond, were the largest iron mills in the South, and at that establishment cannon and projectiles of every calibre were manufactured.

A few of the machines in the Harper's Ferry armory were saved by the Confederates from the fire, and were forwarded to Richmond, where they were set up.

Nearly all the Confederate States established such factories as were needed, all of which were eventually placed under the exclusive control of the Confederate Government. Shops for the remodelling of old guns and the manufacture of Minié rifles were established at Memphis, New Orleans, Nashville, Gallatin, Richmond, and many other places.

At Dahlonega, Georgia, was located the principal powder mill of the rebels; and their factories for percussion caps were in Richmond. At first the cartridge factory was at Memphis, but was later moved to Grenada.

All the horses and mules used in the army were purchased by the Quartermaster's Department; in consequence of very decided objections raised by the cavalry officers, a Cavalry Bureau was established in 1863 by General Orders No. 236. This bureau was charged with the organization and equipment of the cavalry forces of the army and with the duty of providing for the mounts and re-mounts of the same. The purchase of all horses for the cavalry service were to be made by the officers of the Quartermaster's Department under the direction of the chief of the Cavalry Bureau, and dépôts were directed to be established for the reception, organization, and discipline of cavalry recruits and new regiments, and for the collection, care, and training of cavalry horses, which dépôts were to be under the control of the Cavalry Bureau. In consequence there were established, by authority of this order, dépôts at Gisboro', D. C., St. Louis, Mo., Greenville, La., Nashville, Tenn., Harrisburg, Pa., and Wilmington, Delaware. The Gisboro' dépôt was the principal one for the supply of the armies in the Atlantic States, and it occupied a farm of about 625 acres and had a capacity of providing for 30,000 animals at the dépôt, but not more than about 20,000 were ever on hand there at any one time. During the first nine months of 1864 the supply

of horses by the Cavalry Bureau averaged about 500 per diem. The supply of fresh horses to General Sheridan's army during his campaign in the valley of the Shenandoah was at the rate of 150 per diem. Large corrals for the reception of beef cattle were also established at various points, notably at Louisville, Kentucky, which corral could accommodate between 30,000 and 40,000 head; there was likewise a large corral at Alexandria, Va.; and a large herd was kept on what is now the Monument grounds in Washington, D. C.

There are two methods of procuring the supplies required for an army:

1st. By entrusting to contractors the entire work of collecting and delivering them to the troops; and,

2d. By direct purchases made by designated officers of the supply departments.

In the first method the supply departments simply exercise an administrative scrutiny over the contracts made with various firms or individuals.

The defects of this system are universally acknowledged, and it has been the cause of disastrous failures in every army in which it has been adopted. Under this system the success of the most important military operations is dependent upon men who are subject to no military responsibility; and it is often to the interest of the contractor to fail at the most critical juncture, when the means of supply become the most difficult and expensive. Contracts are never fulfilled to the letter, and never will be, so long as avarice exists. General Scott said: "The method is believed to be impolitic, and is vicious in time of war; also liable to many objections in a state of peace. The principal only is known to the War Office, and therefore may be supposed to be free from this objection; but his deputies and issuing agents are appointed without the concurrence or

knowledge of the general or the Government. The deputies or issuing agents are necessarily as well acquainted with the numerical strength of the army to which they are attached as the Adjutant-General himself. For a bribe they may communicate this intelligence to the enemy, or fail to make issue at some critical moment, and thus defeat the best views and hopes of the Commander-in-chief." From the close of the Revolutionary War until after the close of the War of 1812 "the mode of subsisting the army by contracts for complete rations had remained substantially unchanged, but various instrumentalities and combinations of instrumentalities for carrying it into execution had been adopted. Throughout all these changes the result had been uniformly the same—failure."*

By the second method, the officers of the supply departments purchase either in open market, or after making a contract with dealers for the delivery of the supplies, and upon acceptance the supplies are forwarded by the Government to the places where required. The advantage of this system is that it is possible to accumulate the supplies in a distant locality without the likelihood of the enemy's hearing of the same and thus obtaining information regarding a contemplated movement. Furthermore, by this system it is possible to, in a measure, prevent any combinations on the part of dealers to advance the prices of supplies.

The Army Regulations and Acts of Congress in force during the Civil War required, in general, the purchase of all supplies for the army to be made under contract; and Section 16 of an Act approved July 17, 1862, provided that any person who contracted to furnish supplies of any kind or description for the army or navy should be deemed as a part of the land or naval forces and subject to the rules and

*Barriger.—"Legislative History of the Subsistence Department."

regulations for the government of the same. In case such contractor should be found guilty of fraud or willful neglect of duty, the above cited section provided that he should be punished as the court-martial should direct.

The fresh beef was generally furnished on the hoof, and purchased under contract. During the war the troops on the coast of the Carolinas and also the Gulf posts, including New Orleans, received their fresh beef by shipments of the animals from New York; and Louisville and Nashville were the supply points for the armies operating in that section.

The pay of the army was provided by appropriation made by Congress. The enormous sums which were disbursed during the war necessitated some extraordinary means of the Government's raising the same, as the mere fact of a war of that character tends to diminish very largely the ordinary receipts of the Government.

"Modern warfare, with its principle of an uninterrupted and regardless employment of all competent forces, would scarcely be conceivable without subscription loans, by which loans the requisite funds are procured."*

Congress met at the call of the President on July 4, 1861, and on the 17th passed a bill for the issue of bonds and treasury notes to the amount of two hundred and fifty million dollars.† It also increased the duties on many articles, passed an act for the confiscation of property of rebels, and levied a tax of twenty million dollars, apportioned among the States and Territories. The interest-

*Von der Goltz.—"The Nation in Arms."

†In August, 1861, Secretary of the Treasury Chase held a conference with several of the principal bankers of New York, Boston, and Philadelphia, to negotiate a National loan, and when it looked as if negotiations might fail, the Secretary stated that he would return to Washington and issue notes for circulation, "for it is certain that the war must go on until the rebellion is put down, if we have to put out paper until it takes a thousand dollars to buy a breakfast."

bearing debt of the Government in 1865 was considerably over two thousand millions of dollars.

The Confederate Government likewise issued large amounts of paper money, which was to be redeemable six months after the ratification of a treaty of peace with the United States. The South early resorted to requisition and confiscation; the unconvertible bank bills which it issued in vast volumes* speedily lost all value, and the Confederate soldiers waived the farce of being paid in them. The South disposed of its bonds among its European friends; and at the close of the war, when, of course, these bonds could not be paid, "their holders were thus fined for abetting or confiding in a slave power."†

The central dépôt for the supply of the Medical Department was at Philadelphia, with storehouses at New York, Philadelphia, Baltimore, Cincinnati, Louisville, St. Louis, Memphis, Nashville, Chicago, San Francisco, Hilton Head, Salem, Fortress Monroe, Newberne, New Orleans, and Washington. There were in the United States at the termination of the war over two hundred general military hospitals, containing 136,894 beds. When the condition of a patient in general hospital was so far improved as to render a relapse improbable, he was sent to a camp of convalescents, of which there were several situated throughout the North, at places from which transportation to the theatres of war was comparatively easy. When the men had entirely recovered their health and strength, they were armed and returned to

*By November, 1864, the Confederacy had issued over four hundred millions of dollars of treasury notes, which were selling at sixty to one for specie at the treasury. The supply of specie, February 15, 1864, was but seven hundred and fifty thousand dollars. Bonds and certificates were not salable, taxes were with difficulty collected. (Campbell, Assistant Secretary of War of the Confederate States.)

†Goldwin Smith.

duty in detachments of sufficient force to resist attacks by guerillas.

In preparing supplies for a campaign the following points are to be considered:

1. Their composition.
2. The probable daily consumption, and the number of days' reserve to be accumulated.
3. Where, and by what date they must be ready.
4. Whence are the supplies to be obtained, and how are they to be conveyed to their destination?
5. How are the expended supplies to be replenished?

During the war the ration was composed as follows: twelve ounces of pork or bacon, or, one pound and four ounces of salt or fresh beef; one pound and six ounces of soft bread or flour, or, one pound of hard bread, or, one pound and four ounces of corn meal; and to every one hundred rations, fifteen pounds of beans or peas, and ten pounds of rice or hominy; ten pounds of green coffee, or, eight pounds of roasted (or roasted and ground) coffee, or, one pound and eight ounces of tea; fifteen pounds of sugar; four quarts of vinegar; one pound and four ounces of adamantine or star candles; four pounds of soap; thirty pounds of potatoes, when practicable, and one quart of molasses. Desiccated compressed potatoes or desiccated compressed mixed vegetables could be subtituted for beans, peas, rice, hominy, or fresh potatoes, at fixed rates.*

*"During the Atlanta campaign we were supplied with all sorts of patent compounds, such as desiccated vegetables, and concentrated milk, meat biscuit, sausages, but somehow the men preferred the simpler and more familiar forms of food, and usually styled these 'desecrated vegetables and consecrated milk.'" (Sherman, II., 391.) The method of preserving food products in hermetically sealed tin cans was but little used until after the close of the Civil War; it has now been brought to such perfection that all military authorities agree, preserved and prepared foods and forage must be largely used in the future by armies in the field.

Von der Goltz says: "Provisions which are best, and at the

The allowance of clothing was fixed by regulations and the men drew such as was necessary, but were by orders obliged to carry certain articles in their knapsacks; many officers reported the tendency of the men to throw away the knapsacks on the march; and when they were taken off prior to going into battle they were seldom again recovered.

Fuel is one of the most essential of all the supplies required by an army in the field, and on account of its great bulk is very difficult of transportation. In a well-wooded country, and when on the march, it is a comparatively easy matter to supply the fuel required solely for cooking purposes, but when the army remains stationary for any length of time the difficulty increases, and when it goes into winter quarters the task becomes one of the greatest importance

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same time most agreeable to the soldier, are always those that are fresh. * * * But fresh provisions have this disadvantage, that they take up a comparatively large space, that they easily go bad, are difficult to keep, and are difficult to cook. * * * How often does it happen in war that just when the water has begun to boil in the pots, an alarm is raised, and a start must be made. No attempt to cook fresh provisions should be made, unless it is certain that the troops will be undisturbed. Artificially prepared provisions are accordingly an excellent makeshift. They take up but little room, and are not nearly so heavy as the fresh, so that the soldier can carry far more without being burdened by a greater weight. A handful of compressed coffee squares, or a few bars of compressed soup and vegetables, thrown into the knapsack, do not inconvenience, and in the hour of need they can form refreshment and nutriment for a considerable time. Nothing is required save boiling water, for all the various condiments have been already added to the small bodies. A few minutes are sufficient to prepare them, and their preparation requires no knowledge or especial dexterity. The food remains clean and does not become bad."

Colonel Maurice, in his article on "War" in the Encyclopædia Britannica, gives, as one of the modern conditions affecting strategy, "the facility afforded for the supply of armies by compressed food and compressed forage."

Von Schellendorf says: "The problem of feeding an army in the field has again in recent years been facilitated by the use of railways and the partial substitution of preserved for fresh provisions." It must be remembered, however, that canned meats, barrelled pork, bacon, etc., require an increase of transportation, as only cattle on the hoof furnish their own.

and the supply most urgent. The theatres of operation during the Civil War were generally well wooded and the troops provided the fuel by their own labor. The fields in the different theatres of operation were generally enclosed by the ordinary "rail" fences, and the order published in the early part of the war authorizing the use of the "top" rail of the same for fuel, speedily caused the obliteration of all such landmarks. Troops not in the enemy's country were provided by contract made by the Quartermaster's Department.

The fuel required for the large fleet of ocean steamers was purchased by contract principally at Philadelphia and Pittsburgh, and that required by the steamboats on the Mississippi and tributary rivers was cut by contract along the banks of those rivers. The freedmen were employed to cut the wood, and thus were given much-needed occupation, and in this way a fund was created sufficient to clothe, feed, and house them.*

The supply of water to troops in the field is sometimes a most difficult problem, and particularly so in a desert country. Under such circumstances arrangements must be made to transport a supply for the men and animals. "It might be possible on an emergency to do without firewood and straw, but water is absolutely necessary. It must be good, sufficient in quantity, and accessible."†

During the war the troops were enabled to obtain an abundant supply of water from the numerous streams which intersected the country; though the quality was in many instances very bad and was the cause of much sickness, but it was not necessary for any department to arrange for a supply of this most necessary article, except at such enormous establishments as the cavalry dépôt at Gisboro', D. C.

*Grant's Memoirs, Vol. I., page 426.

†Clarke.—"Staff Duties."

The forage ration was fourteen pounds of hay and twelve pounds of oats, corn, or barley. For mules, fourteen pounds of hay and nine pounds of oats, corn, or barley.

The supply of small-arm and artillery ammunition must be ample to enable a general engagement being entered into, even if the same is brought on unexpectedly.

The daily consumption of supplies will be governed by the number of troops, camp-followers, and animals to be provided, and whether active operations are undertaken in which general engagements are to be brought on.

"He who, according to directions, calculates the needs of an army in the field by pounds, and provides for it according to the most careful dispositions, certainly will scarcely ever run the risk of a portion of the supplies he has furnished being spoiled. But the army will suffer by this arrangement. Two and three times as much as an army needs must be supplied, if it is to be kept from want; double and treble in respect of the good quality of the provisions, double and treble of the quantity."*

From May 1st until August 12th, 1864, the daily average number of rations forwarded from Chattanooga to Sherman's army, which numbered about one hundred and five thousand men, was four hundred and twelve thousand—more than three rations for every man that left Chattanooga on that campaign.†

Transportation.

The second subdivision of the duties performed by the service acting in rear consists of transportation and distribution. The following are the means of transport which are at various times available for use in forwarding supplies to armies in the field:

1. Railroads.

* Von der Goltz.

†Symonds.—"Report of a Commissary of Subsistence."

2. Steamers, sailing vessels, boats by sea, on rivers, lakes, or canals.

3. Wagons or pack-animals on ordinary roads.

Railroads.—The employment of railroads in war tends to increase that important factor of the mobility of the troops. It is fully acknowledged that without their aid it would be next to impossible to supply regularly the large armies that would be employed in wars at the present age.

"In a country with numerous lines of railway and vast quantities of rolling stock ready at hand, there are immense possibilities of attack or defense, provided it possesses competent military force. Great bodies of men and material can be moved over extreme distances at a very brief notice, by a vigorous government, directed by the necessary skill and ability. To make the result of full value, however, both men and material must be on hand in entire readiness and fitted for instant use in advance of the movement."*

When railways pass directly from the national territory into that of the enemy, as was the case during the Civil War, they can carry the resources of the former right through, in which case its territory usually becomes a great base of operations. The facility of transport afforded by railways renders the establishment of great magazines at the junction of important lines a comparatively easy one, "but the same principle as before must govern the selection of points on which to establish magazines, and the direction of the lines of supplies."†

"It is thus evident that railways have become the true military roads of an army, and that their location in the future will have a determining influence on the plans of campaign to be adopted."‡

*Holabird.—"Transportation of Troops and Supplies."

†Hamley.—"Operations of War."

‡Michie.—"American Military Roads and Bridges."

Early in the war the Government realized the importance of utilizing the railroads for transportation of troops and supplies, and on January 31, 1862, Congress passed an Act which authorized the President, when in his judgment the public safety required it, "to take possession of any or all railway lines in the United States, the rolling stock, their offices, shops, buildings, and all other appendages, and to prescribe rules for using and maintaining, and to extend, repair, and build the same in the manner most conducive to the interests of the Government, and to place under military control all officers, agents, and employés belonging to the lines, so that they shall be considered as a post-road and a part of the military establishment of the United States, subject to all the restrictions imposed by the rules and articles of war." The same act imposed severe penalties on any person resisting or interfering in any manner with the unrestrained use by the Government of such property, and provided further, "that the transportation of troops, munitions of war, etc., throughout the United States, shall be under the immediate control and supervision of the Secretary of War, and all such agents as he may appoint."

On February 11, 1862, by order of the President, a military director and superintendent of railroads in the United States was appointed (D. C. McCallum), with authority to take possession of, hold, and use all railways, engines, cars, locomotives, equipments, etc., that were required for the transport of troops, arms, ammunition, and military supplies of the United States. At the time General McCallum assumed his duties indicated above, there was only one railroad in the possession of the Government, that from Washington to Alexandria, which was seven miles long.

It was not found necessary to exercise within the loyal States the power conferred upon the President by law, to

take actual military possession of the railroads of the country, but a uniform tariff for Government transportation was made with the officials of the different railroads. Some of the railroads within the theatre of military operations—as the Baltimore and Ohio, the Louisville and Nashville, and the Missouri railroads—repaired their bridges, restored their track, and replaced their rolling stock at their own expense. Others, abandoned by their disloyal owners and managers, were taken possession of, repaired, stocked, and managed by the Quartermaster's Department.

As the war progressed, the nature, capacity, and value of railroads were better understood on both sides, and systematic and determined efforts were made against the lines used for transporting supplies for the Federal armies. The destruction of track and bridges was greater each time the roads passed within the enemy's lines, and extraordinary efforts had to be made to meet it.

A small construction corps, numbering three hundred, was at first formed; this was later enlarged, until at the end of the war it numbered nearly ten thousand men. Storehouses were established at principal points, with an ample stock of tools and materials for making needed repairs. This construction corps was at all times prepared for any emergency, either to build bridges of great length and dimensions, or lay miles of track or repair damages done by guerrillas and raiding parties. The attacks on the line in rear of the army were of such frequent occurrence and often of so serious a character that to insure speedy repairs it was at various points along the different roads operated, and also to collect supplies of construction material, such as iron rails, chairs, spikes, cross-ties, and bridge timbers, at points where they would be comparatively safe and easily obtained when required.

Seventeen hundred and sixty-nine miles of military railroads* were, during the war, repaired, stocked, and operated by the agents of the Quartermaster's Department, under the energetic supervision of General McCallum. In

*I.—The Following Roads Were Operated in Virginia.

Name of Line.	Terminal Stations. From	To	Length in Miles.
Alexandria and Washington	Alexandria,	Washington,	7
Alexandria, Loudon & Hampsh.	Alexandria,	Vienna,	15
Orange and Alexandria	Alexandria,	Rappahannock,	51
Manassas Gap	Manassas,	Piedmont,	34
Norfolk and Petersburg	Norfolk,	Suffolk,	23
Seaboard and Roanoke	Portsmouth,	Suffolk,	18
City Point and Army	Pitkin Sta.,	Humphrey,	13
Southside	City Point,	Burkeville,	62
Richmond and Danville	Manchester,	Danville,	140
Winchester and Potomac	Harper's Ferry,	Stevenson,	28
Richmond and Petersburg	Petersburg,	Manchester,	21
Clover Hill Branch	Clover Hill Sta.,	Coal Mines,	18
			430

II.—The Following Roads Were Operated in the Division of the Mississippi.

Name of Line.	Terminal Stations. From	To	Length in Miles.
Nashville and Chattanooga	Nashville,	Chattanooga,	151
Nashville, Decatur & Stevenson	Nashville,	Stevenson,	200
Nashville and Northwestern	Nashville,	Johnsonville,	78
Nashville and Clarksville	Nashville,	Clarksville,	62
Shelbyville Branch	Wartrace,	Shelbyville,	9
Chattanooga and Knoxville	Chattanooga,	Knoxville,	112
Knoxville and Bristol	Knoxville,	Carter's Sta.,	110
Cleveland and Dalton	Cleveland,	Dalton,	27
Chattanooga and Atlanta	Chattanooga,	Atlanta,	136
Rome Branch	Kingston,	Rome,	17
Atlanta and Macon	Atlanta,	Rough and Ready,	11
Memphis and Charleston	Memphis,	Pocahontas,	75
Mississippi Central	Grand Jct.,	Tallahatchie Riv.,	48
Mobile and Ohio	Columbus,Ky.,	Union Cy., Tenn.,	26
			1062

III.—The Following Lines Were Operated in North Carolina

Terminal Stations. From	To	Length in Miles.
Morehead City	Goldsborough	85
Wilmington	Goldsborough	95
Goldsborough	Raleigh	48
		228

The only line in Arkansas used for military purposes was a portion of the Memphis and Little Rock Railroad between Duvall's Bluff, on White River, and Little Rock, forty-nine miles long.

the repair of so many miles of railroads great quantities of iron, burned and twisted by the contending forces, both of which destroyed railroads which they were obliged to abandon, fell into the possession of the Federals. To make this iron serviceable in the repair of the railroads leading to Atlanta and the Gulf, after the capture of Chattanooga, the rolling mill there was completed, and the twisted rails rerolled at a cost of about fifty dollars per ton; thus effecting an enormous saving, as new rails delivered in Chattanooga cost about one hundred and forty-five dollars per ton. The supply of rails for new lines, or extension of old ones, in the eastern portion of the theatre of operations, was obtained by purchase, manufacture, and by taking up lines unnecessary for military purposes in that section.

The celerity with which the Federal forces repaired the roads was marvelous. Early in October, 1863, the Orange and Alexandria railroad was thoroughly destroyed by the rebels from Manassas Junction to Brandy Station, about twenty-two miles. Repairs were commenced the 23d of October, and, among other works, the Rappahannock River bridge, 625 feet long and 35 feet high, was rebuilt in nineteen working hours.

During Sherman's advance from Chattanooga to Atlanta at no time were the railroad trains more than five days behind the general commanding. The reconstruction of the bridges over the Etowah and Chattahoochie are unparalleled feats of military construction. The Etowah bridge, 625 feet long and 75 feet high, was rebuilt in six days by six hundred men of the construction corps.

The Chattahoochie bridge, 740 feet long and 90 feet high, was rebuilt in four and a half days by the same number of men belonging to the corps. The repairs of the various railroad lines were accomplished so rapidly as to almost

justify the statement of a Confederate that "old Sherman carries a *duplicate* tunnel along."*

The principal factors in the transportation of armies and supplies by rail are the following:

1. The capacity of the train.
2. The time necessary for loading.
3. The time interval between trains.
4. The rate of running.
5. Time required in unloading.
6. Number of railways available.

On a railroad which is employed for the transportation of troops and supplies, the ordinary freight and passenger service will be considerably disturbed, and at times even it may be necessary to entirely suppress them.

In April, 1864, when making preparations for the Atlanta campaign, Sherman found the capacity of the railroads from Nashville forward to Decatur, and to Chattanooga, so limited that on April 6th he issued an order† restricting the use of the railroad plant to transporting only the essential articles of food, ammunition, and supplies for the army proper, and cutting off all civil traffic. The commanders of posts within thirty miles of Nashville were required to haul the stores for their commands from that place in wagons; the troops forwarded to the front were obliged to march, and the beef cattle were driven in herds.

While a railroad may, during the period of preparing for a campaign, be devoted exclusively to transportation of supplies, when active operations commence, the reverse is frequently the case, as the fighting line needs to be at once and strongly reinforced with men.

When the number of railway lines, which can be used

*Sherman's Memoirs, II., 151.

†G. O. No. 6, Hdqrs. Military Div'n of Miss., April 6, 1864.

as lines of communication during a campaign, is sufficient, it is advisable to assign each line for the supply of one or more designated corps; where several armies act in conjunction, such assignment is particularly desirable whenever it is possible.

When the armies of the Ohio, Cumberland, and Tennessee were in the vicinity of Chattanooga (from March to May, 1864) preparing for the Atlanta campaign, the supplies were forwarded from Louisville to Nashville by rail and also by the Cumberland River. General Thomas, as commanding general of the Department of the Cumberland, exercised absolute command and control over the railroads in his department, and the other armies thought that his (General Thomas's) army received more than its share of the supplies and other advantages of the railroads. "I found a good deal of feeling in the Army of the Tennessee on this score, and therefore took supreme control of the roads myself, placed all of the army commanders on an equal footing, and gave to each the same control, so far as orders of transportation for men and stores were concerned."*

Water Transport.—While transportation by rail is liable to innumerable interruptions caused by obstruction or destruction of the railroad lines, and is further limited by the number of trains that can be sent over the line in any given time; transports by water, on the other hand, are liable to none of these accidents, except that caused by ice, when once the command of the water-course has been secured. There is, moreover, no limit to the capacity of a lake or navigable river, so long as there are boats in sufficient number; but a railway, especially a single-track railway, may be overcrowded. An ordinary Ohio River steamer, carrying both passengers and freight, has a capacity of

*Sherman's Memoirs, II., 9.

about five hundred tons. To supply forty thousand men and eighteen thousand animals requires about two hundred and sixty tons daily; therefore, one such steamer would carry supplies for such a force for nearly two days. Jomini says that rivers are excellent lines of supply and powerful auxiliaries in the establishment of good lines of operation, but never the line itself.

The country commanding the sea by its naval force is only limited as to the amount of stores that it can transport by the capacity of the vessels it has at command.*

The demand upon the Quartermaster's Department compelled it to employ not only the fleet which it had gradually acquired by purchase, but nearly every new steam vessel built in the United States for ocean traffic.

The steamboats used on the rivers, etc., were either constructed or purchased by the Government, or captured from the enemy, or impressed under military necessity, either from disloyal or loyal owners, or they were chartered at fixed rates. The vessels in all the above cases being sometimes run by crews in direct Government pay, sometimes by individuals under contract with the Government to man, victual, and equip, and sometimes run by the crews found on board, whose services were impressed with the vessels, and who were paid by the owners.†

On the 17th of March, 1862, the transportation of the Army of the Potomac to Fortress Monroe for the Peninsula

*The Quartermaster's Department had in charge during the war, for use on the ocean and lakes, 394 vessels, having a gross tonnage of 137,006 tons. There were 238 vessels employed on the ocean and lake service *owned* by the Government, having a tonnage of 165,248 tons.

†There were 119 steamers, 305 barges, and 109 coal drayage boats and railroad floats belonging to the United States on the Mississippi River and its tributaries and at Mobile, Alabama. There were 1750 steamers and other vessels chartered on the Mississippi and its tributaries by the Quartermaster's Department.

campaign was commenced. 125,000 men, 14,592 animals, and 44 batteries of artillery, and the wagons and ambulances, pontoon trains, and enormous equipage required for an army of such magnitude, were transported in about four hundred steamers and sailing craft. Later, during Grant's campaign against Richmond, a large fleet was constantly employed in supplying the armies and the troops at the various stations along the coast from the Chesapeake to New Orleans.

The greater part of the stores intended for the supply of Sherman's army on the completion of its march to the sea, were sent to Port Royal Harbor, there to await his arrival at some point on the coast of the Carolinas or Georgia, and transports were dispatched to Pensacola with supplies to await the arrival of the troops, in case some unexpected opposition compelled General Sherman to turn his course to the South. When he appeared in the rear of Savannah and captured Fort McAllister by a *coup de main*, and communicated with the naval squadron, the transports were sent around by the Ogeechee and Savannah rivers, and light-draught steamers suitable for use on the rivers, which had been dispatched on the first news of his approach, arrived in time to transfer to the river landings the clothing, camp and garrison equipage, quartermaster's stores, forage, and provisions which had been sent in sea-going vessels, both sail and steam, and which were of too heavy draught to enter the Ogeechee or Savannah rivers at that time, as obstructions in the channel were not entirely removed.

Wagon Transports.—The introduction of steam as a motive power has effected a remarkable change in the water and land transport throughout the world. But even where these improved means of locomotion are plentiful, an army requires, also, other means of transport on account of

the constant shifting of direction of military operations, the destruction of railway lines, and the necessity of distributing what the railways, steamboats, and steamships carry in bulk.*

The wagon trains used in the Federal armies during the war were the results of long experience and operations upon the Western plains. The wagons and harness were the model so successfully used there in the movements of the troops upon the high and narrow plains at the base of the Rocky Mountains and along the rough defiles of that great chain. Portable forges, with boxes of smiths', wheelwrights', and saddlers' tools, accompanied all the larger divisions of the trains, and spare parts of materials for repair were carried with them; thus any ordinary repairs could be made during the night halt.

The experience of the war convinced all officers of the Quartermaster's Department that for army trains mules† are much superior to horses, and in the latter part of the war horses almost entirely disappeared from the trains, being transferred to the cavalry or artillery and replaced by mules.

General Ingalls, the Chief Quartermaster of the armies operating against Richmond, in his report for the fiscal year ending June 30, 1864, says: "I have, during the year, frequently reported my views as to the best and proper means of transportation for an army. I do not think that the kind and amount now furnished these armies could be improved

*"Much suffering has been caused by the impossibility of furnishing supplies to the wounded, when those supplies were within a few miles of them in great abundance." (Report of the Surgeon-General, dated November 10, 1862.)

†"This country produces in great abundance, and of the best quality, one of the most valuable animals in the world for purposes of war—the army mule." (Holabird.—"Army Wagon Transportation.")

upon. The common six-mule wagon has proved to be the most economical and durable for years past of any ever tested."

In order that the enormous streams of supply may be uninterrupted, the wagon roads should be of the best construction, drained, hard, and smooth. Up to the time of the Civil War but little attention had been given to the wagon roads throughout the country. The ordinary dirt roads over which the armies moved during that war were soon cut up by the heavy traffic to which they were subjected, and in wet weather they became absolutely impassable. General McClellan, in his report of the Peninsular campaign, tells us: "On the 15th and 16th (May, 1862) the divisions of Franklin, Smith, and Porter were with great difficulty moved to White House, five miles in advance; so bad was the road that the train of one of these divisions required thirty-six hours to pass over this short distance."

After the battle of Chickamauga the Army of the Cumberland was encamped in and around Chattanooga. Its line of communication, along the south bank of the Tennessee, with its dépôt at Bridgeport, was broken by the rebels; and furthermore the destruction of the railroad bridge at that place interrupted the communication with Nashville, the base of supply. The wagon trains were thus obliged to move by a circuitous route along the bottom lands of the Tennessee and Sequatchie valleys and then to cross Waldron's Ridge by very steep, narrow, and rough roads. Until the rains commenced, the roads were practicable, though difficult; but early in October (1863) they became impassable, and the rebel cavalry, having crossed the Tennessee above Chattanooga, attacked the trains, entangled in the mud of the Sequatchie valley and the rocks of the western slope of Waldron's Ridge, and destroyed about three hun-

dred wagons, and killed or captured eighteen hundred mules.

The roads leading from the main dépôt of supply of an army to the several corps, divisions, brigades, and other subdivisions of the same, were especially liable to be rendered unserviceable and impassable. To remedy this recourse was had to "corduroying" the roads.

Intimately associated with the maintenance of roads is the bridging of rivers, streams, and torrents, as an impassable stream or a swollen torrent may lead to unfortunate results, by delaying the advance of very much needed reinforcements, or of very urgent supplies.

Pontoon trains accompanied all the armies in the Peninsular campaign, and "the pontoons were used in discharging quartermaster and commissary stores at Ship Point; in disembarking General Franklin's command at West Point, and in constructing bridges over Hampton Creek, the stream in front of Yorktown, and upper Chickahominy."* "During the year 1863 the pontoon trains accompanied the army in all its marches backward and forward through Virginia, frequently bridging the Potomac, Rapidan, and Rappahannock. * * * During the campaign of 1864, trains composed of fourteen pontoons and two trestles accompanied each of the three army corps of the Army of the Potomac."†

SUPPLY SERVICE WORKING IN THE FIELD.

In order to insure the continuity of the service of supply for troops in the field, that is to say, the connection between the troops during the operations of war and the centres of production in rear of the army, there are officers, with necessary assistants, belonging to the various departments of sup-

*Michie.

†"Organization of the Bridge Equipage of the United States Army."—War Department, 1870.

ply, attached to each of the different organizations of an army.

On June 24, 1861, General McDowell was authorized to divide his army into brigades and divisions. By an order of the President, dated March 8, 1862, the Army of the Potomac was divided into corps; similar organizations existed in the other Federal armies. Each regiment had an officer with the rank of lieutenant who was charged with the duty of obtaining supplies from the different supply departments for the troops in the regiment. Each brigade consisted of two or more regiments, and had an officer assigned to it from each one of the supply departments, who was designated as brigade quartermaster, commissary, etc., respectively. Such officers received, took charge of, and transferred to the proper officer all property and supplies furnished for the use of the brigade. The brigade quartermaster also had charge of the baggage train, material and animals. Each division consisted of two or more brigades, and had officers known as the division quartermaster, commissary, etc., to perform duties relating to the division similar to those attributed to a brigade. When several divisions were organized into a corps, a chief quartermaster, commissary, etc., were designated; these officers had the general superintendence of the affairs of their departments within the corps. When several corps were united into an army, there were officers appointed, designated as chief quartermasters, commissaries, etc., for the army. The medical service was under the supervision of the medical director, who had one assistant. Each corps had its medical director; each division, a chief medical officer; and each regiment, one surgeon, two assistant surgeons, and a hospital steward. Each of these officers exercised general supervision over the conduct of the officers and agents subordinate

to him and within his command. Each received his orders and instructions from the commander of the body of troops to which he was attached, and also from his immediate superior in his own department.

The difficulties of supplying armies in the field are mainly caused by their state of concentration and by their constant change of locality. The supply of an army in the field is dependent upon, first, the resources of the country forming the theatre of operations, in the way of food, forage, transport, and communications; second, on the time of year and the climate; third, on the nature of the war, whether offensive or defensive; fourth, on the character, condition, length, and number of the lines of communication; fifth, on the rapidity of the movements; sixth, on the propinquity of the enemy and the temper of the inhabitants.

"A general should neglect no means of knowing in advance and in its details the country in which he is going to make war. He should procure its most accurate statistics; he should know in what its resources of every kind consist. * * * The least negligence in this study may have the gravest consequences."*

At the outbreak of the Civil War there were few if any good maps of the theatre of operations, and the science of statistics had not then received much attention in this country, consequently the knowledge of the resources of the theatre of war was very imperfect. Later on very accurate information was obtained of the location of the various flour mills and other centres of production of food and other supplies.

The Civil War was really a war of conquest and of invasion. "The North, therefore, if it undertook to fight for the reëstablishment of the Union, was forced to commence a

*Marmont, page 262.

war of conquest. No other phrase can so precisely describe the kind of war which the North must prosecute, or else acquiesce in the permanent dissolution of the Union."*

It is easier to provide the supplies when acting on the defensive in one's own country than when engaged in war in the enemy's territory; for regular communications with the dépôts and magazines can be organized, and if obliged to retire, the surplus stores can be destroyed to prevent them falling into the hands of the enemy. If in an enemy's country the troops remain stationary and the lines of communication are secure and in good working order, the question of supply is comparatively an easy one; but when the troops begin to move, the question becomes more complicated in proportion to the rapidity of the movement and the size of the army. Upon the march the extent to which the local resources can be utilized will depend upon the breadth of the march-front and the rate of the movement. The broader the front in this case the easier the supply. When leaving Atlanta, Sherman directed that the habitual order of march should be, wherever practicable, by four roads, one for each corps comprising his army, as nearly parallel as possible, and converging at indicated points; this same order of march was adopted in his campaign through the Carolinas, and thus, in both instances, he was able to fully utilize the local resources. The propinquity of the enemy obliges an army to diminish its march-front, prevents the resources of the country from being utilized, and also impedes the supplies being brought from the rear, as the trains cannot be brought within easy distance of the troops. If the inhabitants are hostile, the task of supplying is most difficult, as, in that case, the population will conceal, carry off, or destroy its own resources, and endeavor to capture and burn the supply

*Ropes' "Story of the Civil War."

trains of the invading army. "There was * * * nothing in the temper of the South to suggest that the war was carried on for the redress of grievances. * * * On the contrary, the attitude of the South was from the beginning one of resistance to the uttermost."* The bitter animosities and burning passions gave rise to the most implacable enmities, which raged so at New Orleans and culminated in Washington, in April, 1865, but which it is most devoutly hoped were forever calmed and obliterated by the Message of Peace from Mount McGregor twenty years after.

There are two methods of supplying an army in the field:

1. By consignments of supplies forwarded by the service in rear to an advance dépôt, and carried from that dépôt by the supply trains of the army; and,

2. By utilizing the resources of the country.

The supplies an army carries with it may be divided into two classes, those carried by the troops themselves, and those which are carried in the trains. The quantity of supplies the men can carry is limited not only by the strength of the men, but by the rapidity of the movement which is entered upon. The amount of supplies, and, therefore, the size of the trains containing them, are dependent upon the distance of the army from the base or its advance dépôt.

At the commencement of the war the supplies to be carried by the troops were prescribed in General Orders, which provided that in ordinary marches, where the troops could receive daily issues from the trains, they should carry only two days' rations; but in the immediate vicinity of the enemy, and where the exigencies of the service rendered it necessary for the troops to move without baggage or trains,

*Ropes' "Story of the Civil War," page 4.

the men were required to carry with them from eight to twelve days' rations,* which were arranged as follows:

For Eight Days.

5 days' beef or mutton to be driven on the hoof or collected in the country passed over.		
3 days' cooked rations in haversack, weight...	5¾	pounds.
5 days' rations of bread and small stores in knapsack, weight.....	6	"
A change of underclothes in knapsack, weight..	2	"
A blanket, weight.....	5¼	"
Total weight.....	19	"

For Twelve Days.

9 days' ration of meat on the hoof.		
3 days' cooked rations in haversack, weight....	5¾	pounds.
9 days' rations of biscuit and small stores in knapsack, weight.....	10½	"
A change of underclothes in knapsack, weight.	2	"
A blanket, weight.....	5¼	"
Total weight.....	23½	"

The men carried sixty rounds of ammunition, forty in the cartridge-boxes and twenty in their pockets. It was observed that in the second and third days of the march many men abandoned their overcoats and blankets if the weather was warm.

*General Orders No. 7, Headquarters Military Division of the Mississippi, dated April 18, 1864, provided: "II. When troops are ordered to march for action, or to be in condition for action, all encumbrances must be left in store at the most safe and convenient point. Mounted officers (general, regimental, or cavalry) will be expected to carry on their own or led horses the necessary bedding and changes of clothing, with forage, and provisions for themselves for three days—which must last five days. Infantry officers and soldiers must carry on their persons, or on led horses or mules the same; to which end will be allowed to each company when practicable—one led horse or pack-mule. Artillery can carry the same on their caissons, so that all troops must be in readiness for motion without wagons for a five-days operation."

General Ingalls in his report said: "Our troops are undoubtedly loaded down on marches too heavily even for the road, not to speak of battle. I have witnessed great loss of knapsacks and articles of clothing on the routes taken by our troops at the commencement of the campaigns. In my report of the Chancellorsville campaign I showed you that the loss of knapsacks of those actually engaged was at least twenty-five per cent. I am in favor of putting the lightest possible weight on the soldier, consistent with his wants and the character of the service. I do not think the knapsack should be dispensed with altogether, for it should, ordinarily, form a part of the equipment, but on short campaigns, and on the eve of battle and when near the supply trains, a blanket rolled up and swung over the shoulder, and looped up under the arm, is sufficient without knapsack or overcoat. The soldier can carry three days' cooked food in his haversack. If necessary, he can carry two or three days' bread and some underclothes in his blanket. Our men are generally over loaded, fed, and clad, which detracts from their marching capacity, and induces straggling."*

As the war progressed the tendency to abandon the knapsacks was very marked, until finally they were seldom used in the field, and the suggestions outlined above were adopted, with the addition of half of a shelter-tent and a rubber blanket (poncho) to the blanket-roll.

General Sherman says: "Each soldier should, if not actually 'sick or wounded,' carry his musket and equipments containing from forty to sixty rounds of ammunition, his shelter-tent, a blanket or overcoat, and an extra pair of pants, socks, and drawers, in the form of a scarf, worn from the left shoulder to the right side in lieu of knapsack, and in his haversack he should carry some bread, cooked meat, salt,

*Report dated August 28, 1864.

and coffee. I do not believe a soldier should be loaded down too much, but, including his clothing, arms, and equipment, he can carry about fifty pounds without impairing his health or activity."

The coffee and sugar components of the ration were usually mixed together by the men when stowing them in their haversacks; this prevented them from constantly "nibbling" while on the march, and therefore tended to husband the supplies carried.

The supplies that the men carried with them were replenished at the earliest opportunity from those carried in the trains.

Dépôts.—Dépôts are classed in three categories: 1st, the base dépôts; 2d, advance dépôts; 3d, temporary dépôts. The base dépôt, from its name, is located at the base of supply and must be remote from the theatre of operations. The advance dépôts are those formed during offensive movements when an army proceeds so far from its base that it would waste time by drawing supplies directly from the base. These dépôts are supplied with stores obtained by consignments from that at the base; supplemented, when possible, by others procured in the vicinity. They are located in such places where the supplies can be brought to them and carried from them with the greatest ease, rapidity, and safety, and where they can be most easily secured from danger of hostile attack.

A secondary base of supply is an advance dépôt of sufficiently large dimensions to make an army independent of the base when the line of communication is very long. As the difficulties of supply increase with the length of the line of communication, when the distance of an army from its base is very great the formation of a secondary base becomes indispensable to facilitate the transportation of sup-

plies. A secondary base must contain a surplus of such stores as an army needs, so as to provide against any temporary interruption on the lines of communication, and a very complete organization is essential, as a variety of demands will be made upon it, all of the utmost urgency and admitting of no delay. Temporary dépôts are small ones, sufficient to provide merely for the daily wants of the troops. Such dépôts are usually temporary in character, existing for a few days, and sometimes only for one day.

In Sherman's campaign against Atlanta the base dépôt was located at Louisville. Nashville, Chattanooga, Knoxville, and Johnsonville were the advance dépôts. Allatoona, and Big Shanty in Georgia, were the temporary dépôts containing supplies intended solely for the immediate use of the army. The dépôts of Nashville and Chattanooga were expanded so as to form a secondary base of supply, and a thirty days' supply of rations for 100,000 men and clothing for six months were stored at Chattanooga. During Sherman's march through the Carolinas, dépôts were established at the following places: Sister's Ferry, Fayetteville, Morehead City, Newberne, Goldsboro', and Raleigh.

The base dépôts for the Army of the Potomac were at Alexandria, Baltimore, and Annapolis. During the Peninsular campaign, dépôts were located at Fort Monroe, Cheeseman's Landing, and Brick House on the York River, and White House on the Pamunkey; the railroad was rebuilt from White House as far as Savage Station and at the latter place a dépôt of supplies was established, which was destroyed when the army let go its hold on the Pamunkey and established itself on the James River, when the dépôt was located at Harrison's Landing. These dépôts were changed in accordance with the movements of the troops, the fleet with the transports moving around to the different places so

as to be in easy reaching distance of the trains. In the Maryland campaign the Army of the Potomac was supplied direct from the base at Alexandria, by means of its wagon trains, until after the recapture of Frederick. The destruction of the railroad bridge over the Monocacy necessitated the formation of a temporary dépôt on the left bank of the river while the bridge was being rebuilt, and supplies were shipped there over the Baltimore and Ohio railroad, from the base dépôt at Baltimore. After the battle of South Mountain, a dépôt was established at Hagerstown, and the supplies forwarded there over the Cumberland Valley railroad. After the battle of Antietam, the supplies were forwarded from Alexandria, New York, Philadelphia, and Baltimore, and an advance dépôt was formed at Harper's Ferry and later at Berlin. When the army crossed the Potomac, a dépôt was established at Salem on the Manassas Gap railroad, and supplies were forwarded there from Alexandria.

When the army entered upon the Fredericksburg campaign, dépôts were established at Acquia and Belle Plain; the former assumed the proportions of a secondary base (although it was never so designated), and large wharves were constructed and storehouses erected there to accommodate all the supply departments. The army was supplied from these dépôts by the Acquia and Fredericksburg railroad, along the line of which temporary dépôts were located at convenient points for the delivery of the supplies, the principal one being at Falmouth.

After the battle of Chancellorsville, the dépôt at Falmouth was broken up and the army moved by Dumfries, Fairfax, Leesburg, Edwards' Ferry, and Poolesville to Frederick and entered upon the Gettysburg campaign. For its supply during that epoch dépôts were established at Westminster and Frederick; the supplies were forwarded to the

former from Baltimore over the "branch road" from that place, and to the latter over the Baltimore and Ohio.

When the rebel army crossed into Virginia after the battle of Gettysburg, the Army of the Potomac concentrated in the vicinity of Harper's Ferry and Berlin and replenished its supplies from the dépôts located at those places and also from the one at Sandy Hook; the lines of supply were the Chesapeake and Ohio canal and the Baltimore and Ohio railroad. Having crossed the Potomac, the army was supplied from dépôts at Gainesville and White House on the Manassas Gap railroad, and also from the one at Warrenton, on the branch road of that name. The army then took up a line near the Rappahannock, across the Orange and Alexandria railroad, and dépôts were established at Warrenton Junction, Warrenton, and Bealton.

September 15, 1863, the army advanced to Culpeper and vicinity and remained there until October 11th, when the movements of the rebel army necessitated a rapid march to Centreville. The Orange and Alexandria road was destroyed by the rebels from Broad Run to the Rappahannock, during this retrograde movement, and while it was being rebuilt, the dépôts were at Manassas and Gainesville. When the concentration at Centreville was affected, Fairfax Station became the advance dépôt. The enemy retreated to the Rappahannock and was pursued by the Army of the Potomac, which forced a passage of that river and drove the enemy to the Rapidan, and then Brandy Station became the advance dépôt. While at Mine Run the army was supplied by its trains of wagons and pack-mules, from that dépôt.

December 1st, 1863, the army fell back and occupied its former positions in the vicinity of Culpeper and remained there until May 4, 1864, when the grand campaign from the Rapidan to the James was commenced. On that day the

dépôts at Brandy Station and at other points on the railroad, as far as the Rappahannock, were broken up and all surplus stores sent to Alexandria. Communications were opened with Acquia and Belle Plain, the river was cleared of obstructions by the navy, and the railroad from Acquia to Fredericksburg was repaired. During the flank movement to Spottsylvania, the trains were parked at Fredericksburg, and the dépôts remained unchanged. On May 21st the dépôts at Acquia, Belle Plain, and Fredericksburg were abandoned, and one was established at Port Royal. The army crossed the Pamunkey on the 28th and took up a position at Cold Harbor, and on the 31st a dépôt was established at White House. June 12th the advance across the Chickahominy to the James was commenced, and, on the 16th, upon reaching the latter river, a dépôt was established at City Point. During the siege of Petersburg in the final operations against Richmond, City Point was made a secondary base of supplies for the armies of the Potomac and the James; and separate wharves were provided there for unloading the various kinds of supplies; a large repair dépôt for the wagon transportation; twenty large ovens constructed by the Subsistence Department, capable of producing one hundred and ten thousand rations of bread per diem, for the supply of the armies of the Potomac and James; and the Medical Department had large permanent hospitals located there, which received the sick and wounded from the field hospitals and from which the convalescents were conveyed by water, in steamers specially fitted for such service, to the great hospitals at Washington, Philadelphia, Baltimore, etc.* Expense dépôts were located at Cedar Level, Ber-

*All of these improvements were rendered absolutely necessary in order to create a dépôt of sufficient magnitude and facilities for the supply of the armies lately operating against Richmond. Storehouses had to be erected to protect the daily supplies, and to hold in

muda Hundred, and at Jones' Hundred, Point of Rocks, Deep Bottom, Broadway Landing, and Varina Landing.

In 1862, during Grant's campaign against Vicksburg, Holly Springs was his secondary base of supply. The capture of that place by Van Dorn and the destruction of supplies there valued at over a million dollars, together with the demolition of the railroad between Jackson, Tenn., and Columbus, Ky., by Forrest, caused the abandonment of the campaign.

After the capture of New Orleans, that city became the secondary base of supplies for all operations throughout the southwestern portion of the theatre of war.

In Banks' Red River campaign the condition of the river and the inability of the transports to pass the falls made it necessary to establish an advance dépôt at Alexandria; which was a departure from the plan of the campaign, as no dépôt at any point on the Red River was contemplated.

Allowance of Transportation.—The number of wagons required by an army in the field will vary according to the character of the theatre of operations, the resources of the same in food supplies, and the railroad and water transportation, the length of haul from the dépôt to the army in the field, and also with the capacity of the wagons.* In other

dépôt 20 days' forage, and at least 30 of subsistence, besides large quantities of clothing, ordnance, and hospital stores. Wharves had to be put up for the different departments. There were, generally, at the dépôt, in harbor, from 150 to 180 vessels of all kinds daily, and the amount of business transacted was immense. The daily supply of forage, for instance, was over 600 tons of grain and hay. I make these remarks simply to show you why such extensive preparations were necessary. The dépôt was and is the most perfect and commodious of any ever established anywhere for the supply of armies, and the Government has gained by it more than it cost." Report of General Rufus Ingalls, dated June 24, 1865.

*"One good six-mule team, in the best season of the year, is sufficient to haul this load (*i. e.*, 3730 lbs.) and its own forage of 270 lbs., or a total of 4000 lbs." (Holabird.—"Army Wagon Transportation.")

words, as the distance of an army from its base of supply increases a greater number of wagons is required. The Comte de Paris has calculated that an army of 100,000 men to move ten days from its base would require 10,975 wagons drawn by 65,850 animals. In order to prevent tying an army to its base, advance dépôts were formerly established at places separated by about four days' march; the introduction of steam made an army still more independent of its base; and during the Civil War, as the character of the country favored it, an innovation was effected by moving these advance dépôts to different points so as to be within easy distances from the army. This was especially the case with the Army of the Potomac, as the fleet of transports could move around by the rivers and Chesapeake Bay so as to keep near the army in all its movements.

At the beginning of the war the amount of transportation considered essential and allowed the armies was so excessive that General Halleck said: "If it be true that the success of an army depends upon its 'arms and legs,' ours has shown itself deficient in the latter of these essential requisites. This defect has been attributed to our enormous baggage and supply trains. * * * There is no doubt that the baggage trains of our armies have been excessively large. Every possible effort has been made * * * to reduce them; but it is no easy task. Once accustomed to a certain amount of transportation, an army is unwilling to do without the luxuries which it supplies in the field."* He also stated that the increase of the army ration, "which was previously larger than in any other country," necessitated a considerable amount of transportation.

The allowance of transportation was reduced from time

*General Halleck's Report, dated November 25, 1862.

to time by orders* from Army Headquarters, until it was finally reduced to the following for the armies operating against Richmond:†

The Lieutenant-General and army commanders were allowed such transportation as was deemed necessary; army corps headquarters, four wagons or eight pack-mules; division headquarters, three wagons or five pack-mules; brigade headquarters, two wagons or five pack-mules. The foregoing wagons and pack animals included the transportation for all personal baggage, mess chests, cooking utensils, desks, papers, etc.

Each regiment of infantry, cavalry, or battalion of heavy artillery, two wagons; for each battery of artillery, one wagon. The number of wagons allowed for artillery ammunition depended upon the number and character of the guns; for the reserve artillery there was to be twenty rounds of ammunition for each gun; for small-arm ammunition there were allowed three wagons for every one thousand men of cavalry, infantry, and heavy artillery, present for duty; for fuses, powder, and primers, for the reserve ammunition train, two wagons. For the general supply trains, seven wagons to each one thousand men of cavalry, infantry, and heavy artillery, for forage, subsistence, etc., which should carry eight days' supply; to each cavalry division, exclusively for forage, fifty wagons; to each battery, for its subsistence, forage, etc., four wagons; each horse battery, for the same purpose, four wagons; to every twenty-five wagons of

*G. O. No. 130, A. G. O., September 14, 1862.
G. O. No. 160, A. G. O., October 18, 1862.
G. O. No. 274, A. G. O., August 7, 1863.

†Special Orders No. 44, Headquarters Armies U. S., City Point, Va., June 28, 1864. This order, published the third year of the war, may be very properly be considered as the standard upon which, in the future, all estimates for allowance of transportation for armies in the field will be based.

artillery ammunition train, five wagons additional, for the forage of the animals and the subsistence of the men. Ammunition trains were loaded exclusively with ammunition. To each brigade, for hospital supplies, three wagons; to each corps headquarters, for forage and subsistence, three wagons; each division, two; each brigade, one wagon, for similar purposes; and to each brigade, one wagon, for commissary stores for sales to officers.* The unit of organization for the supply trains of subsistence, ordnance, and forage was by division, and the division quartermasters were responsible for them. Brigade and regimental quartermasters were responsible for the brigade and regimental baggage trains respectively. It was found by experience that the advantage of keeping up regularly organized pack trains was not commensurate with the expense; and to provide for emergencies when they could very advantageously be used, two hundred pack saddles were carried in the wagon trains of each corps; and in cases where it was necessary to pack baggage, provisions, and ammunition for short distances over rough roads and broken country, the *pack* trains were made up temporarily by taking mules from the wagons, not exceeding two mules from any one wagon.

Size of Trains.—The Army of the Potomac in its first operations upon the Peninsula was supplied by means of a flotilla sent down the Potomac River and Chesapeake Bay, which established advance dépôts at the points indicated above, and, as such places were within easy distance of the troops, large supply trains were unnecessary. General Ingalls reports on the first of July, 1862, as the result of an inspection then made, that the Army of the Potomac had in its possession the following means of transport: 3100

*Paragraph III. of General Orders No. 7, 1864, Military Division of Mississippi, restricted the officers to the same food as the men were provided with.

wagons; 350 ambulances; 17,000 horses and 8,000 mules; the army numbered 80,000, or forty wagons in all to every thousand men. After the battle of Antietam, the size of the train with the army was: 3911 wagons; 907 ambulances; 12,483 mules and 8693 horses, not including those with the artillery and cavalry; the army numbered 110,000 men, or forty-nine wagons for every thousand men.

In the Gettysburg campaign the trains numbered over four thousand heavy wagons. After the retreat of the rebel army from Gettysburg, the Army of the Potomac was ordered concentrated at Middletown on the evening of July 7th, and no trains but ammunition wagons, medical wagons, and ambulances were permitted to accompany the troops. The supply and baggage wagons were ordered to be parked in the Middletown valley on the roads taken by their respective corps. After crossing the Rapidan, in Grant's advance upon Richmond, the troops that composed the armies on that river numbered about 125,000 men. There were 4300 wagons; 835 ambulances; 29,945 cavalry, ambulance, and team horses; 4046 private horses and 22,528 mules; thirty-four wagons to every thousand men. In the Appomattox campaign the Army of the Potomac numbered 107,777 men; there were 25,796 horses and mules; 2448 wagons; twenty-two wagons and 239 draft animals per thousand men.

On July 1st, 1864, General Sherman's army, which was composed of the armies of the Ohio, Cumberland, and Tennessee, numbered about 100,000 men, and had about 28,300 horses, 32,600 mules, 5180 wagons, and 860 ambulances, or sixty wagons to every thousand men. On leaving Atlanta, November 15, 1864, General Sherman's army consisted of 63,680 men, 14,780 horses, 19,410 mules, 2520 wagons, and 440 ambulances; forty wagons to every thousand men.

From the foregoing it is seen that the size of the trains

decreased in each successive campaign, and at times the armies were sent forward without any.

Composition and Movement of the Trains.—The trains moved as follows: Wagons containing small-arm ammunition coming first, and then those containing the ordnance, subsistence, and forage, following after in the order named, and the sutlers' wagons bringing up the rear of the column.

"In a forward movement our trains are never in the way of the troops; on the contrary, each corps has its train which follows it on the march, and which forms its indispensable, movable magazine of supplies. Wagon trains should never be permitted to approach within the range of battle-fields. They should be parked in safe and convenient places out of risk, and well guarded. Troops should go forward to battle lightly loaded, and without wagons except for extra ammunition. If they are successful, the trains can be brought up very quickly; if defeated, they will find an unobstructed road, and will get back to their wagons soon enough."*

General Ingalls says of the Gettysburg campaign that the wagon train and all impedimenta were assembled at Westminster, a distance of about twenty-five miles in the rear of the army; no baggage was allowed in the front, a portion only of the ammunition wagons and ambulances were brought up to the immediate rear of the lines. By this arrangement, which was always made in the Army of the Potomac, on the eve of battle and marches in the presence of the enemy, experienced officers were enabled to supply their demands without risking the loss of trains or obstructing roads over which the columns marched. Empty wagons were sent to the rear and loaded ones or pack trains brought up during the night or at such times and places as did not interfere with the movements of the troops. He also

*General Ingalls' Report, dated September 28, 1863.

adds that in this campaign the trains, large as they were, never delayed the march of a column, and, excepting the small-arm ammunition trains, were never seen by the troops. The main trains were conducted on roads to the rear of the army without the loss of a wagon.

In Sherman's march to the sea, in starting out from Atlanta, the empty wagons to be loaded with forage and other supplies taken from the country were at the head of the trains, so that, when reaching farm-houses and other points where supplies were obtained, the wagons turned out of the road and were loaded by the time the rear of the general supply trains came up to them, and then fell into their proper places.

In the Red River expedition the column was preceded by the cavalry, which was followed by its wagon trains and then the infantry. On approaching Sabine Cross-roads, April 8, 1864, it was confronted by a Confederate force commanded by General Richard Taylor, and after a short conflict the cavalry was driven back, and as the wagons blocked the roads the infantry were unable to be brought to the front, and in consequence the Federals lost their trains.

General Grant says* there never was a better organized corps than that of the quartermaster's corps of the Army of the Potomac in 1864. The wagon train would have extended from the Rapidan to Richmond if marched in single file upon one road. General Ingalls had each wagon marked with the corps badge, division color, and the number of the brigade, so that the particular brigade to which each wagon belonged could readily be told. The wagons were also marked to indicate the contents: if ammunition, whether for artillery or infantry; if forage,whether grain or hay; if rations, whether bread, pork, beans, rice, sugar, coffee, or

*Memoirs, Volume II., page 198.

whatever other components of the ration. As soon as a wagon was emptied, it was at once dispatched to the base to obtain a load of precisely the same article as that which had been taken from it.

Ambulances—Hospital Supplies.—An Act of Congress approved March 11, 1864, provided that there should be furnished to each army corps two-horse ambulances on the following basis: three to each regiment of infantry of five hundred men or more; two to each regiment of infantry of two hundred men and less than five hundred men; one to each regiment of infantry of less than two hundred men; two to each regiment of cavalry of five hundred or more; one to each regiment of cavalry of less than five hundred men; and one for each battery of artillery; two ambulances to headquarters of each army corps; and to each division train of ambulances, two army wagons. The Medical Director of the army corps was given charge of the direction and supervision of all ambulances, medicine and other wagons, horses, mules, harness, etc., and of all officers and men detailed to assist the management thereof in the corps in which he was serving. Officers and men were detailed from each corps for service in its own ambulance corps. The field hospital of each corps was located about three miles in rear of the line of battle, and there were assembled the medicine wagons, four army wagons containing one thousand rations, clothing, and other supplies. The field hospital was composed of the same number of sections as there were divisions in the corps, each section being under charge of the medical officer of the division to which it appertained. Necessary assistants were detailed in these hospitals and the remainder of the surgeons were on the battle-field, where they took advantage of any shelter to form small temporary hospitals, in the rear of which ambulances were stationed.

The litter-bearers brought the wounded to these temporary hospitals, from which they were transferred to the field hospital, and eventually to the permanent hospitals located at the dépôt of supplies, and thence transferred to the general hospitals in different parts of the country.

"We began the war with methods borrowed from Europe. We ended with methods that were developed by the cries of our wounded for relief. We realized that to enable a medical department to care properly for the wounded of an army it must have full control of all the men and material needful to this end."*

There were various charitable organizations instituted during the war for the purpose of relieving the sick and assisting the wounded; among these may be mentioned the Sanitary Commission, the officers of which received donations of supplies and money from all the loyal States. "Wherever our armies fought, wherever there were any sufferings to assuage or sick to relieve, upon the field of battle or in the hospital, amongst the camps and in the garrisons, for the men assembled under the flag and for those whom sickness or wounds sent singly to their homes, the Sanitary Commission was always there, as indefatigable in its devotion as it was inexhaustive in its assistance."†

General Sherman says: "For the more delicate and costly articles of food for the sick we relied mostly on the agents of the Sanitary Commission. I do not wish to doubt the value of these organizations, which gained so much applause during our Civil War, for no one can question the motives of these charitable and generous people; but to be honest, I must record an opinion that the Sanitary Commis-

*Major Smart.—"Medical Department of the Army."

†De Trobriand.—"Army of the Potomac."

sion should limit its operations to the hospitals at the rear, and should never appear at the front."*

Sutlers.—The laws of Congress authorized the appointment of a sutler for each regiment in the army. But one sutler was allowed to a regiment and the various stores which they were permitted to sell were also defined by law, with a restriction limiting the lien to one-sixth of the monthly pay of the officers and men. In General Halleck's report dated November 15, 1863, in speaking of the reduction of the size of the army trains, he says: "In this connection I would respectfully call attention to the present system of army sutlers. There is no article legitimately supplied by sutlers to officers and soldiers which could not be furnished at a much less price by the Quartermaster and Commissary Departments. Sutlers and their employés are now only partially subject to military authority and discipline, and it is not difficult for those who are so disposed to act the part of spies, informers, smugglers, and contraband traitors. The entire abolition of the system would rid the army of the incumbrance of sutler wagons on the march, and the nuisance of sutler stalls and booths in camp."†

Beef Cattle Herds.—The beef on the hoof accompanying the armies was under the entire control of the commissary officers. The herds of beef cattle were driven by special drivers, who were directly under the orders of the chief commissary of the army, or of an army corps if operating detached. The position of the herd, its places of holding, and the rate of march were all controlled by the chief commis-

*Sherman's Memoirs, Volume II., page 392.

†See also Par. II., G. O. No. 130, A. G. O., 1862, which states that the trains were increased by carrying sutlers' goods in them under guise of being Government supplies, and prescribed severe penalties for any one permitting that abuse.

sary, who received orders on such matters only from the general upon whose staff he was serving. The movements of the herd were so arranged that such number of cattle as were required to furnish the meat ration equivalent to the number of days' rations of hard bread, coffee, sugar, and salt carried in the men's haversacks, marched as a unit of brigade organization; the number necessary to constitute the meat ration corresponding with the number of days' rations in the soldiers' knapsacks, were marched as a division unit. The main or corps herd comprised a sufficient number of cattle to furnish rations corresponding to the number carried in the trains. In addition to these, there was a general herd provided as a reserve upon which drafts could be made when necessary to replenish the corps herds.* The butchers connected with the brigade organization slaughtered the cattle at night and then the meat was cooked, and, if upon the march, it was issued to the men either late that night or early the next morning so that it could be placed in the haversacks. It was found necessary during the war, when the army was encamped for any length of time in the same place, to frequently change the location of the herd in order to obtain better pasturage and water, and also to avoid any unsanitary conditions which are likely to arise from the continued holding of a large number of animals in the same locality. No epidemic or disease was, during the last war, directly traceable in any way to the large herds of cattle which were then so generally used. Although in wars on the continent of Europe, as in 1813 and later in 1870-71, great epidemics were traced directly to the large herds of cattle then brought together, some of which were found to be diseased.

The difficulty of obtaining proper pasturage, the slow rate of movement which the herd is capable of, and the fact that one or more roads in rear of the army must be given up

*Wilson.—"Feeding a Great Army."

to the use of the herd, are (now that the method of shipping dressed meats by means of the cold storage system is so much in vogue) very potent objections to the practice of furnishing the beef supply of an army by means of a cattle herd. But it must be remembered that if this method of supply is to be abandoned, a large increase will be required in the transportation furnished the various armies.

UTILIZING THE LOCAL RESOURCES.

The right of armies to take from the country all that they require for their sustenance is indisputable; though we usually understand that the expression "living upon the country" has direct application to the enemy's country. Military necessity, as understood by all civilized nations, permits in an enemy's country the enforcement of all those measures which are indispensable for securing the end of the war, and which are lawful according to the modern law and usages of war, and also permits an army to make use of the resources of its own country when face to face with the enemy, because of the absolute necessities of the case and of the paramount duty to defend the country against invasion.

There are four methods of utilizing the resources of the country: 1. By billeting or quartering the troops upon the inhabitants, a right maintained by General Orders No. 100, when in an enemy's country; 2. By contributions levied upon the country; 3. By making requisition for such supplies as are required to satisfy the wants of an army; and, 4. By foraging upon the country, or the collection of supplies found therein by the troops themselves.

Billeting.—Supplies of food are, as a rule, to be found for several days in every town or village, and every householder usually has a sufficient quantity of the same to pro-

vide his family for a few days; consequently, at least the same number of men as there are numbers in the household can obtain subsistence there a day or two. When troops are billeted upon the inhabitants, the number assigned to each household is dependent upon the number composing the family of the same. An exception should always be made in favor of the poorer classes, who, at the best of times, are barely able to provide for their own families. The following exceptions are usually made: 1st. Any householder who has entertained a wounded man in his house is "exempted from the quartering of troops, as well as from a part of the contributions of war which may be imposed."* 2d. Charitable institutions, hospitals, asylums for aged and infirm, unprotected women, and educational institutions for young girls should not have troops billeted upon them. The advantage to be derived by this system of subsistence is that the men at the end of a day's march find, as a rule, their meal ready cooked and prepared, or, at any rate, will have to trouble themselves very little with cooking and preparing it. The great disadvantages are that it causes very great dispersion and separation of the different units composing the army, and, except in very thickly settled countries, obliges a command to spread out over too large a portion of the country in order to obtain subsistence. The men, furthermore, live in the kitchen and are very apt to obtain either by force or in other ways more supplies than they are entitled to; and, furthermore, very many indignities are liable to be offered to the female portion of the inhabitants of the country, as their natural protectors are, in many instances, enrolled in the ranks of the enemy's army. Moreover this method may lead to oppression on the part of the troops, if

*Article V., Geneva Convention of 1864, acceded to by U. S., March 1st, 1882.

they are not treated as liberally as they consider they should be, and it will provoke frequent disputes if more is demanded from the inhabitants than they can fairly be expected to furnish; and the dispersion of the troops prevents the officers enforcing strict compliance with orders, and, therefore, is subversive of discipline. This method of subsisting the troops was not resorted to upon any occasion during the Civil War, although the Government, in General Orders No. 100, Section 37, reserved the right to do so in the enemy's country.

Contributions.—Contributions in money were formerly imposed upon cities and districts instead of subjecting them to pillage. They are now recognized as one of the justifiable means of causing the inhabitants of an enemy's country more fully to feel the rigors of war, and thus are means of bringing the same to a speedy termination. The Army Regulations of 1863 provided that when the wants of the army absolutely required it, and under special instructions from the War Department, that the General of the Army was authorized to levy contributions in money on the enemy's country occupied by the troops. But no other commander could levy such contribution without written authority from the General Commanding in chief. "Contributions are principally possible in large towns and cities, and, as a rule, are the only demands that can be made on a manufacturing population."*

Contributions have the following advantages over requisitions in kind: 1. The collection is less difficult. 2. While the burden of the requisition bears almost entirely upon the producers and manufacturers, contributions bear upon each one in proportion to his financial resources, and are consequently less of a hardship. 3. They can be made

*Furse.—"Lines of Communication in War."

over a wide extent of territory, as money is easily transported. They should not be imposed in excess of military necessity, and the amount should be fixed in accordance with the wealth of the country and so as not to affect social conditions, but it is perfectly permissible to make contributions excessive, provided the purpose is by such means to effect a more speedy termination of the war. Private property and the person of the peaceable inhabitants who are citizens of the occupied territory are respected, as war is waged against a State and not against individuals, and consequently contributions are, as a rule, imposed on municipalities. The sum demanded should be collected through the local civil authorities, if any remain in the country, and should by them be handed over to the proper officer in the invading army, to be by him accounted for in accordance with instructions.

The contributions imposed during the Civil War were not intended to secure funds to provide the necessary supplies for the armies, but were usually resorted to as a species of reprisal, as shown by the following order, viz.:

"Special Orders No. 40.

"Hdqrs. Left Wing, 16th Army Corps,
"Pulaski, Tenn., December 16, 1863.

"I. In accordance with the orders of Maj.-Gen. U. S. Grant, Perry Nicks, of Lewis County, Tenn., having been damaged by guerrillas, citizens, etc., to the amount of $800, it is hereby ordered that an assessment to that amount be made upon the known rebels of that county, and collected in money, cotton, or stock, and turned over to Mr. Nicks. A full account and report of the transaction under this order will be made to these headquarters. Major Murphy, of Fifth Tennessee Cavalry, is requested to carry out this order.

* * * * * *

"By order of Brig.-Gen. G. M. Dodge.

"*J. W. Barnes,*
"Lieutenant and Acting Asst. Adjutant-General."

Requisitions.—Requisitions are demands for necessary supplies and services made on the inhabitants of certain districts or localities, through their civil authorities, to satisfy the requirements of an army. They are accompanied by force, if necessary to resort to such extreme measures, to exact the fulfilment of the demands.

Requisitions are of comparatively recent date.* In former times the invader possessed the right of booty and pillage, the practice of which was most unfortunate for the army, as it embittered the population and compromised the safety of the troops in an enemy's country, and in the event of any real or imagined injury being done them, it gave rise to redress and reprisals; it furthermore caused the interruption of all commercial transactions, and stores were not offered for sale, as private individuals were compelled to submit their supplies to the rapacity of the enemy.

Requisitions may be considered under two aspects, according to whether they are made in an enemy's country or in the national territory. In the latter instance they are only made in case of urgent necessity, and receipts are always given, which are eventually paid. In our own territory we can count on the patriotic feeling of the people and on their obedience to the mandates of the civil authorities. To en-

*Requisitions were first employed by Washington and so named by him during the Revolutionary War. "In order to provide for the wants of the Continental troops who were in need of food and clothing, and even shoes, he frequently resorted to requisitions, but 'always exercised great moderation and endeavored to protect private property. He never resorted to such means except in cases of urgent necessity, and then asked in a detailed manner for such articles as were indispensable for his army, employing the form of a request, reserving vigorous measures for the recalcitrant. Furthermore, he gave receipts for the articles received, which were eventually paid.' "

Cf. Georges Ferrand, "*Réquisitions Militaires*," page 3, and Calvo, "*Droit International Théorique et Pratique*," Section 2235; also Rouard de Card, "*La Guerre Continentale*," etc., page 170, quoted by Georges Ferrand, page 3, "*Réquisitions Militaires*."

force requisitions, however, when campaigning in a friendly State, is a delicate operation; for, to all appearances, the people are subjected to the same exactions as are enforced on the inhabitants of a hostile country. Even in an enemy's country requisitions should never be imposed in too arbitrary a manner. Before making any exactions an estimate should be formed of all the resources which the inhabitants can be made to surrender without subjecting them to serious want.

Vauchelle remarks: "These demands should be imposed and apportioned with judgment and moderation, taking into consideration the population, the geographical situation, the nature of the products, the richness of the country, and also, when possible, proportioning the extent of the demands to the grievances of the conquerors. To ravage a country you reduce the inhabitants to misery, to despair, flight, etc.; and then you not only deprive yourself of their favorable co-operation, but, on the day of reverse, you will find in these same men implacable and cruel enemies."

Requisitions are further divided into two categories: first, those that are paid for; and, second, those that are not, but are imposed as a species of fines to help reduce the cost of the war.

Jomini says: "A general should know how to turn to advantage all the resources existing in the country which he invades; he should make use of the authorities, when they remain there, to impose uniform and lawful requisitions, which he will cause to be paid for promptly if he has the means; when the authorities do not remain, he should appoint provisional ones, composed of well-known men and invested with extraordinary powers. They will have the supplies requisitioned collected in the safest places and the

most favorable for the movements of the army, and in the vicinity of the principal lines of operations."

Such requisitions as were imposed during the late war were ordinarily not paid for at the time. Resort was frequently had, and particularly by the Confederates in their various raids throughout the border States, to requisitions exacting the delivery of certain supplies. These requisitions were made upon the local authorities and were usually of the form given below:

"Headqrs. 2d Army Corps, A. N. V.,
"June 27, 1863.

"*To the Authorities of Carlisle, Pa.:*

"By direction of Lt.-Gen'l R. S. Ewell, I require the following articles:

"5000 suits clothing, including boots, shoes, and hats.

"5000 bushels grain (corn or oats).

"10,000 pounds sole leather.

"10,000 pounds horseshoe nails.

"Also use of printing office and two printers, to report at once.

"All articles except grain will be delivered at the Court House Square at once.

(Signed) "*John A. Harman,*
"Major and Chief Quartermaster,
"2d Army Corps, A. N. V."

Foraging upon the Country.—Foraging upon a country is to collect the supplies for men and horses either from the enemy or from friends by impressment. This method differs from requisitions in that the collection is made directly by the troops without the assistance of the local civil authorities.*

*"Of course, you cannot question my right to 'forage upon the country.' It is a war right as old as history. The manner of securing it varies with circumstances, and if the civil authorities will supply my requisitions, I will forbid all foraging. But I find no civil authorities who can respond to calls for forage or provisions; therefore must collect directly from the people." General Sherman to Wade Hampton, February 24th, 1865. See also Century Dictionary.

Instructions were given to generals operating in hostile territory, to subsist their armies whenever possible upon the country, receipting and accounting for everything taken, so that all loyal persons might afterwards be remunerated for their losses.* The supplies obtained in accordance with the instructions referred to were gathered by detachments designated from the various corps throughout the army. The laws of the United States and the general laws of war authorized in certain cases the seizure and conversion of private property for the subsistence, transportation, and other uses of the army, and provided that all property lawfully taken from the enemy or from the inhabitants of an enemy's country instantly became public property and was to be used and accounted for as such. The Articles of War (Art. 52) prescribed the severest penalty, death or such other punishment as the court directed, for any officer or soldier who should quit his post or colors to plunder and pillage; and the penalty was the same whether the offense was committed in our own or the enemy's territory. A very marked distinction was thus drawn between foraging or the collection of supplies by properly deputed forces, acting under lawful orders, and pillaging or plundering by individuals or squads. All property, public or private, taken from the enemy, was to be inventoried and duly accounted for. If the property taken was claimed as private, receipts were to be given such claimants or their agents, and officers were held strictly responsible for all property taken by them or by their authority and it was accounted for the same as any other public property.

When foraging bodies were sent out to collect provisions or other stores, the commanding officer of such party

*Order of the President, dated July 22, 1862, published in G. O. No. 109, A. G. O., 1862.

was held responsible for the conduct of his command and required to make a true report of all property taken.

In order to enable the troops to utilize the supply of corn which was sometimes found in great abundance, portable mills for grinding the same were in some instances provided,* and proved quite useful in the Army of the Tennessee. Suitable mills for grinding wheat were not made. The objection to using portable mills is that it is practically impossible to properly bolt the meal or flour with them, and in consequence it is very liable to cause sickness by creating stomach troubles; but such flour or meal can be used to advantage if mixed with other of good quality.

General Johnston said, in speaking of the methods adopted by the Confederates to obtain their supplies in the States in rebellion, that "supplies, also, instead of being honestly raised, were impressed by a band of commissaries and quartermasters, who only paid one-half the market value. As might have been expected, this was enough to prevent them getting anything. These they took by force, and did it with the greatest injustice. You can imagine what disorganization of labor and what discontent this produced."†

During the early part of the war there seemed to be some hesitation among the commanders of the Federal armies about utilizing the resources of the enemy's country in order to obtain the supplies for their armies.‡

In speaking of the collection of supplies by the foraging parties, General Sherman says that each brigade commander had authority to detail a party of foragers of about

*"Movable columns in the field should be furnished with hand and horse mills for grinding the grain which they procure in the country." Par. III., G. O. No. 2784, A. G. O., 1863.

†Swinton's "Campaigns of the Army of the Potomac," page 572.

‡General Halleck's Report, November 15, 1863; and Grant's Memoirs, Volume I., page 369.

fifty men with one or two commissioned officers. This party was sent out before daylight, being informed of the route of the day's march, and proceeded five or six miles from the road travelled by the brigade and then visited every plantation and farm within range. Wagons of some sort were obtained, which were loaded with the supplies collected, and then the party regained the main road and waited until the arrival of the train, when the supplies were turned over to the brigade commissary or quartermaster. General Sherman states: "No doubt, many acts of pillage, robbery, and violence were committed by these parties of foragers, usually called 'bummers,' * * * but these acts were exceptional and incidental. * * * No army could have carried along sufficient food and forage for a march of three hundred miles; so that foraging in some shape was necessary. The country was sparsely settled, with no magistrates or civil authorities who could respond to requisitions, as is done in all the wars of Europe; so that this system of foraging was simply indispensable to our success."

The supply of forage for the animals in an army is at all times a most difficult task, as the bulk to be supplied is so enormous. There was much suffering and great loss among the animals in the several armies when they went into winter quarters, owing to the difficulty of obtaining forage; this was particularly the case in the Army of the Cumberland when in the vicinity of Chattanooga, in 1863. When upon a campaign it is usually possible to collect all of the long forage and most of the grain the animals require; this was strikingly shown in Sherman's march to the sea, and is concisely expressed in his letter to the Quartermaster-General dated December 25, 1864.* A large body of cavalry, and especially an independent cavalry command, may often

*Rebellion Records, Volume XLV., page 512.

be unable to provide forage for its animals even in a rich country, for if in pursuit of the enemy it cannot take time to search for the grain during the march, otherwise it is likely that but little damage could be inflicted upon the enemy. Whenever cavalry is to rest and recuperate from the strain of a hard campaign, it cannot be expected that the command will be able to provide forage for its animals; for 10,000 or 15,000 horses consume the surplus of a very rich district in an incredibly short time, and if the horses and men are sent out to scour the country for forage, neither will obtain the rest needed; and therefore dépôts of grain and hay must be provided in such cases. General J. H. Wilson, in his report* dated February 6, 1865, of the pursuit of Hood's army and his march from Athens, Ga., to Gravelly Springs, Ala., sets forth the difficulty of providing forage for the horses under such circumstances.

The great objection to the method of supplying an army by means of foraging upon the country is that it is almost impossible to prevent the men from scattering over a wide extent of the country in search of food and plunder, and as a consequence the number of stragglers and skulkers largely increases and the discipline of the army is apt to be very lax.† The armies in the western part of the theatre of operations resorted to foraging quite generally during the latter portion of the war, and this system was also employed by the cavalry when on their raids. The Confederate army at all times adopted this system. The Confederate reports are replete with evidence of the enormous straggling in their armies, and, in speaking of his campaign in Maryland, Lee

*Rebellion Records, Volume XLV., page 513.

†"Of all things, the most important is, that the men, during marches and in camp, keep their places and do not scatter about as stragglers or foragers, to be picked up by a hostile people in detail." Special Field Orders No. 119, Headquarters Military Division of Mississippi, November 8, 1864.

says: "The arduous service in which our troops had been engaged, their great privations of rest and food, and the long marches without shoes over mountain roads, had greatly reduced our ranks. * * * These causes had compelled thousands of brave men to absent themselves and many more had done so from unworthy motives."* And General D. H. Hill also says: "Thousands of thieving poltroons had kept away from sheer cowardice. The straggler is generally a thief, and always a coward, lost to all sense of shame; he can only be kept in ranks by a strict and sanguinary discipline."† Swinton says, page 67, that during the Maryland campaign Lee lost over twenty-five thousand from his effective strength by straggling. When dealing with this evil in his army General Sherman ordered:‡ "The only proper fate of such miscreants is that they be shot as common enemies of their profession and country, and all officers and privates sent to arrest them will shoot them without mercy on the slightest impudence or resistance."

An Act of Congress approved July 2, 1864, for the purpose of regulating commercial intercourse between loyal and insurrectionary States, and to provide for the collection of private and abandoned property, provided that all moneys arising from the leasing of abandoned lands, houses, and tenements, or from sales of captured and abandoned property, should be paid into the Treasury of the United States. In conformity with the above laws of Congress, General Sherman issued instructions prohibiting trade in his army in the field or with moving columns of troops, save that necessary to supply the wants of the troops themselves. This was probably done as a precautionary measure, as

*Confederate Reports of Maryland Campaign, Vol. I., page 35.

†Confederate Reports of Maryland Campaign, Vol. II., page 119.

‡G. O. No. 18, Headquarters Military Division of Mississippi, June 21, 1864.

spies, on a pretext of being on mercantile errands, have often gained admission within the lines of an army and thus acquired very valuable information. General Sherman also ordered that all such cotton as was found should, when transportation to the rear was practicable, be consigned to some quartermaster at the base, to be by him delivered to the agent of the Treasury Department, and, moreover, it was to be treated as the captured property of an enemy and invoiced accordingly, and no claim of private interest in it was to be entertained by the military authorities.

The exportation from any of the States in rebellion, although fully occupied by Federal forces, of such supplies as were necessary for armies, was frequently prohibited in General Orders. As, for instance, by General Sherman in General Orders No. 20, dated July 13, 1864, prohibiting the exportation of grain and hay raised in the State of Tennessee, and providing that the Quartermaster's Department should purchase the same required for consumption by the army.

There were immense amounts of abandoned and captured property disposed of by the Government during the war, and on February 19, 1867, the Secretary of the Treasury reported that the net amount received from the sale of the same and covered into the Treasury was over twenty-five millions of dollars.*

In order to provide for the supply of an army in the portion of an enemy's country occupied by it, the commanding general exercises direct military control over the same or administers the affairs of the country with the assistance of the local authorities, if they remain, or, if not, with those whom he has appointed in their stead. It is perfectly law-

*See House Executive Document No. 97, 39th Congress, 2d Session.

ful, according to the rules of war, for him to compel the withdrawal from city or town of such portion of the enemy's subjects as he may designate, in order to secure a greater supply of provisions and so forth for the use of his army, and oblige the enemy to deplete his own resources in order to supply inhabitants expelled from the town or city.*

In a communication, dated September 12, 1864, addressed to the mayor and a committee from the City Council of Atlanta, General Sherman said: "We must have peace, not only at Atlanta, but in all America. To secure this we must stop the war that now desolates our once happy and favored country. * * * You might as well appeal against the thunder-storm as against these terrible hardships of war. They are inevitable, and the only way the people of Atlanta can hope once more to live in peace and quiet at home is to stop the war. * * * Now you must go, and take with you the old and feeble, feed and nurse them, and build for them, in more quiet places, proper habitations." * * *

If, under the conditions of modern warfare, an attempt was made to bind an army, as regards its supplies, to any one particular form or system of providing the same, it would soon be found utterly incapable of making war, or, at any rate, would be at a great disadvantage when opposed by an army supplied by different methods according to circumstances.

Freedom of movement is only possible where a judicious use of the resources of the theatre of war is made; but as large armies cannot be supplied entirely from the same and be held in that state of concentration which insures the best results being obtained, such resources must be supplemented

*"War is not carried on by arms alone. It is lawful to starve the hostile belligerent, armed or unarmed, so that it leads to the speedier subjection of the enemy." General Orders No. 100, paragraph 17.

by obtaining a portion of the needed supplies from the base and advance dépôts; and this is especially necessary as regards the ammunition supply, which in general must be obtained from the national territory.

The marked features connected with the supply of the Federal armies during the Civil War were: the use of railroads and navigable rivers, and the facility with which the dépôts of supply were constantly changed so as to be always in touch with the armies in all their various movements, and always so located as to be within ready access by the wagon trains.

General Baratier says that if it is not always possible to approve the strategy employed by some of the Federal commanders, or to admire their methods of conducting the different campaigns, one is, however, "amazed by the vigorous and liberal policy which directed the organization and maintenance of the large armies, which were at all times furnished with great possibilities for action."* In this connection it may be said that the results of a campaign are gauged by the victories and other feats of arms which are exhaustively described by the many participants therein; but it is very seldom adequate credit is accorded the efforts of the administrative officers, who indirectly contribute very greatly to the successful issue, although the work of such officers never ceases, nor can flag for one instant. When the army is upon the march, these departments are strained to their utmost capacity to supply the wants of the same; and when it goes into winter quarters or halts to recuperate its strength, the same unremitting care and attention must be given by the administrative officers.

As a consequence this great subject of the art of supply-

*Baratier.—"*L'Art de ravitailler les grandes Armées.*"

ing troops in the field is very apt to be neglected in time of profound peace, but, as General Lewal says: "In time of war every moment is precious; to hesitate before acting is a fault; to ask for instructions, to await for orders for supplying the troops would be almost criminal."*

*"*Tactique des ravitaillements.*"

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