THE ROYAL ENGINEERS JOURNAL.





NOVEMBER, 1912.

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Authors alone are responsible for the statements made and the opinions expressed in their papers.

FIELD TROOP SUMMER TRAINING, 1912.

Compiled by CAPT. H. J. ELLES, R.E.

It has been suggested by the Inspector of Royal Engineers that the publication in the R.E. fournal of the tactical-technical Schemes carried out by the 1st, 3rd, and 5th Field Troops, R.E., this year—with comments on the various points brought to notice—would be of interest to officers concerned in the training of other Engineer Field Units.

The Field Troops, R.E., do annually six weeks Summer Training in Camp. For those in England this consists of three weeks bridging and rafting practice (latterly on the Thames) by each Troop separately, and three weeks Combined Training together on "Schemes" with as much practical work as possible included.

This year the Individual Camp was just below Streatley-on-Thames. The Combined Camp was also to have been there. But the Troops were ordered by the War Office to prepare the camps in the Army Manœuvres area for the Cavalry Divisional Training, and to carry out their own Combined Training in the same area; so the Combined Camp was located at Newton, one of the Cavalry Camp sites south-west of Cambridge.

Owing partly to inclement weather, and partly to days having to be put aside for work in connection with Camp preparation and movements to Brigade Camp sites, the actual number of working days on "Training" was somewhat less than usual.

Capt. R. Hutchison, 11th Hussars, of the Directorate of Military Training, kindly came down to Newton at the commencement of the Camp, and assisted with the preparation of the General and Special Ideas.

The main points aimed at during this year's training were :--firstly, rapidity in forming decisions as to the occupation of localities and the work to be executed, and in the actual commencement of work ; secondly, intercommunication between troops.

In all schemes the actual work was carried out as far as possible, *e.g.* dummy charges fixed for demolition and fuses or leads laid, tools required for works laid out, etc.

On two bye-days memory-map-reading was practised by N.C.O.'s. A sample exercise and explanations are given at the end of the Schemes. This affords a very useful exercise in map-reading and memorizing and in observation and deduction.

Reference ½-inch Manœuvre map, Southern Sheet, or 1-inch O.S. map, Sheet 85.

GENERAL IDEA.

1. BLUELAND and BLACKLAND, first-class Continental Powers, are at war on the Continent of Europe.

BLUELAND has gained control of the sea north of the ENGLISH CHANNEL.

2. REDLAND (England), an ally of BLACKLAND, is just completing her mobilization of one Cavalry and six Infantry Divisions, and is undecided whether or not this force shall be sent to the Continent to help BLACKLAND.

3. BLUELAND, in order to prevent REDLAND from sending any troops to BLACKLAND'S assistance, has invaded REDLAND with a force of one Cavalry Division, a number of cyclists, and two Corps.

These troops have landed at KING'S LYNN and are matching on LONDON.

SCHEME "A."

(i.). Rapid Reconnaissance of a Position.(ii.). Deliberate Preparation of a Position.

Special Idea No. 1.

1. The REDLAND Government have hastily collected all available troops to drive out the invader. They have concentrated by rail in the area BEDFORD—POTTON—HITCHIN—LUTON, with the Cavalry Division about ROYSTON.

2. As far as can be ascertained the positions of the respective forces at 2 p.m. on the 1st of June are :—

(a). REDLAND.

Cavalry Division on the line ROYSTON (4th Brigade)—KNEES-WORTH (1st Brigade)—ORWELL (2nd Brigade)—Headquarters at ORWELL.

Infantry columns billeted in depth with their heads at BALDOCK, ASHWELL, DUNTON, GAMLINGAY. Army Headquarters at BEDFORD.

(b). BLUELAND.

Cavalry Division and cyclists at NEWMARKET, one Corps at BRANDON, and one Corps at THETFORD (16 miles N.E. of NEWMARKET).

Patrols are reported to have been in BOTTISHAM, FUL-BOURNE, BARTLOW, and LITTLE THURLOW at 6 a.m.

3. At 4 p.m. G.O.C. Red Cavalry Division after a conference with Red G.O.C.-in-C., issued orders of which the following is a *precis* :—

"The Division will move forward to-morrow and make good the high ground between GUNNERS HALL, two miles N.E. of LITTLE ABINGDON, and CHERRY HINTON.

"The Division will march in three columns, which will move *viâ* TRUMPINGTON, GREAT SHELFORD, and WHITTLESFORD. Each column will furnish its own advance guard, which will be accompanied by a Field Troop.

"On arrival on the above-mentioned line the Field Troops will strengthen the position WORSTED LODGE--RESERVOIR under instructions from the C.R.E."

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The following special instructions were issued to the C.R.E. by the G.O.C. :-

"As soon as the advanced guards have got beyond the line WORSTED LODGE-RESERVOIR, I want you to reconnoitre this line and report :--

"(i.). How it can best be strengthened.

"(ii.). What working parties you will require to assist you.

"The time available for the work will probably be about six hours; and the Division will hold the ground for 24 hours until relieved by the Infantry, who will occupy the ground with the strength of one Division."

Exercise (A).—C.R.E. will issue preliminary instructions to O.C.'s Field Troops, which are in billets allotted to Brigades.

Exercise (B).-C.R.E. will report as instructed by G.O.C.

Exercise (C).—Cavalry will be allotted to assist in the preparation of the line, tasks assigned, and sappers distributed for work and supervision.

Exercise (A).—C.R.E. issued the following instructions to O.C.'s Field Troops by Troop cyclist orderlies attached to Headquarters :—

"The Field Troops will strengthen portions of the position referred to in Divisional Orders as follows :---

" 5th Field Troop. -- WORSTED LODGE -- COPLEY HILL, exclusive.

"*ist Field Troop.*—COPLEY HILL inclusive—road junction at POINT 22 exclusive.

" 3rd Field Troop .- POINT 22 inclusive to RESERVOIR.

" Each O.C. Troop will reconnoitre his section and report-

"(i.). How it can best be strengthened.

"(ii.). What working parties and extra tools he will require, on the assumption that about six hours are available for the work. The Cavalry will hold the position for 24 hours until relieved by Infantry. The dispositions should be such that the arrangements are capable of expansion for the line to be held by one Division of Infantry.

"O.C.'s will hand in reports personally at COPLEY HILL as soon as possible after 1.30 a.m."

The scheme was so timed that about one hour was available for O.C.'s Troops to make their reconnaissance and the C.R.E. to prepare his report before the supposed arrival of the G.O.C. at COPLEY HILL. The line taken up presented no particular difficulties. The C.R.E. was able himself to make a cursory inspection of about two-thirds of the line in the allotted time.

COMMENTS.

(1). The necessity for punctual report at the rendezvous was not realized in every case. In the time given the C.R.E. was not able to make a thorough reconnaissance of the line himself, and for certain portions of the line he had to depend entirely on the reports of his subordinates. From their reports, combined with his own observations, the C.R.E. would, in such a case, advise the G.O.C. on the points mentioned in his special instructions. The G.O.C. would then give orders for the detailing of working parties as far as the tactical situation would permit. If, however, the reports were not up to time, as actually happened in this instance, there would be considerable danger of all the Cavalry passing the line and of the C.R.E. having to carry out his suggestions without any working parties at all. This of course might happen even if the reports were in time, if the tactical situation demanded it.

(2). In the orders to the G.O.C. Cavalry Division, issued by the G.O.C.-in-C., the phrase used with regard to this line was "The Cavalry will make good the line." This phrase was taken to mean that the Cavalry would operate well in front of the line and not plant themselves on the line itself. Exercises (A) and (B) therefore resolved themselves into, firstly, a reconnaissance, and secondly, the employment of the Field Troops up to the time when the line would be definitely settled by the C.R.E. and such working parties as had been given him by the G.O.C. had been distributed to sections. Up to this time the Sappers of the Field Troops could be employed in collecting tools and materials and making a detailed inspection of localities that would probably be used.

In Exercise (C) it was supposed that one regiment was allotted for strengthening the whole line, and the C.R.E. allotted one squadron from that regiment to each of the three sections. No material alteration was made to the line suggested by the three O.C.'s Troops.

(3). Some difficulty was experienced by O.C.'s Troops in meeting each other at the ends of their sections for the purpose of connecting their flanks. After considerable discussion on this point, it was decided that the most effective way of overcoming this difficulty was for each O.C. Troop to place one man at each end of his section, to act as a post-office for messages, and to guide officers and orderlies to their Troops. The O.C. Troop would start reconnoitring his section from one flank, and drop an orderly at that flank with instructions as to how that flank was to be occupied. He would send an orderly to the other flank to get similar information from the officer in charge of the next section. Each of these orderlies would be informed of the probable whereabouts at certain hours of his own O.C.

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(4). When two or more officers are called upon to report on sections of a defensive position or other locality, and they are required to or are likely to submit sketches or enlargements from a map, the C.R.E. (unless some permanent understanding on the point exists in his command) should give instructions as to whether the sketches should be drawn with two edges of the paper true north and south or whether they should be drawn with edges parallel to the supposed line of the enemy's advance; unless this is done a variety of orientations will result, and it will be impossible to piece the sketches together so that they can be read as one. In the case of a *line* being reconnoitred, it seems most convenient for the sketches to be drawn with two edges running north and south and with place names east and west, as in a map, while the information re allotment of troops, position of machine guns, etc., etc., is entered so as to read when the sketch is held facing the enemy; the sketch can then be easily compared with the map and yet be conveniently read with reference to the tactical problem. In other cases, the sketches would usually be best made exactly as a map.

As War Diaries apparently require to be accompanied by copies of all reports, messages, orders, etc., officers should accustom themselves to making all sketches in duplicate.

(5). The tools of Cavalry regiments are carried in a limbered G.S. wagon with signalling equipment. In cases of this sort, where the occupation of the line is contemplated overnight, some arrangement should be come to with Divisional Headquarters for brigading the tools of a brigade, so that the tools can be fetched up without delay.

SCHEME "B."

Night Raid on Hostile Railway Communications.

Special Idea No. 2.

"The C.R.E. will detail three parties of Engineers, which will leave to-night with escort of one Squadron each from the 1st, 2nd, and 4th Brigades, and move and act as follows :—

"(1). From 1st Brigade (ROYSTON) via NEWTON, and southeast of NEWMARKET-ABINGTON ROAD, and destroy the railway between SIX MILE BOTTOM and NEWMARKET.

"(z). From 2nd Brigade (KNEESWORTH) via NEWTON and south and east of CAMBRIDGE, and destroy the railway between STOW-CUM-QUY and SWAFFHAM PRIOR.

"(3). From 4th Brigade (ORWELL) via NEWTON and west and north of CAMBRIDGE (avoiding that town), and destroy the line between FEN DITTON and WATERBEACH."

C.R.E. issued the following instructions (by Troop cyclist orderly attached to Headquarters) to each Field Troop :--

"You will send with the squadron from your brigade two parties of cyclists with demolition materials."

Exercise (D).-At 10 a.m. report very briefly :-

- (i.). How you think the Squadron should be employed.
- (ii.). At what time and by what routes you would move.
- (iii.). What steps you would take to decide how, where, and when your separate parties would act.

and (iv.). Parade your parties ready equipped.

N.B.—For purposes of instruction as many parties as possible should be employed, both cyclists and mounted.

Exercise (E).—(i.). Carry out your march and demolitions with all your parties in accordance with the plans approved after discussion on the points raised in Exercise (D).

Dummy charges to be actually placed as far as possible.

(ii.). Report on the exercise at 3.30 a.m., on Saturday, 3rd inst., at LODE.

COMMENTS.

(1). It was agreed that when time was available, the way to carry out these distant demolitions was to occupy two nights and one day in the process. On the first night parties with their escort would proceed as near as possible to the proposed site of the demolition, and the escort would there be dropped. The demolition parties would lie concealed during the next day in some copse or building within sight (if possible) of their objective; the route would be explored (probably with field glasses), and if possible the objective reconnoitred. During the second night the demolition party would proceed on foot to execute its task, and on completion of the work would retire to their escort, which would act as the rallying point.

In this exercise the conditions were that the railways should be destroyed on the same night. The question then arose as to whether it would be better to act by force or by stealth. By "acting by force" is meant that the escort should overpower the picquets on the railway and keep off reinforcements until the work of destruction had been completed. "Acting by stealth" would mean that the escort would take the demolition parties as far as they could with a reasonable hope of not being disturbed by any formidable opposition, and that from that point the demolition parties would proceed alone and unobserved. All three troops decided on the latter method; and, generally speaking, advanced to within about three miles of their objectives, there dropped their squadrons, and proceeded on foot.

(2). The question of the timing of several demolitions was discussed on the completion of the exercise. It was agreed that, in order to get as good a result as possible, a definite hour should be fixed before which no actual demolition should take place, unless any party were interrupted. By this means the danger of one party letting off their charge before the second or third party were ready to do so would be considerably reduced. An ample margin of time must, however, be given to allow for the delays on the road which are certain to occur.

(3). Three minor points, which are of interest, arose in this exercise.

In the first place nearly all the supposed culverts and bridges turned out to be level crossings. The difference of the conventional signs on the $\frac{1}{2}$ -inch map is just noticeable when the map is examined carefully in a good light.

Secondly, an observer, who was waiting on a culvert for the approach of one party, heard the horses of that party on the road at a distance of $2\frac{1}{2}$ miles; but he did not hear the party itself cross the railway in order to attack it from the rear at a distance of 400 yards. Obviously demolition parties should when possible proceed on bicycles and not on horses.

The method of attack from the rear seems very sound, as a seutry might easily take movements of a party behind him to be those of his own side.

Thirdly, one of the few culverts was of peculiar construction. The rails rested on longitudinal sleepers on chocks in trough girders, and the spaces between the rails were filled with steel or iron plate decking; the stream under the culvert was deep water. In the pitch dark it took a considerable time to ascertain the construction of the culvert, and the fixing of charges was a difficult matter.

SCHEME "C."

(i.). Preparation of Bridge Heads.

(ii.). Hasty Reconnaissance of a Defensive Line.

NARRATIVE.

On the night of the 1st-2nd June, the attempts on the railway lines met with some slight success. Rails were removed in two places, and the small culvert 1 mile east of LODE station was destroyed.

On the 2nd June, the Cavalry Division held the line RESERVOIR-WORSTED LODGE, but were hard pressed along their front, and in the late afternoon forced back to their defensive position.

SPECIAL IDEA NO. 3.

At 11 p.m. on the evening of the 2nd June, the G.O.C. Cavalry Division gave the following confidential instructions to the C.R.E. verbally :---

"The Division will retire slowly to-morrow west of the line of the R. GRANTA. I intend holding this line from GRANTCHESTER to WHITTLESFORD, both inclusive, until the arrival of the Infantry columns, which I expect at 4 p.m. to-morrow.

"You will arrange for defence of the river crossings with the Engineers at your disposal, assisted by one regiment of Cavalry.

" No bridges are to be destroyed.

"You will also report by 10.30 a.m. on the suitability for defence of the line indicated."

The C.R.E. issued orders, of which the following is a summary, by Troop cyclist orderlies :--

"The Field Troops will prepare the defence of the crossings of the GRANTA from GRANTCHESTER to WHITTLESFORD, both inclusive, with a view to the occupation of this line on the west of the GRANTA.

"*ist Troop.*—WHITTLESFORD STATION inclusive to PAPER-MILL BRIDGE inclusive.

"5th Troop.—PAPERMILL BRIDGE exclusive to HAUXTON MILL BRIDGE inclusive.

" 3rd Troop.—HAUXTON MILL BRIDGE exclusive to GRANT-CHESTER inclusive.

"A squadron of Cavalry will report to each Troop at 10 a.m. at GRANTCHESTER, GREAT SHELFORD, and WHITTLESFORD) respectively.

"Bridges are not to be destroyed, but may be prepared for demolition provided traffic is not obstructed.

"O.C.'s Troops will also reconnoitre their sections, and report to me by 9.45 a.m. at HAUXTON MILL as to the suitability of their sections for occupation by a brigade of cavalry and as to artillery positions."

* *Exercise* (F).—O.C.'s will reconnoitre and report as instructed in C.R.E.'s orders.

Working parties and tools will be distributed, and tasks allotted.

Exercise (G).—Subalterns will submit sketches of the sections of the line allotted to their Troops, showing :—

(i.). Positions selected.

(ii.). Troops suggested for occupation.

(iii.), Works proposed.

N.C.O.'s will submit sketches of localities and works allotted to them, and a statement of working parties, tools, and time.

COMMENTS.

(1). Regarded as an exercise in reconnaissance, Scheme "C" was a variation of Scheme "A." In this instance, O.C.'s Troops, in order to get their reports submitted punctually, had only sufficient time to canter and trot round the sections allotted to them. The nature of the country was such that the C.R.E. could, by the time at which his report was due at Divisional Headquarters, do no more than make a very partial examination himself and collate the reports of his subordinates. A definite hour had been fixed by the G.O.C. for the rendering of the C.R.E.'s report; it was therefore assumed that the G.O.C.'s tactical dispositions might to a large extent be dependent on that report, and the importance of punctuality was thus emphasised.

(2). As regards the preparations for defence of the crossings, this Scheme differed from Scheme "A" in that no delay need be incurred in actually starting work, for the line indicated in C.R.E.'s orders was a very definite one, a long natural obstacle; and the only variation possible was whether bridge heads should be constructed in front of the crossings or whether defences should be prepared in rear. The works to be undertaken were perforce isolated, and the maintenance of a connected line between these works was of secondary importance.

(3). The questions to be answered in order of importance in this case were :—

(i.). How can I best assist the retirement of our cavalry ?

(ii.). Can I make my dispositions such that, in addition to (1), I can facilitate the advance of our troops to-morrow when we expect to be reinforced?

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On examination of the ground, it was found that the decision of the question whether defences should be constructed in front or in rear of the passages was at each place entirely dependent on the locality itself. At the GRANTCHESTER crossing, for instance, the only possible line to hold was found to be the east edge of TRUMPINGTON village; at HAUXTON and GREAT SHEL-FORD the defensive post was slightly in front of the bridge; at WHITTLESFORD the main defence was well behind the stream.

(4). Other points which arose in the discussion on the exercise were as follows :--

Having placed the locality in a state of defence, careful arrangements must be made for leading into the positions the troops detailed to occupy them. This, it would appear, can only be done by sending officers to meet the troops on the line of retreat some distance in advance of the positions.

Considerable confusion was caused at one place by an officer issuing orders to a N.C.O. partly by word of mouth and partly in writing, with the result that his instructions were entirely misunderstood and only the written orders carried out. If, in cases where subsequent supervision is difficult or unlikely, there is not time to give all necessary instructions in writing, at least the main headings of the instructions should be clearly given in writing, and these written instructions should then be amplified by verbal explanations.

SCHEME "D."

Engineer Reconnaissance for Materials.

(Officers and N.C.O.'s).

Evercise (H).—The C.R.E., from a map, issued the following order on the supposition that the information collected might be useful to Field Companies later on.

"I. The Field Troops will make an Engineer Reconnaissance of the areas in CAMBRIDGE specified below.

3rd Troop .- Area bounded by :-

- N.W. Gonville Place.
- All inclusive. S.W. Hills Road.
- N.E. Mill Road.

1st Troop.-Area bounded by :-

- N. River Cam.
- Victoria Avenue, Emmanuel Road, Parker E. Street, to south corner of Parker's Piece. | Inclusive.
- S. South boundary of Downing College.
- W. The River Cam.

5th Troop.—Area bounded by :-

- W. Newmarket Road.
- E. G.E. Railway to Elv.
- S. Mill Road exclusive.
- W. East boundary of Christ's Piece exclusive.

"2. This reconnaissance has special reference to materials suitable for bridging.

"3. Troops will rendezvous at the Market Place, and O.C.'s will submit reports to the C.R.E. there at 11.30 a.m."

COMMENTS.

1. This Scheme was timed so as to give about $1\frac{1}{2}$ hours in CAMBRIDGE before reports had to be given up. O.C.'s Troops were not supplied with maps of Cambridge beforehand. Two officers bought such maps on arriving in CAMBRIDGE; the third officer did not do so, and his report was not delayed thereby. The Scheme was well carried out, and reports submitted punctually.

2. In the area allotted to the 3rd Troop, the S.E. boundary was undefinable on the C.R.E.'s map and was not defined. It turned out that on this side, beyond the Railway Station, was one of the two largest builder's yards in the town. When possible the C.R.E.

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should make a personal reconnaissance before allotting areas in a large town, and areas should definitely include or exclude principal roads. (In a similar exercise at Maidenbead last year, a road which was apparently outside the industrial area was given as the boundary between two units; neither unit reconnoitred the road, and it contained the largest timber yard in the place). These reconnaissances show that a very large quantity of engineer material is to be found even in comparatively small towns; they also show that that most useful article, the beer-barrel, is to be found in large quantities, but is often overlooked.

3. The following other point was raised in a discussion on the Scheme:—

In most cases the troops were subdivided into parties of three or four, to whom areas were allotted and by whom materials of all sorts were searched for. ' In one case, however, materials were looked for by men according to trades, that is to say, carpenters reconnoitred only for scantlings and scaffolding, iron workers for girders, bolts, etc., and so forth. The question seems to be one of personal taste; but it is suggested that for general building materials, such as are of use in field engineering operations, all sappers should be sufficiently trained to know what is useful and what is not; whilst for special stores, e.g. Portland cement, girders, traction engines, and vehicles, experts should be detailed if such stores are required.

SCHEME "E."

Occupation and Defence of Close Billets.

NARRATIVE.

On the 3rd June, the Cavalry Division retired behind the line of the river GRANTA, and held that line till the morning of the 4th June. Infantry columns then began to arrive.

'At 4 p.m. on the 4th June, the Cavalry Division again advanced across the GRANTA in a north-easterly direction.

SPECIAL IDEA NO. 4.

At 6 p.m. the positions of the Cavalry columns were as follows :---

	ist Bde.	2nd Bde., Divl. Headquarters, and Divl. Troops,	4th Bde.
Advanced Guards	MUTLOW HILL	FULBOURN	TEVERSHAM
Main bodies	WORSTED LODGE	MEGGS HILL	RESERVOIR

The 3rd Brigade was operating independently to the front.

The disposition of the Field Troops was as follows :--

Mounted men with advanced guards, cyclists and vehicles in rear of leading regiments of main body.

At 6 p.m. the Brigades were ordered into close billets at SIX MILE BOTTOM, LITTLE WILBRAHAM, and LODE respectively, with Divl. Headquarters at BOTTISHAM, Divisional Troops (less Engineers) at GREAT WILBRAHAM, and the 3rd Brigade on the line SWAFFHAM PRIOR—NEWMARKET.

Exercise (\mathcal{F}) .-C.R.E. issued the following orders :---"(i.). O.C.'s Troops will submit sketches showing the billeting arrangements of their Brigades, including allotment of troops, defensive arrangements, alarm posts, and water supply.

(ii.). Water supply as for a Brigade will be actually carried out.

NOTE.—Attention is drawn to *Field Service Regulations*, Part I., paragraphs 45—54."

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Later on orderlies were sent to each of the Field Troops, to the billeting areas of their Brigades, with instructions that the Field Troops were to march to BOTTISHAM, and to close billet there on completion of the task allotted to them in the exercise. The Troops arrived during dusk and after dark, and billeted in a farm hired for the purpose. An alarm was sounded at 3 a.m. and the Troops turned out on their alarm posts; the time taken to turn out, ready for the road, was between twenty minutes and half an hour respectively for the first and last Troops. The night was a very dark one.

The C.R.E. and Adjutant worked out Exercise (J) (i.) with regard to BOTTISHAM itself, and other dispositions were examined and discussed on the following morning.

COMMENTS.

1. Considerable doubt exists as to the methods which should be adopted for protection of Cavalry in close billets. Regulations on the subject are, it is submitted, generally obscure, and do not appear quite to meet war methods which have not yet been put into actual peace practice in this country. It is understood that in close billets, men, as necessary, would be told off to occupy certain points in the perimeter (e.g. barn walls, garden hedges, farm windows), and on alarm would go to those points; the surplus would go to the alarm post of the unit, which would more properly be termed the assembly post for the local reserve. The general alarm post would appear to mean the assembly post for the general reserve, *i.e.* for the unit (if any), or the part of such unit, which was not allotted any position on the perimeter.

It is believed that the regulations are under revision. An authoritative solution of this problem by the general staff would be of great value.

2. Two points of interior economy arose during this exercise viz. method of carrying cleaning gear, and supply of canvas buckets. The best method of carrying cleaning gear is to have a small stout cloth bag (made for it under Troop arrangements), and to carry it strapped to the offside of the saddle.

Buckets are issued on a certain scale for manœuvres; they should form an article of Troop equipment at the rate of one for every two horses, and for riding horses should be carried on the saddle.

3. The disposal of rifles when in billets requires very careful attention. In close billets they would be with the men; in open billets they would be placed under a sentry in each house (see F.S.R., I., paragraphs 52-54).

4. It was pointed out on this Scheme that it is quite probable that, in a case where Brigades got into either close or open billets in a Brigade area, a Field Troop might be allotted a building or buildings in a detached position.

In such a case the unit becomes entirely responsible for its own immediate protection. It is therefore considered necessary for O.C.'s Troops to pay considerable attention to the training of their units in simple protective duties and in fire control and fire discipline. The latter training has been much neglected since the abolition of field practices in the annual musketry course of the Royal Engineers.

SCHEME "F."

(i.). Bridge Demolition.

(ii.). Defence of a Locality.

(iii.). Tactical Use of Field Troops.

NARRATIVE.

On the 5th and 6th June, fighting took place in the neighbourhood of NEWMARKET, with the result that the BLUELAND troops in that area were driven back in some confusion on THETFORD.

Considerable BLUELAND forces, however, were reported on the afternoon of the 6th to be at WISBECH and advancing on CAMBRIDGE.

The REDLAND Commander-in-Chief determined to change his line of communication to the line HERTFORD—CAMBRIDGE, and to retreat in the direction of the former place.

This movement was begun on the night of the 6th June, covered by the Cavalry Division, and was continued on the 7th June.

Special Idea No. 5.

At 8 a.m. on the 8th, the position of the opposing forces was as follows :---

REDLAND.—Infantry columns on the line ROYSTON—CHRIS-HALL—LITTLEBURY.

ıst	Cavalry Brigade		•••	•••	FOXTON.
2nd	Cavalry Brigade an	nd F	Ieadquai	rters	
	Cavalry Divisior	ı <i></i>	••••	•••	THRIPLOW.
4th	Cavalry Brigade		•••		WHITTLESFORD.
3rd	Cavalry Brigade		•••	•••	GUNNER HALL.

The rear guards of the 1st, 2nd, and 4th Cavalry Brigades were in touch with the enemy's mounted troops on the line HASLING-FIELD—HAUXTON—SHELFORD.

At 8.30 a.m. an order, of which the following is a summary, was communicated to the C.R.E. :—

"The 1st, 2nd, and 4th Brigades with Divisional Artillery will concentrate at CHRISHALL GRANGE.

"The Engineers will, under the orders of the C.R.E. :--

" (i.). Destroy the bridges over the GRANTA from WHITTLES FORD STATION exclusive to GREAT CHESTERFORD inclusive.

" (ii.). Prevent the enemy crossing between these points.

"(iii.). Hold ICKLETON.

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"The 3rd Brigade will retire slowly on LITTLE CHESTER-FORD."

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NOTE.—For this scheme the GRANTA is considered unfordable, except where fords are shown on the 1-in. O.S. maps.

Exercise (K).—At 8.30 a.m. O.C.'s Field Troops received orders from the C.R.E. of which the following is a summary :—

"Reference Divisional Orders issued this morning, the 5th Field Troop will destroy the bridges from WHITTLESFORD STATION exclusive to HINGSTON FORD; this Troop will block HINGS-TON FORD and arrange for its defence.

"The 1st Field Troop will destroy the bridges from HINGSTON FORD exclusive to ICKLETON MILL inclusive; and the 3rd Field Troop from ICKLETON MILL exclusive to GREAT CHESTER-FORD inclusive.

All *personnel* not required for the demolitions will rendezvous as early as possible at ABBEY FARM, ICKLETON, with the exception of a half-troop of the 5th Field Troop, which will defend HINGSTON FORD and send patrols as far as HILL FARM and WHITTLESFORD STATION.

COMMENTS.

(1). The orders were carried out differently by the three Troops. One O.C. divided his Troop, and sent parties independently to their two bridges and the ford previous to reconnoitring; another took the whole Troop along his section and dropped men as required; the third sent an officer forward to reconnoitre, and took no action until his report had been received. In the last case considerable delay was incurred, as the officer's horse got away in a ford, and it is doubtful whether, owing to this delay, the bridges in that section would have been destroyed in time. The correct procedure, it is thought, would be to send parties immediately to the sites of the demolitions, and to get tool carts with explosives to them as soon as possible. Speed in accomplishing demolition of the bridges was in this case of the greatest importance.

(2). The C.R.E. reconnoitred ICKLETON village, and divided its defence between the 3rd and 1st Troops, keeping the half-troop of the 5th Troop in reserve.

A deliberate examination of the ground at the close of the exercise raised doubts as to whether putting so great a proportion of the force at disposal into a definite defensive area was sound under the circumstances. The village was important mainly as blocking two avenues of approach, that is to say the DUXFORD—ICKLETON road and the HINGSTON—ICKLETON road. The most that a small force

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could do, if attacked in such a position, would be to delay the enemy by turning him off the avenues of approach and making him go across country. It seems extremely improbable that an enemy, especially Cavalry, would but his head against that portion of the village which lay between the two avenues of approach; it would be entirely to the advantage of the delaying force if he were to do so. The enemy's probable action in such a case would be to go round the village, and to turn the defenders out by threatening their horses which would be behind the village.

The correct solution of this problem seems to be, that one should hold the approaches only, and keep as many men as possible in reserve to delay the enemy by manœuvring on the high ground to the west, which he would probably endeavour to gain.

As every man is of value, it would appear to be uneconomical to expend men in holding the ground between the two lines of approach. The row of houses and the cross roads which join the two lines of approach, make an admirable obstacle which is hardly likely to be surmounted without considerable loss and confusion.

(3). The question of reporting progress also arose in this exercise. The Troops were allotted two separate tasks by the C.R.E., viz., firstly, to demolish certain bridges on their own account, secondly, to assemble for tactical defensive action under himself. He would have been greatly assisted in his dispositions, and relieved of considerable anxiety, if he had received information from Troop commanders as to the progress and probable duration of their demolition work and the hour at which their commands would be free for their second task, *i.e.* the defence of ICKLETON.

SCHEME "G."

Construction of a Bridge by Three Troops combined.

NOTE.—This Scheme was taken out of its proper place in the sequence of events. It should have come after Scheme "D," and have date June 4th.

NARRATIVE.

On the 3rd June, the Cavalry Division retired behind the line of the river GRANTA on to the line WHITTLESFORD-GRANT-CHESTER, being followed as far as the G.E. Railway-line by hostile mounted troops.

SPECIAL IDEA NO. 6.

On the evening of the 3rd June the G.O.C. Cavalry Division gave orders, of which the following is a summary, to the C.R.E.:-

"I intend to turn the enemy's right flank by a movement from MILTON across the fens on LODE and STOW-CUM-QUY tomorrow.

"With the three Field Troops you will :--

"(i.). Construct a bridge over the river CAM at MILTON, for the passage of all arms.

"(ii.). Reconnoitre the routes thence to LODE and STOW-CUM-QUY, and prepare the crossings of the fen streams where necessary."

Exercise (L).—Construction of a bridge by three Field Troops under the commanding officer of one.

Exercise (M).—Reconnaissance by officers and N.C.O.'s for routes and crossings.

Exercise (N) .- March on routes reconnoitred.

NOTE.—The stores used for the bridge were supposed to be those found in CAMBRIDGE during the Engineer Reconnaissance of Scheme "D." Actually they were kindly lent by the Engineer Company of the Cambridge University Officers' Training Corps, and were carted to the site in Troop wagons overnight.

The spars for the trestles were unsuitably long and could not be cut.

In order to give all three Troops some work, one was given the raft, one the near trestles, and one the far trestle. The supervision of the whole was given to the officer commanding one troop.

COMMENTS.

(1). The bridge, which consisted of one barrel cut-raft, one trestle on the far bank, and two trestles on the near bank, illustrated the disadvantages of a bridge partly trestles and partly floating in a narrow river with steep banks. (2). The plan of three Field Troops working under the orders of one Field Troop Commander on a small job proved a failure under peace conditions, owing :--

(i.). To the natural reluctance of one officer in taking complete charge of others of equal standing.

(ii.). To the comparatively large number of officers and senior N.C.O.'s who could have no definite task suitable to their rank, and therefore assumed perforce the *rôle* of spectators. This seemed to have a deleterious effect on the energy of the lower ranks.

It is suggested that, if it is necessary to carry out engineering work by more than one Troop, under the orders of an officer other than the C.R.E., either the Troops other than his own should be handed over to that officer, minus their Captain; or only the sappers and junior N.C.O.'s actually required from other Troops should be attached for work, and higher ranks kept well in the background.

(3). Certain shortcomings in horsemastership were noticeable during this exercise. The horses were placed in a meadow where there was good grazing; in many cases bits had not been removed and girths were found not slackened. The question as to whether saddles should or should not have been removed, on a cold, windy, rainy day is open to doubt, but the point is always worth considering when it is known that horses will be idle for some hours.

The proper disposal of the empty store wagons was omitted, and they were left on both sides of the only approach road to the bridge.

SCHEME "H."

(i.). Bridge Demolition, Hasty Defence of Localities.

(ii.). Tactical Employment of Field Troops.

NOTE.-In this Scheme the Field Troops are supposed to form part of the BLUELAND forces operating from WISBECH (Scheme "F").

NARRATIVE.

On the morning of the 8th June the BLUE Cavalry Division of three brigades was following the retreating RED Cavalry. This was covering the retirement of its Infantry columns, which were retreating in a southerly direction.

The BLUE Cavalry advanced in three lines from CAMBRIDGE on FOXTON, THRIPLOW, and WHITTLESFORD, keeping touch with the hostile cavalry.

At 8.30 a.m. the three brigades were ordered to concentrate at THRIPLOW for action against the hostile mounted troops, which were reported to be massed near CHRISHALL GRANGE.

The Field Troops at this hour were engaged repairing the bridge at HAUXTON MILL, which had been destroyed by the RED Cavalry in their retreat.

SPECIAL IDEA NO. 7.

At 9 a.m. a Staff Officer arrived at HAUXTON MILL, and gave the following information and instructions to the C.R.E. :--

"Our left and centre brigades were surprised by the enemy's cavalry near THRIPLOW and are being pushed back in some confusion on SHEPRETH and FOXTON. Our right brigade is covering this retirement.

"The G.O.C. intends to retire across the river RHEE and rally behind the line ORWELL-HASLINGFIELD.

" The Field Troops will protect the left flank by holding HARS-TON. HARSTON BRIDGE must be prepared for demolition.

"The Field Troops will retire to HASLINGFIELD when the brigades have crossed the river RHEE and hold that place."

Exercise (O).-Tactical and technical dispositions for hasty defence of HARSTON.

Exercise (P) .- Preparation of bridge for demolition.

Exercise (Q).-Reconnaissance of HASLINGFIELD for prolonged defence.

Exercise (R).-Dispositions for defence of HASLINGFIELD.

On receipt of Special Idea No. 7 the C.R.E. issued orders of which the following is a summary :---

"The 1st Field Troop will occupy HARSTON village east of the HASLINGFIELD-NEWTON road exclusive.

"The 3rd Field Troop will occupy HARSTON village west of the HASLINGFIELD-NEWTON road inclusive.

"The 5th Field Troop will prepare HARSTON bridge for demolition and act as a reserve at HARSTON CHURCH. An officer will be detailed to reconnoitre HASLINGFIELD for the purpose of defence.

"The O.C. 3rd Field Troop will establish a look-out post on ROWLEYS HILL, and signalling communication thence to HARS-TON."

COMMENTS.

(1). O.C.'s Troops were given 25 minutes to make their hasty dispositions and report to the C.R.E. in HARSTON.

This portion of the exercise was carried out up to time. Generally speaking the dispositions gave too extended a line. In such a case, the close defence of the bridge approaches was of the first importance. The bridge could only be approached down the main road, and the houses at the two forks were admirably adapted for the defence of this road.

After an examination of the dispositions, and when the bridge was reported ready for demolition, the Troops were retired on HASLING-FIELD, and there took up positions in accordance with the scheme prepared by the officer who had reconnoitred that place.

(2). HASLINGFIELD proved to be an exceedingly difficult locality in which to make any good prolonged defence by a very small force. Any arrangements made would have to be entirely dependent on the tactical situation. In the first place, HASLINGFIELD became untenable unless the right flank was held by supporting troops, *i.e.*, on CHAPEL HILL; this appeared to be a *sine qua non*, and if CHAPEL HILL were occupied by the enemy the Field Troops would have to abandon the village. The Field Troops themselves were certainly not strong enough to hold HASLINGFIELD for flank defence and to protect their own right on CHAPEL HILL as well. It therefore became necessary to depend on the Cavalry, whom one expected to rally north of the high ground, to hold CHAPEL HILL.

The action of the Field Troop would therefore be confined to its front and to its left flank. It seems probable that the opposing Cavalry, having found HARSTON BRIDGE destroyed, would endeavour to get round the left flank at the next crossing rather than attack frontally. The ground in the neighbourhood of FROG END therefore would be of primary tactical importance; and the

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defence of the village itself of secondary importance. The correct disposition therefore seems to be to have the bulk of the Troops in reserve at the north end of HASLINGFIELD, to act where required as mounted infantry, with a half-troop picket at point 71 near FROG END, and a half-troop in the neighbourhood of MONEY HILL (south of HASLINGFIELD) to oppose any attempt at crossing near HARSTON BRIDGE.

(3). During the Training considerable thought was expended on the defence of villages. In no two cases was the solution the same ; but the following notes may perhaps be of assistance :--

(1). Villages, when first examined, are extremely puzzling, owing to the curling roads, side tracks, high walls, and the impossibility of seeing clearly. It was found, however, that a rough large-scale sketch, which can be made in three minutes from the Ordnance map, helps very much to crystallize one's ideas.

(2). Road junctions, of which there is nearly always one, are usually the important places for the purpose of close defence.

(3). If the enemy attacks across gardens and enclosures, he must lose cohesion and would certainly be delayed. Cross-country defence is therefore often unprofitable and sometimes undesirable. Communications through back gardens are, however, very useful for the defence.

(4). Very little actual engineering work is required in village defence. It is a waste of time to loophole walls which may never be manned. The value of obstacles, such as farm wagons and threshing machines stretched across the road and commanded from upper storey windows, is considerable.

(5). It is better to occupy the left side of a street parallel to the enemy's line of advance as it is easier to shoot from windows to the left than to the right.

(6). Unless flanks are guarded by troops other than the garrison of the village, a large reserve should be kept to manœuvre.

MEMORY MAP-READING EXERCISE.

(Junior Non-Commissioned Officers and Sappers).

Officers and senior N.C.O.'s, each accompanied by a proportion of junior N.C.O.'s, proceeded to the points allotted to them. The seniors, who carried maps, remained at the points, and directed the juniors to go to any other point. The juniors, who rode or bicycled, carried no maps, but had to find their way after a study of the map at each point.

Each junior carried a slip, which was filled up and initialled at the various points he visited. An example of the slip is given below.

Junior N.C.O.s were questioned at each point as to any objects of military interest, such as forage, forges, saddlers' shops, post and telegraph offices, barns suitable for billeting, water, etc., seen when coming from the last point; and were also asked to declare what topographical features they were likely to meet or see and the nature of the terrain on the way to their next point.

Point	. Description.		Officer at Point.
А.	Cross roads 3 mile N.E. of FOWLMERE		T.S.M. "S."
В.	Heath Farm		T.S.M. "A."
С.	Pt. 182, 3 mile S. of Hevdon Grange		T.S.M. "K."
D.	Summer House Farm		Sergt, "B."
Ε.	Farm 1 mile due E. of Melbourn Church		Sergt. "F."
F.	Bridge 11 miles due W. of Fowlmere		Sergt. "R."
H.	Shepreth Church		Capt. "K."
J.	T road 1 mile S, of Foxton Station		Lieut. "M."
К.	20th milestone on FowImere-Royston roa	.d	Lieut. " N."

SPECIMEN SLIP FOR JUNIOR NON-COMMISSIONED OFFICER. Name.....Lance-Corpl. Buggins, B.

Point,	Next Destination.	i Depart,	Artíve.	Initial.
А	с	8.30	8.55	V.K. Sergt.
С	D	9-3	9.20	C.B. Sergt.
D	н	9.30	10.5	P.K. Capt., R.E.
Ħ	В	1 0 .10		—

After some little practice most N.C.O.s become very good at finding their way by memory of map. Such N.C.O.'s can be further exercised in similar work at night.

GRAVITATIONAL SHUNTING.

By LIEUT. J. W. J. RAIKES, R.E.

WITHIN the last 30 years the goods traffic conveyed on our English railway systems has increased very considerably in volume, and a large number of improvements in the system of "Transportation," to borrow an Americanism, has therefore been necessitated in order to cope with this development. A few of the most obvious are :---Increase in Engine Power. We now have engines 50 per cent. more powerful than those of a decade ago, and with this increase in engine power follows increased speed from point to point. This increased speed demands further improvements, and we find the bulk of the perishable and highly competitive traffic now conveyed in trains composed of "piped" vehicles (*i.e.* fitted with automatic vacuum or Westinghouse brakes) at little less than express passenger train speeds, rendering possible a one-day service, not only between the mills of Lancashire and Yorkshire and London, but also between London and Scotland.

Increase of train loads and increase of speed inevitably means an increase in the volume of traffic which has to be dealt with in a given time at the concentration and distributing centres, and it is one of the principal developments in the shunting yard that I propose to give a short account in this paper.

It is obvious, after a moment's thought, since the Railway Companies only charge freight on goods between two stations, such charge depending solely on the class of traffic and the distance between the stations, that all work necessitated in shunting yards, marshalling and sorting sidings and the like, is entirely unprofitable, and that every attempt should be made to reduce expenses incurred there. Consequently all Goods Traffic Superintendents will welcome any improvement tending to reduce labour and expenditure of time, provided that no increase of expense is incurred.

The efficiency of a shunting yard may be measured in minutes of engine time expended, (a) Standing, and (b) Shunting, per wagon dealt with, bearing in mind that the unit of expense is an engine in steam, and the lower this time-index the higher the efficiency and the more economical the working of the yard in consequence.

Gravitational shunting, in one form or another, is the natural outcome of these conditions, and it is with some of the main principles of this development that I propose to deal.

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My remarks are based chiefly on L.N.W. Railway practice, on which railway I have had an opportunity of collecting a certain amount of information at first hand. The first application of this principle from a general railway point of view appeared some 30 years ago as the now famous Gridiron Sidings at Edge Hill, Liverpool, which example possesses the unique distinction of being not only the first but also the largest undertaking of its kind. The scheme in its origin proves again the truth of the old proverb "Necessity is the mother of invention." The L.N.W. Railway was faced with the necessity of providing additional large siding accommodation to cope with the ever-increasing traffic at Liverpool. The fact that the main lines had to be crossed in order to provide means of exchange between the different groups of sidings then in existence presented grave difficulties, especially during foggy weather, and, as the security of the passenger traffic was the first consideration, it became necessary to provide better accommodation for the goods traffic which would be independent of the passenger service.

The Railway Company possessed at that time some 60 or 70 acres of land to the north of the main lines, and it was in this direction, that the enlargement was decided upon. But to reduce this area to rail level would have meant the removal of over 2,000,000 tons of soil, an altogether prohibitive undertaking. As, however, the ground sloped gradually from east to west, a group of sidings could be laid on a uniform gradient for a comparatively small outlay. This then naturally suggested Gravitation. The idea was not wholly a new one, for, in several places for certain special classes of traffic such as coal wagons loaded or empty, gravitation was in use, but for a general goods sorting and marshalling siding the idea represented a completely new departure. The diagram shows the general plan of the sidings, and, from it, it will be seen that the arrangement consists of :—

- 1. Six reception lines at the top of the slope.
- 2. Two groups of sorting sidings, with 12 sidings in each group. In these sidings the wagons are sorted into district order. They arrive at the top of the incline "Rough" (*i.e.* in a mixed state), and as each of the sorting sidings is reserved for a particular district, the end of the first operation leaves the wagons in district order.
- 3. Two pairs of smaller groups of sidings, called the "Gridirons," in which the wagons are actually marshalled into station order, and from which the complete trains emerge on to the departure lines, ready for the road.

The reception lines will accommodate nearly 300 wagons; the sorting sidings about 1,100; and the "Gridirons" 72 wagons apiece;

while each of the departure lines will hold about 200, or, roughly speaking, some four trains.

Being concerned only with the principle of Gravitation and not with the siting of a shunting yard, we need say no more of the geography of the place, except that it is quite uniquely situated with respect to the different points from which traffic is received, and the various departure roads.

Every train arriving at the sidings is drawn to the summit of the incline by the train engine; enough brakes are then pinned down to ensure the safety of the train, and the engine is unhooked and goes away to fetch another trip. The whole of the sorting and marshalling process is now performed by Gravitation.

A man who has a special knowledge of the geography of the line passes quickly along the train, and chalks on the front of each wagon the number of the siding in the first groups of sorting sidings for which the wagon is destined. The couplings between the wagons are then unhooked, and the brakes of each wagon in turn, starting with the front one, are taken up. The wagons of their own accord move down the incline, the gradient of which, as will be seen from the sketch, grows steeper at the head of the sorting sidings which has the effect of separating the wagons out from one another ; and thereafter, until the raft of wagons is done with, there is a continuous stream of them, separated by some 20 or 30 yards, entering the sorting sidings. Men stationed at the heads of these sidings divert each wagon in to its proper siding, in exactly the same manner as in any other shunting yard, and each man, as a wagon passes him, is responsible for pinning down a brake, or holding it down sufficiently to check its run, as it must never be allowed to get out of hand. This may necessitate a man travelling some way down the group of sidings until he has the wagon well under control. No man may pass a wagon on to his neighbour until he has checked it properly. We may say here that there is a great difference in the running powers of different classes of wagons; an empty truck fitted with grease boxes will hardly crawl along, while a heavy refrigerator van, for example, fitted with oil boxes and a somewhat ineffective brake, often requires a great deal of stopping. It is quite extraordinary to see the way in which these men, who have been properly trained to the business, deal with wagons which to the lay mind appear to have got completely out of control. A safeguard against the possibility of one getting out of hand does exist, however, and is most efficacious, when it has to be called into play. It is the "Chain drag." This appliance consists of a hook pivoted at its lower end, so that under ordinary circumstances it rests horizontally in the 4-foot, but when a wagon gets quite out of control and all ordinary means of stopping it have proved of no avail (sand thrown on to the rail will often prove most

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efficacious in stopping a runaway whose brakes are properly pinned down), by the simple reversal of a lever this hook assumes a vertical position, the jaw of the hook facing the runaway vehicle and being on a level with the axle of the wagon. As the wagon passes over the hook the latter engages with the leading axle, and the wagon has now to draw the hook and the chain which is attached to it over the rough cinder ballast. The effect is to produce a very considerable drag on the vehicle, the retardation increasing as more of the chain is drawn out of the tank which contains it. The chain is heavy, weighing several tons. The runaway is thus gently but firmly brought to a standstill, without damage either to the wagou itself or to the load which it contains, and without incurring any risk to any of the men employed on the Gridiron. One may gather some idea of the weight of the chain when one realizes that it requires an engine to draw it back to the tank whence it was raised. These chain drags are only used in extreme cases and have never failed to respond when called upon. About 10 cases occur on an average every year. There are six such chain drags in use and their several positions are indicated on the plan. The chains vary from $4\frac{1}{2}$ to $5\frac{1}{2}$ tons in weight.

The profile elevation of the sidings shows the general arrangement of the gradients, varying as it will be seen from 1/60 to 1/100. The maximum gradient occurs where wagons are expected to start singly, or where they have to enter curves; on the straight where they will as a rule be moving in groups, the gradient is less. All curves are of the same radius, namely seven chains, so that a shunter may know that all curves will offer exactly the same amount of resistance to a passing wagon. No two wagons run alike, as has been pointed out above, and it requires long experience to estimate the precise amount of breaking power that is required for any particular one. The shunters employ brake-sticks to steady the speed of the wagons, and they apply these between the wheel spring and the brake lever, so as to obtain a greater leverage than would otherwise be the case if they merely pinned the brakes down by hand. Telephonic communication exists between the principalpoints of control of the sidings, and a very efficient system of lighting is in force at night.

In round figures the number of wagons dealt with, on an average, is 2,500 per day, while the average number of the staff employed is about 80. The cost of the shunting works out at an average of $2\frac{1}{4}$ d. per wagon handled ; a far lower figure than is obtained by the ordinary methods of shunting.

Another very large gravitational installation exists on the Great Central Railway at Wath, the concentration centre for the coal fields of South Yorkshire. The chief differences between this installation and that described above, are that it is designed for dealing with coal and not with mixed goods, that all facing point connections are worked by compressed air from small ground frames, only trailing points being operated by tumblers, and that the whole of the sidings are fitted with a sort of track circuiting apparatus, which enables the man who works the points from the control cabin, or ground frame, to watch the course of each wagon on an electric indicator, and so to assure himself that the fouling point of any particular siding is clear before he turns a wagon into it. There are also other points of difference, but the gravitation principle is the same.

It must not be supposed that Gridiron methods will entirely supersede the older customs. Naturally the gravitational principle will only be economical where there is a very large volume of traffic to be dealt with, and where the local circumstances permit. Very few places are likely to possess the unique qualifications of Edge Hill, but there are nevertheless a number of other points where a minor form of gravitational shunting is in vogue. Rugby, Nuneaton, Bescot, Bushbury and Crewe are cases in point on the L.N.W. Railway. At these places the sidings or groups of sidings are as a rule more or less level, or on a slight gradient of about 1/200 to 1/300, and in order to reduce engine power expended, a modification of the Gridiron principle has been introduced.

At the head of the groups of sidings, corresponding to the summit of the incline at Edge Hill, a "Hump" or mound is formed, over which the line common to the group of sidings passes. The gradient of this "Hump" is generally about 1/40 on the side away from the sidings, and about 1/30 on the side facing them.

The length from end to end of the Hump varies, depending on the length and form of the sidings with which it is connected ; the height, and therefore the length, being calculated on the understanding that the worst running vehicle, when pushed over the summit of the Hump, should run unaided to the end of the longest or most sharply curved siding into which it leads.

The principle of working is as follows. A powerful shunting engine (there is a special type for the purpose) is attached to a long raft of wagons and draws these over the Hump away from the sorting sidings, and this fact means that the neck on the reverse side of the Hump must be long enough to accommodate a long train of, say, 80 to 100 wagons. As soon as the last vehicle is clear of the summit of the Hump, the engine stops, and the wagons are chalkmarked for the different sidings in the usual manner. The shunting engine now proceeds to propel the train slowly by a series of scarcely perceptible "shoves" over the Hump, towards the sorting sidings. As the wagons mount the reverse slope of the Hump, they tend to press back on the ones which are behind them, with the result that the couplings become slack and are therefore easily unhooked. With each push from the engine a wagon, or group of wagons, is
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launched over the Hump, and travels away towards the siding for which it is destined. From this point, onwards the method of working is an exact representation, on a smaller scale, of that which takes place on the "Grid."

There remains only one point with which to deal. Gravitational shunting, be it of the Gridiron or the Hump principle, reduces the engine power necessary to deal with the traffic, but owing to the greater rapidity with which the wagons follow one another and the higher speed with which they move, it is necessary to employ more shunters in proportion than is the case in other yards. Notwithstanding this fact there is a very large saving financially. But it would certainly be an advantage if some of these men could be dispensed with, and the working be rendered more automatic.

An appliance which has quite recently been invented suggests the means to obtain this end. For want of a better name we will call this appliance the "Hump Slipper."

The "Slipper" is in appearance very much like an ordinary dragshoe used on road wagons, with certain additions and this exception, that the flanges of the shoe, instead of bearing against the tyre of the vehicle, run on either side of the rail, while the wheel of the wagon rests on the upper surface of the shoe and bears against a strong stop riveted to it. A rough sketch of the slipper is given below. The sole or body of shoe is made of steel, about $\frac{1}{8}$ in. in thickness, the flanges being bent down out of it, while the stop is composed of heavier material about 2 in. wide and $\frac{3}{4}$ in. thick. This portion is firmly riveted to the sole. In the new patterns now being constructed the material is to be of steel cast in one piece, with a small removable bearing plate let into the sole, where the tyre of the vehicle being braked bears upon it and where it rubs upon the rail. The weight of the slipper is about 9 lbs.

The principle of the working is as follows. The slipper is placed on the rail in front of the oncoming vehicle at a point decided by experience, the bottom of the shoe having been freely greased. One leading wheel of the wagon as it comes down from the hump is caught by the slipper. The friction between the slipper and the rail is very considerable, sparks flying in all directions; the rotary motion of the wheel is rapidly checked and the leading axle becomes locked on the slipper, the momentum of the wagon being very soon dissipated in the heat generated between the slipper and the rail.

At a fixed point at the end of the "Braking Road" is the "Slipper Trap," a device to free the slipper from the wheel, while the wagon is not derailed but runs on quietly into the siding for which it is destined, the amount of retardation required for it to reach its proper destination having been supplied by the slipper. A sketch of the slipper trap is given below, from which it will be seen that the device

SKETCHES OF SLIPPER AND SLIPPER-TRAP.



NOTE. — The Sleepers are closer than usual under the Trap. The sketches are not to scale.

is very simple. The stock rail on which the slipper is running is carried outwards from the alignment of the rail at an angle of 1/14, while the rail forming the toe of the switch in the trap is so shaped that one edge of it runs parallel to, and at a distance of about $\frac{1}{4}$ in. from, the edge of the stock rail, while its other edge continues the primary alignment of the stock rail. The small clearance between the two rails is called the "Slipper-Way," for the inner flange of the slipper enters it, the outer flange being forced to follow the outer edge of the stock rail, and the result is that the slipper gradually draws away from under the wheel, finally falling off at the end of the

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trap, while the wheel, having only an inner flange which is too wide to enter the slipper way, runs on to the toe of the switch and so on to the running rail. The toe of the switch is slightly lower than the stock rail at this point; half-way between the toe and the end of the stock rail it is on a level with it; and at the end of the stock rail, the running rail is slightly the higher of the two. This difference in level has the effect of allowing the slipper to drop off more easily than would be the case if the rails were level across throughout. Special chairs, designed for the purpose, support the rails at this point, and the rail opposite to the trap is "checked."

These slippers are intended for use wherever gravitational shunting is in vogue, and the proper position for them is directly at the base of the "Hump," which will probably be made somewhat shorter and steeper in order to receive them. The braking road itself, *i.e.* that portion of the road over which the slipper will travel, should be level and from 15 to 20 yards in length; the outlet from the braking road to the sorting sidings should fall slightly towards those sidings so that the vehicles will travel without further assistance, but at the same time without undue violence to their proper positions in these sidings. The efficacy of this system of braking must be seen to be fully realized. Wagons travelling at 15 miles an hour are stopped dead within a dozen yards or less, and the risk of derailment of either empty or full wagons is so very small as to be almost negligible, and the contents of the wagons if properly secured are in no way disturbed.

It will be a long time before the adoption of the "Slipper" becomes at all general, or even popular. At present it is eyed with considerable disfavour by the older hands, but these are notoriously conservative in their ideas, and there can be little doubt that the principle has a future before it as gravitational ideas become more generally recognized.

It will certainly require great experience on the part of the men who will use it, to decide at what point the Slipper shall be placed on the road for any particular wagon so that the correct amount of braking will be applied and the wagon sent on with the proper velocity to carry it without undue violence to its ultimate destination. There are so many factors to be considered; the state of the rail, the class of wagon, the speed of the wagon, the position that the wagon has to reach, and so on which can only be solved by experience. The developments in this direction should be interesting.

Doubtless a good deal more could be written on the subject of gravitational shunting, but up to the present, at any rate as far as "Humps" are concerned, the subject is more or less in its infancy, and statistics are therefore hard to come by. This paper does not pretend to be exhaustive, but only in the nature of an outline introduction to the subject, indicating some of the possibilities of the principle and of its more recent developments.

COST OF WELL SINKING AT THE TANGRI RIVER BRIDGE, NORTH WESTERN STATE RAILWAY.

By MAJOR E. BARNARDISTON, R.E.

THE North Western State Railway crosses the Tangri River about 3 miles S.E. of Amballa, by a bridge of six deck spans of 75 ft. clear on 12-ft. cylindrical wells.

The line between Amballa and Saharanpur is being doubled, and for various reasons it was decided to build the new bridge for the second track about 250 ft. downstream of the existing bridge, and of three through spans of 150 ft. clear on piers 10 ft. wide.

A double octagonal type of well curb 24 ft. 6 in. $\times 14$ ft. was adopted, a plan and section of which is given overleaf.

Mr. E. Fraser, Assistant Engineer, Indian State Railways, who was in charge of the work, has prepared the diagrams given on the *Plate*, showing the cost of sinking the four wells, which were completed last year, and has given me permission to send them to the *R.E. Journal*. They show the cost of labour and fuel only. The cost of erecting and removing gantries, as also workshop charges, have been divided equally amongst the four wells and shown at the top of the diagram.

Steam hoists and Bruce's dredgers were used. The latter are very good in soft material, but little use in hard ground. At the time, however, no others were available.

No. 3 Well gave a great deal of trouble. When about 40 ft. down, hard clay was met on the upstream side, and almost liquid clay on the downstream end, and it was with great difficulty the well could be kept reasonably straight.

The Tangri is a dry sandy bed most of the year, and No. 2 Well was the only one on which the work was seriously interrupted by a flood. The rates paid for labour were as follows :---

Bombay	Khala	ssies		Rs.1 (18. 4d.)	per diem.
Panjabi	,,			As.12 (15. od.)	- ,,
Coolies	• • •			As.5 & 6 (5d. & 6d.)	"
Drivers	•••		•••	Rs.1 (18. 4d.)	**
Firemen				As.8 (8d.)	11
Bihishtie	s (Wat	lermei	1)	As.8 (8d.)	"

Coal cost Rs.13/14/0 (18s. 6d.) per ton delivered at the steam hoists, and each hoist required about $\frac{3}{4}$ ton per diem.

Mr. Fraser is just completing the well sinking at the Markanda River about 4 miles south-east of the Tangri, and I hope to be able to send similar diagrams for the wells there, which are very much larger (40 ft. \times 20 ft.) and the sinking of the seven wells from 40 ft. to 60 ft. deep has been completed in about three months. These diagrams should be of interest and use to officers of the Corps, who, in certain branches, may be called upon to estimate for and carry out such work at any time.



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AN ENGINEER OFFICER UNDER WELLINGTON IN THE PENINSULA.

(Continued).

(Edited by COMMANDER THE HON. HENRY N. SHORE, R.N., RETIRED).

Sunday, Feb. 4th. Took up my old Qrs. in Lisbon. I find that the 79th and 94th Regts. have arrived here from England, under Genls. Picton and Hon. W. Stewart. Saw the 79th Regt. Inspected in the Rocio by Genl. Stewart.

Feb. 6th. In consequence of advices having been received from Cadiz of the French having pushed thro. the Sierra Morena, entered Seville and appeared before Cadiz, the 79th, 94th, and 87th Regts. began to embark this afternoon under command of the Hon. W. Stewart. Dined at the Artillery Mess; but both Owen's and Hughes' Companies (just landed from England) receiving orders to embark whilst we were at dinner, every person was hurried and in a bustle this evening.

Feb. 7th. Capt. Goldfinch and myself purchased a Gold Snuff Box, for which a subscription was raised by the officers of the Corps in Portugal, and which is to be presented to the Landlord of our office in 33, Rua de Alecrim.

Feb. 9th. Lord Wellington, etc., went to Fort St. Julian; the Col. and Capt. Goldfinch accompanied him.

Feb. 10th. The Col. set out with Lord Wellington upon his return to the army thro. Castanheira. I went to the Rua das Condes Theatre. It was on the occasion of this visit to Castanheira, that Lord Wellington—according to Sir John Jones—perceiving that it was a line open to be turned, ordered the works to be filled in. This explains the following entry in the Diary :—" Found Lt.-Col. Fletcher at Torres Vedras, and heard of the demolition of our works at Castanheira, (Feb. 13th)."

Feb. 15th. Procured Qrs. for the Col. and myself at Eiriceira where I am to remain in charge of the works in that neighbourhood.

Feb. 16. Making out my Reports upon the roads I have lately reconnoitred, and copying part of Lt.-Col. Fletcher's Report upon Peniche.

Feb. 18th. Removed my Qrs. from Mafra to this place (Eiriceira).

Rice Jones remained here, in charge of the works under construction, until May 7th. A few extracts from the Diary will suffice to give an idea of his daily duties :— *Feb.* 19. Picked out the Redoubts near the 3 Mills above Carvoeira, in readiness for the 2 Companies of the

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Militia of Figueira to begin to-morrow; tasked the men in parties of & each; they work extremely hard and willingly; reduced the parties to 5; the ground at the Redoubts begins to be very hard and rocky; Mr. Miller a Conductor of Stores arrived here, to relieve a Child of the name of A. *Fcb.* 28. Met Capt. Chapman; he fixed upon the spots to destroy the roads from Picanseira to Mafra; pointed out the lines of the Redoubts to be begun; and the several places where the roads leading to Marvao and Ribar Mar are to be destroyed; the principal roads are to be prepared by means of mines; all the others are to be broken up immediately.

Accommodation had to be provided for parties of Miners from the various British Regts. employed in breaking up the roads ; and parties of Peasants had to be set to work on the Redoubts ; all of which kept our author very fully employed. Then, from time to time, difficulties arose :—" Went to the Redoubts at Picanceira, found some of the Ericeira Peasants, but could not employ them, as they had brought no tools ; the day being very wet and stormy I was obliged to order all the working parties in ; there will be no work to-morrow, being a holiday."

March 8. Col. Fletcher arrived, and proceeded to inspect the spots fixed upon for destroying the roads; he made some alterations. An experiment is to be made upon one of the mines which is intended to complete the destruction of the roads upon the advance of the enemy. We all returned to Ericeira for dinner; the Col. and C. slept at the Qrs. I had prepared for them at the house of the Conceilleiro. Next day, Col. Fletcher visited various points of the coast, etc., and marked out spots for Redoubts;—" it was a very wet and windy day."

Sunday, March II. Rode with Capt. Ross to Mafra, and then went to Cintra by the paved road; left our horses at the English Inn and walked to the Penha Convent; just reached the top before the sun set. Went to the Capitao Mor, and settled with him that the Company of Ordonnances of San Joao de Lampadao shall assemble at Carvoeira on Wednesday.

March 24. Major Fras. Rapozo of the Portuguese Engineers arrived at Ereceira to take over part of the works; Rice Jones paid a visit to a Quinta at Santo Isidoro where he intended occasionally, to take up his Qrs. and ordered a bed to be prepared; and received intelligence of the arrival of several Engineer officers from England. Such an entry as the following is of frequent occurrence—" Paid the Companies of San Joao, etc., for the past week." Apropos, we learn from Sir John Jones that, the difficulty of supplying so many with food was met by the Engineer officers turning Commissary, and issuing rations of bread instead of an equivalent in wages.

April 16. Began fascining the Redoubts at Picanceira. (The

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Fascine manufactory was in a wood near Fonte Boa dos Nabos and the greater part of the timber required for the gun platforms, magazines, etc., in the Redoubts was supplied from the Royal Park at Mafra).

April 17. Met Col. Fletcher near Mafra, and after loading and preparing a Mine on the road below Ribar Mar; viz.—Length of Box for Powder 15 ft. 10 in., $3\frac{3}{6}$ in. square inside; Depth of mine 7 ft.; Breadth of Road from 8 to 10 ft. at top, 12 ft. below; we fired it; the effect produced was only that of the blowing away the soil with which the Mine was loaded, to a short distance, and loosening the rock to about the level of the Powder; but the cavity formed was nearly filled up by the earth which fell in upon the explosion taking place.

April 22. Our diarist rode from Ereceira to Lisbon, passing a village (name illegible) "beautifully situated on the banks of a small rivulet, to the more beautiful scenes near Bellas, and from thence by Bemfica to Lisbon. Went to my old Qrs. and found all as usual, well."

April 26. "Capt. J. T. Jones ordered to relieve me at Ereceira; I am directed to take up my abode at No. 33, Rua do Alecrim as soon as I have given up my District." (The Capt. Jones mentioned above is better known as Major-General Sir John T. Jones, Bart., R.E., the Historian of the war, and of "Journals of the Sieges in Spain.")

Setting off again, on April 30, our diarist rode with the Col. to the marshes near Alhandra; from thence, alone, to Aruda; thence to the works at Monte Agraca (where, later on, he was destined to pass many weary and anxious hours, waiting for an enemy that would not attack); thence on to Sobral, just under the Great Work, and onwards, to Enaxara. "Between Sobral and Enaxara," he writes, "near the village of Guisandeira the scenery is most romantically picturesque." With which statement I am in hearty accord; in fact, I may say, from a personal investigation of this beautiful tract of country, that a tour of the famous Lines of Torres Vedras, will prove a revelation to most people, not only in respect of the enormous strength of the position selected by Lord Wellington for stemming the flood of invasion, but for the beauty of the scenery.

May 1. "The day being very wet, Mulcaster and myself agreed to remain at home, which we did, and spent the day in reading and conversation very pleasantly." The next few days were chiefly occupied in examining and making up Pay Lists, ready for handing over charge of the District.

May 7. "Capt. J. T. Jones and myself rode along the works from Ribamar to Picanceira. Gave up everything in the district to Capt. Jones, and sent my baggage and pony to Lisbon." And on May 10. "Rode from Mafra through Bellas to Lisbon; took up my Qrs. in this city."

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His friend Capt. Goldfinch had the misfortune to lose his English mare, which died of a wound in the shoulder from an Ox-goad : and poor Capt. Hamilton who had been wounded at Oporto, died on May 20, and was buried in the new Factory Burying Ground ; the 2nd grave from the Hospital, on the South side of the centre walk, near a young Cyprus Tree. May 29. "Took charge of our Mess at this place. Completed my 22nd year ; went to the Rua dos Condes (Theatre) in the evening."

June 1. "Went with Mudge on board the Marlborough Packet* to procure for him a passage to England in her."

The following entry of same date calls for explanation :—" Bought 11 telescopes for the Signal Stations." Rapid means of communication along the Lines of Torres Vedras being essential, signal stations, five in number were established on the most conspicuous positions; the principal one, near the centre, being on the lofty mountain of Socorro, just above the village of Pero Negro, where Lord Wellington subsequently fixed his quarters. The apparatus consisted of a mast and yard from which balls were suspended; and there being no trained signallers available amongst the troops, Lord Wellington applied for and obtained the services of a party of seamen under their own officers, from the fleet in the Tagus. And so expert did these men become after a little practice, that signals were passed from one end of the line to the other with undeviating accuracy, in seven minutes. It was for the signal-parties that the telescopes above-mentioned were purchased.[†]

June 4. Goldfinch and myself rode to the Rocio, where the Regts. fired 3 volleys in honour of His Majesty's Birthday, and then marched past General Leith.

June 5. Walked to the Royal Silk Factory with Mrs. Dalebarra and 2 other ladies. The Royal Silk Factory, here mentioned, had a curious history. It must be explained that, in consequence of the expulsion of the Jews from Portugal, by King Emanuel, in 1496, the decay of industry and manufactures commenced; for the Jews, here,

* The Duke of Marlborough, commanded by Capt. John Bull, was one of the most famous vessels of the Post Office Packet Service. While in her, that well-known officer fought more actions than any other Packet Officer. She was attacked on two occasions, while homeward bound from Lisbon, during the year 1810. (The Post Office Packet Service, by A. H. Norway).

+ (The following report from Capt. J. T. Jones to Col. Fletcher is of interest: -*July* 18, 1810. I am sorry I cannot give you a favourable account of the Signal Stations; the sailors say that the distance between the stations is too great, and that the masts are all too light for the yards; on Sunday evening two were sprung; they also complain of the telescopes. I have ordered stronger masts and yards to be prepared for each post, and if better telescopes can be procured in Lisbon, I shall not hesitate to authorize the purchase of them).

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as in Spain, were the commercial backbone of the kingdom; and although a few found their way back to Portugal and re-established industries, the fanatical outburst of Inquisitorial persecutions under John Vth caused a fresh exodus. Very curious too, were some of the methods resorted to by Ecclesiastics for repairing the ruin they had brought on the kingdom. Thus, a "dignified churchman," Southey tells us, founded a silk factory at Sobral, an ill-chosen situation, being a day's journey from Lisbon. But—alas ! 'tis not in mortals to command success; the attempt failed, and the costly buildings were in ruins, when Southey was there.

Then the great Minister Pombal—whose hatred of the Jesuits led to their expulsion—tried his hand at the re-establishment of manufactures, and with a view to encouraging the silk industry, he imported nearly 20,000 mulberry plants from France, in 1771, and an equal number the following year, with the result that the produce of the Royal silk factory he had established at Lisbon, rose in one year, from 16,000 lbs. to 44,000 lbs. Another silk factory was established by the same Minister in an empty College of the Jesuits at Evora, "which, for want of support, soon fell to the ground," as happened to most of his manufactures," we are told by a well-informed writer.

With respect to the Royal silk factory at Lisbon, which, by the way, was protected by a severe prohibition of any importation of that article from abroad, some curious facts have come to light. Thus, even during Pombal's administration, it happened often that the looms were stopped merely through the want of money to keep them going, insomuch that the great warehouse of the factory was often without goods to meet the public demand, and the Minister was under the necessity of ordering privately, and in contravention to his own laws, silks to be smuggled from the French ships in the river, in the nighttime, and afterwards sold to the public as the produce of his own manufactory.

It is interesting, in view of the above facts, to find the Lisbon silk factory bravely struggling against fate—to say nothing of the handicap of a long and exhausting war—some thirty years after the fall of the great Minister who brought it into being.

What with frequent visits to Theatre and Opera, a constant succession of friends to dinner, and dining out at other Messes, our Diarist seems to have had a gay time in Lisbon. On June 21st, several brother officers came into Lisbon to see the Procession in honour of the Festival of Corpo de Deos, which was celebrated with all its wonted splendour —the war notwithstanding :—"The Rocio was very splendidly fitted up with Tapestry and Red Velvet Hangings, and the concourse of spectators very great."

Rice Jones' pleasant sojourn at Lisbon was about to be cut short— "The Col. having received permission to join the army, which he

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talks of doing shortly,"—accompanied, of course, by his Adjutant. Great events were impending on the North-Eastern frontier of Portugal, where Massena was massing his hosts for the third invasion of that unfortunate Kingdom. Ciudad Rodrigo was being besieged; General Crawfurd and the Light Division were watching events on the Coa, and Lord Wellington had established his headquarters at Celorico. Under these circumstances—and in view of the work on the Lines being well advanced—it was natural that Lt.-Col. Fletcher, as Chief Engineer, should desire to be at the front.

The Diary contains the following abstract with respect to the work on which the writer had been employed for so many months :—

July 1. Mem. of Works constructed.

	Works.	Men.
First Line	32	10,040
Second Line	65	14,600
San Julian	. 1 1	3,850

While, amongst his Papers are sundry Abstracts and Pay-Lists containing accounts of the daily expenditure, and number of men employed under his immediate superintendence.

It may be of interest to explain here how these defences, covering a vast extent of country, came by the designation they bear. A reference to the dates previously given will show that, except at the Monte Agraça, a point quite out of the beaten track, and almost unknown at that time to the British, the works at Torres Vedras were commenced three months before any other part of the Lines,— "which accidental circumstance," says Sir John Jones, "added to the previous celebrity of the Pass, caused their name to be given to the whole system of defence."

NOTE.-COPY.

COMDG. RL. ENGRS. ORDERS,

MAFRA, 6th July, 1820.

As Lieut.-Colonel Fletcher, Captains Chapman, Squire, and Goldfinch are about to join the army, Capt. Jones will be left in the immediate command and superintendence of all works and other duties connected with the Engineer Department in this part of Portugal, and he is therefore to be obeyed accordingly.

> (Signed) RD. FLETCHER, Id.-Col. Comdg. Ryl. Engineers,

Copied from the original in Lieut.-Colonel Fletcher's handwriting-Rice Jones.

Quitting Lisbon on July 5th, Colonel Fletcher and party marched viâ Mafra, Torres Vedras, Peniche, to Alcobaca, where the party was—"most hospitably received by the good monks of that Con-

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vent; we were supplied with a plentiful dinner; and afterwards retired to good beds. Next morning, after breakfasting at the Convent, we went through the Chapel, Refectory and magnificent Kitchen belonging to it; we then set out, and after viewing the church at Batalha and taking some refreshment at the Convent arrived at Leyria; Col. Fletcher procured good Quarters at the House of Donna Maria do Candide, near the Bishop's Palace; I slept at a tolerably good yellow house at the foot of the hill."

Little did the inhabitants of these beautiful spots divine the impending storm—already gathering on the frontier,—which, in a brief while, was destined to overwhelm them; leaving nothing but ruin and desolation in its train.

Thence, the party proceeded through Pombal, Condexa—near which one of the Colonel's horses got entangled in a deep ditch, and was only extricated, with the assistance of the villagers—to Ponte de Murcella, where—writes the Diarist ;—" My quarters were in a little cottage most beautifully situated above the romantic little river Alva, from the old stone bridge over which this poor village takes its name." Very full details are given of the nature of the country traversed,—size and description of the villages, and exact distance between each, with remarks on the condition of the roads, bridges, etc. ; interesting only to anyone planning a tour through this part of Portugal.

The next halting place was San Jago, where quarters were only obtained through the kindness of Mr. Deputy Commissary-General Rawlings taking the party into his Quinta, where they all slept in one room. Next day, July 13th, they reached Celorico, with its narrow, dirty streets, where, again, quarters could only be got by the exertions of a friend. The town was occupied by Sir Brent Spencer and the 3rd Guards; several other Regts. being quartered in the neighbouring villages. On arrival here, they first "heard of the skirmish on the 10th and of the death of Col. Talbot of the 14th Lt. Dragoons in it; also, the account of the capture of Ciudad Rodrigo by the French was confirmed."

Meanwhile Lord Wellington had transferred his quarters to Alverca; and being unable, for lack of troops, to save Ciudad Rodrigo, had made the best preparations he could to meet the impending invasion. For Massena, at the head of an overwhelming force of veteran soldiers was about to cross the frontier; and it was clearly perceived that the only hope of saving Portugal was by assembling the numerically inferior and heterogeneous forces composing the allied army in the citadel which had been secretly constructed across the Lisbon Peninsula. It was at this crisis, says Sir John Jones, that rumours of an immediate invasion having reached Lisbon, a great impetus was imparted to the work going forward on the Lines. The

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intelligence had the further effect of stirring up the Portuguese authorities, on whose assistance and goodwill the execution of the design was in some measure dependent. The conscription for labour was now extended to a distance of more than 50 miles round, and at one period, although the middle of harvest, the workers on the Lines were augmented to more than 7,000. Even women and boys took their share, being paid respectively at the rate of one-half and onefourth the price of men ;—though to be sure, anyone who has seen Portuguese women labouring in the fields would be inclined to rate their work at a much higher figure.

July 14th. Alverca. "Here we have once more been fortunate enough to rejoin the Head Qrs. of the army; the Col. and Chapman dined with Lord Wellington. After some trouble I got quarters in the cottage of a Cobbler on the road to Guarda."

July 15th. From Alverca the Col., Chapman and myself set out early this morning, and upon our arrival at Almeida we called upon Brig.-Genl. Cox, the Governor, by whose permission we staid to dinner, and procured Qrs. for the night. After dinner we rode to Brig.-Genl. Crawfurd's Head Quarters at the village of Valdela Mula, about 4 miles from Almeida; found Burgoyne there and went with him to Fort Conception. By the time we had walked round the Fort, and seen the mines prepared by Burgoyne for its destruction, the lateness of the evening made our quick return to Almeida desirable, to prevent our being shut out of that Fortress. Tormented all night by innumerable hosts of Bugs at my bad billet.

Describing the country traversed this day, the Diarist thus refers to the bridge over the Coa, which was destined to play such an important part in General Crawfurd's famous fight, a week later :— "Ascended a hill and then descended to the river Coa; a stone bridge of 3 arches, forming 3 different lines, the bank steep and very rough; ascended a long hill to Almeida; the country perfectly open and flat to Valda Mula."

July 16th. While the Col. and General Cox were consulting upon the defence, etc., of Almeida, Chapman and I walked round the works. Breakfasted at the Governor's and met Major Napier of the 50th Regt.; he went with a Flag of truce to Gallegos yesterday and saw General Loison there; he says Lord Wellington will not fight a battle to relieve Almeida. General Crawfurd retired the Infantry of his Division at daylight this morning to Guinse, (?) leaving his cavalry to cover Fort Conception. We returned to Alverca.

July 17th. Col. Fletcher and myself dined at Head Qrs. Marshal Beresford dined there also.

Sir Augustus Frazer, who commanded the Royal Horse Artillery, thus describes a dinner with Lord Wellington :—" The party consisted of 28; Lord W. sits in the middle of one side. Fancy smiles at the eager looks which betray the anxiety to catch a smile from the hero of the day. A Count de Chaves and his boy were soon asleep; I and Col. Arentschild were ready to follow the example before we broke up; (at 11.30) heat, good cheer and champagne had made us all drowsy and stupid; all, however, seemed unnecessarily in fear of the great man; on his part he talked with apparent frankness."

July 21st. The French at daylight this morning drove in our outposts, and established themselves at Valda Mula. Burgoyne fired the mines at Fort Conception which answered perfectly; our videttes about 2 miles in front of Almeida this morning.

July 23rd. This evening and part of the night there was incessant and tremendous thunder and lightning with heavy rain.

July 24th. The rain continued violent the whole of this day, with thunder and lightning. Col. Fletcher and Chapman rode to Pinhel, and returned with the intelligence that the enemy, this morning, had driven the Light Division under General Crawfurd from before Almeida to the left bank of the Coa, with considerable loss. Napier, in his History, tells us that General Crawfurd "Had kept a weak division (4,000 British infantry, 1,100 cavalry and 6 guns) for three months within two hours march of 60,000 men; but this exploit did not satisfy his feverish thirst for distinction, . . he with headstrong ambition resolved, in defiance of reason and of the reiterated orders of his general, to fight on the right bank." And the historian, who was present as a captain in the 43rd, at this memorable but disastrous fight, describes the affair with all his wonted eloquence. In the sequel, Crawfurd brought his division over the Coa, but with a loss of 272 British, including 28 officers, and 44 Portuguese, killed and wounded. The French loss was over a thousand, but,-"with a conscription, and the nations of Europe to draw on, Massena could better have afforded twenty times that number than Wellington could afford the loss of his veterans of the Light Division."

July 25. The Light Division retired before daylight and took post near the village of Carvalhal; the German Legion bivouacked near this village (Alverca). Lord Wellington and Col. Fletcher rode towards the outposts at daylight; Chapman and I followed; hearing that everything was quiet, we returned. Next day, the Light Division retired to Freixeras 3 miles from here. July 27. The Col., Chapman and I rode out early; at Freixeras found the Light Division, also Ross, and his brother's troop of Horse Artillery; we continued our ride to the out pickets; finding everything quiet, returned to Head Qrs. Orders given to march to-morrow. Burgoyne and Thomson sent to mine the Ponte de Murcella.

July 28. At daylight the army retired from their ground near Alverca. The Light Division came into this town (Celorico), as did

Head Qrs. We find this town nearly deserted; quartered in a white house, uninhabited and full of fleas.

Celorico, July 30. Col. Fletcher and myself rode in the evening along the banks of the Mondego, met a dragoon who informed us that Col. Wyndham, Comdg. the Ryl. Dragoons, had just been taken.

During the next few days,—"everything remained quiet, in statu quo." But our Diarist had a sad misfortune—" My Batman having lost my Ass, described the night before last, or early yesterday morning,"—"the Col. and I took a ride with Ross, his brother, etc., to Val de Serra, a beautiful village about 2 miles south."

August 8. Went to Guarda, dined at General Coles'. The enemy have not broke ground before Almeida. Don Julian with a few of his troop pass through Guarda to Celorico. Massena said to be at Fort Conception with two Corps of his army. Deserters say they are preparing gabions, etc., for the siege of Almeida. The Portuguese peasantry on the frontier begin to show some enterprise. General Hill is still at Sarzidas; he, it is supposed intends fighting on the Abita. On the other side of the beautiful Valley of the Mondego is the romantic village of Porco, the Head Qrs. of General A. Campbell's Brigade; there are a number of large Quintas in this valley; from here the road ascends by innumerable turnings up the heights to Guarda, an ancient city, the walls of which are old and incomplete on part of one side.* The Colonel sent to Mulcaster (at Guarda) to establish a Mast and Flag for a Telegraph to communicate with one to be crected at Celorico.

Next day, the Col. went to Guarda about erecting a Telegraph there. The Staff-corps under Capt. Ross' directions continue the preparations for erecting a Telegraph at the Castle (at Celorico). Chapman received a letter from Lord Mulgrave offering him the situation of Under Secretary; it was dated 5th of May (Recd. Aug. 10) but for some unaccountable accident has been so long delayed.

Celorico, *August* 10. Lord Wellington publishes two letters from officers of the Army to a merchant at Oporto which had created considerable alarm in that city; His Lordship requests that officers will be more careful in their future correspondence.

This brief entry—without comment, is thus alluded by Napier :— "an officer of the Guards, writing to a friend at Oporto, indiscreetly declared that Massena was advancing in front with a hundred thousand men, and eighty thousand more were moving in rear of the allies upon Lisbon. This letter was made public, and created such a panic amongst the English merchants in Oporto that one and all applied for ships to carry their families and property away." The senior Naval

^{*} Built in 1197 as a defence against the Moors, at an altitude of 4,500 ft.

officer on the spot applied to Lord Wellington for instructions; and his lordship, "to dry up this spring of mischief announced in general orders that he would not even seek for the authors of that and similar letters, being assured their sense and feeling would prevent a continuance of such pernicious correspondence."

The fact is that, ever since the Battle of Talavera a feeling of despondency with respect to the war in the Peninsula had been growing in England; and when, in March, Ministers of the Crown asked for a sum of money for the defence of Portugal, it was opposed by a powerful and influential party, on the grounds of the utter hopelessness—as they declared, of continuing the struggle. Whi'e in the House of Lords, Lord Grenville speaking in the same lofty strain, declared that "it was a sacred duty imposed upon them to see that not one more life was wasted, not one more drop of blood shed unprofitably, where no thinking man could say that, by any humau possibility such dreadful sacrifices could be made with any prospect of success." In short, "he would consider it nothing but infatuation to think of defending Portugal with such a force."

Despondency was by no means, however, confined to a party in England: It had infected Wellington's army in the field. Even Napier admits that "many British officers laughed at the notion of remaining in Portugal; the major part supposed the campaign on the frontier to be only a decent cloak to cover the shame of an embarkation."

That these gloomy views were not shared by the army at large, however, is made clear by certain correspondence which has recently come to light :- "There is a very numerous body of officers in this army," wrote Capt. Dickson of the Artillery, (better known as Sir A. Dickson, who subsequently commanded the whole of the Artillery of the Peninsular Army under Lord Wellington), under date 27th of August, 1810, (the day of the fall of Almeida)-" who, either tired of the service, or having an idea the Portuguese won't fight, do nothing but put the worst colouring on the matter, dwelling on the impossibility of resistance against the immense force of the French, and the certainty of being obliged to embark in a short time; and all this, without the smallest knowledge of disposition or locality beyond their own division or corps." While Capt. Warre, on Lord Beresford's Staff, writing two days later, to friends at home, was even more scathing in his remarks :-- "I hate grumbling and croaking, and I think it most unsoldierlike in an army such as ours, even were we less strong. We must trust to the fortune de la Guerre, and the abilities of our generals. I wish that every English officer thought the same, and wrote less nonsense to their friends at home."

In truth, the position of the Commander-in-Chief at this critical juncture was no bed of roses; the troubles and perplexities by which Wellington was beset indeed would have broken the hearts of most men. For, in addition to the clamour of a formidable party at home, intent on throwing up the sponge and abasing the nation before the "man of destiny," as well as the disloyalty of certain officers in his own army, he had to face the unscrupulous hostility of the Portuguese Government, whose members, with scarce an exception, instead of exerting themselves in the national cause, not only opposed every measure necessary for the salvation of their country, but excited discontent amongst the populace. At length Wellington turned on these wretches, and with fierce rebuke warned them that " their miserable intrigues must cease, or he would advise his own Government to withdraw the British Army." But difficulties which would have driven weaker generals to the verge of despair, only steeled the nerves of this man of iron constitution and inflexible will.

(To be continued).

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TRANSCRIPT.

THE SOURCE OF THE NILE.*

The last occasion upon which the City of Dundee extended its hospitality to the members of the British Association was in 1867, fortyfive years ago, and at that meeting the President of the Geographical Section was Sir Samuel Baker, who had then recently returned from his explorations on the Upper Nile, for which he had been awarded the Patron's Medal of the Royal Geographical Society, and which were of the greatest importance as regards that then little-known river.

In the Address which he gave to Section E. Sir Samuel Baker naturally referred at considerable length to the geography of the Sudan, and to the question of the sources of the Nile, which had been discovered a few years previously by Capt. Speke and Capt. Grant, when they visited the great lake, named by them the Victoria Nyanza, out of which flows the main branch of the river, the fertilizer of Egypt, which, after a course of more than 3,500 miles, pours its waters into the Mediterranean. He also spoke of the second great lake, the Albert Nyanza, which he had himself discovered, after a long and very arduous journey, though, perhaps naturally, he did not dwell so much on what he had himself accomplished, as another speaker might have done. The words he spoke are well worth calling to remembrance, and, on reading them over, one is struck by the fact that hardly anything was then known of the country through which he travelled; but that, thanks to him and his predecessors, Speke and Grant, the first steps were taken which led to half a century of steady progress in geographical knowledge, until now the basin of the Upper Nile is fairly well known and fairly well mapped.

To-day I propose to take up the tale where Sir Samuel Baker had to stop, and to give a short *resume* of the story of the Sudan since those days, more especially from the geograpical point of view; but it will be necessary briefly to allude to its history also, for, in this case, as in all others, history and geography are closely united, and it is difficult to understand one without knowing something of the other.

There is a considerable amount of uncertainty in the minds of some people as to what the Sudan is, an uncertainty not without reason, as the word has an ethnological rather than a geographical meaning. The complete word, Balad-es-Sudan, is an Arabic expression for the country of the black people, and therefore includes, theoretically, all those parts of Africa which are inhabited by negro or negroid races. There has,

^{*} Address delivered by Colonel Sir C. M. Watson, K.C.M.G., C.B., M.A., R.E., President of the Section, to the Geographical Section of the British Association for the Advancement of Science at the Dundee Meeting, 1912.

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however, been such a mingling of different races that it would be difficult to say to what part of the great continent the word Sudan should properly be applied. But, of recent years, changing from its original ethnological meaning, it has come to be regarded as the name of a more limited area; and perhaps the simplest definition is that it includes all the country watered by the Nile and its tributaries, as far north as the twentieth degree of latitude, and excluding the Sahara, and the basins of Lake Chad and the Congo on the west, and the districts watered by the river systems which terminate in the Red Sea and Indian Ocean on the east. Such a definition does not, of course, altogether agree with the existing political divisions, as it includes the eastern part of Abyssinia, Uganda, and part of the Congo State territory; but these divisions are in no sense geographical, whereas the basin of the Nile is a well-defined region which contains the greater portion of what may be regarded as the real Sudan.

There is one point as regards the geography of the Sudan which is remarkable and perhaps unique. In former times it was to a certain extent known, and, in the maps of Ptolemy, and of the Middle Ages, the great lakes, the ranges of mountains, and the rivers flowing from them, are indicated in a distinct, if not very accurate manner. But, owing to various causes, this geographical knowledge was completely lost, and the natural features disappeared from the maps. Look, for example, at Keith Johnston's Atlas, published in 1843, and you will see that there are no lakes shown, while the Nile to the south of 10° North latitude is indicated as an insignificant stream. The Sudan had relapsed into the position of a *terra incognita*, just as it had been in the days of Herodotus, and Ptolemy and the other ancient geographers were regarded as victims of their imaginations.

The revival of the knowledge of geography of the Sudan may be said to commence with the travels of James Bruce, who visited Abyssinia in 1770, explored Lake Tsana, and found what he believed to be the true source of the Nile in the River Abai, which ran into the lake from the south. He examined the place where the Blue Nile flowed out of Lake Tsana, but was not able to follow its course through the western mountains of Abyssinia, and rejoined it at Sennaar, about 220 miles above the junction with the White Nile. Travelling along the south bank of the Blue Nile, he crossed it at the ferry of El Efun, and then went on to Halfava, north of the site of the present town of Khartum, which at that time did not exist. Of the White Nile he says: "At half-past eight, about four miles further, we came to the village Wad Hogali. The river Abiad, which is larger than the Nile, joins it there. Still the Nile preserves the name of Bahr-el-Azrek, or the Blue River, which it got at Sennaar. The Abiad is a very deep river; it runs dead, and with little inclination ; because, rising in latitudes where there are continual rains, it therefore suffers not the decrease the Nile does by the six months' dry weather." This is all he says of the White Nile, and he does not seem even to have taken the trouble to look at it, as he reports the point of junction of the two rivers as four miles north of Halfaya, whereas it is to the south of that place. He was so convinced that the Blue River was the one and only Nile that he regarded the investigation of the White Nile as unimportant, and shows it on his map as a comparatively insignificant river. Bruce's action in this matter is a warning to explorers not to neglect to examine something that does not fit in with their preconceived ideas.

At the time of Bruce's visit the origin of the White Nile seems to have been unknown to the inhabitants of the kingdom of Sennaar, a kingdom which had been established in 1504 by the Fung dynasty, which had taken possession of what had been the Christian kingdom of Alwah. Soba, the capital of Alwah, was abandoned, and a new town built at Sennaar, which was made the seat of government. The Fungs were partly of Arab and partly of negro descent, and their kingdom extended east of the Blue Nile to the foot of the Abyssinian Mountains, and westward as far as the White Nile, beyond which were the independent kingdoms of Kordofan and Darfur. At that time there appears to have been little or no traffic on the White Nile, and the marshes of the tenth degree, inhabited by the powerful Shilluk tribes, formed an impenetrable barrier to the south.

But, although, after Bruce's expedition to Lake Tsana, the majority of people seem to have accepted the Blue River as the true Nile, there were some wider-minded persons who felt that there was a secret hidden behind the marsh barrier. One of these was a certain Mr. W. G. Browne, who made an interesting journey to Darfur in 1793, and who records in the account of his travels that he had the conviction that the river, of which Bruce had discovered the source, was not the true Nile, and that he considered it a matter of great importance that the course of the more western river, *i.e.* the White Nile, should be investigated, as he could not believe that its source was only two hundred leagues south of Sennaar.

Starting from Egypt, Browne travelled with a merchant's caravan from Assiut, by way of the oases of Khargeh and Selima, to El Fasher, in Darfur. Here he remained for three years, but was not able to do much in the way of exploration, as he was thwarted by the king and people, and was not allowed to go to Sennaar or to explore the White Nile. He collected, however, from the accounts given him by the natives, a good set of itineraries in Darfur and Kordofan, the first, so far as I know, compiled for the Sudan. But his efforts to obtain information as to the source of the White Nile were not successful, and all he was able to learn was that ten days' journey south of a place called Abu Telfan, the Bahrel-Abiad had its source in forty rivers, which came from the hills of Kumr. It seems probable that these numerous rivers were those that form the head waters of the Bahr-el-Ghazal, and that the people of Darfur knew as little about the Bahr-el-Gebel, as the southern part of the White Nile is called, as the people of Sennaar.

But although Browne was not able himself to solve the mystery, his name should not be forgotten, as being one of the first in modern times to realize the fact that the White Nile was the longer of the two rivers. His views, however, seem to have met with no support, and Bruce was supposed to have settled the question of the sources of the Nile. The great lakes, shown by Ptolemy and the mediæval geographers, were, as 1 have already mentioned, erased from the map, and the White Nile was left in peace.

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During the visit of Browne to Darfur the kingdom of Sennaar had fallen upon evil times, as an insurrection, which had commenced during the reign of Bady, ended with the death of King Adlan in 1789, when the Fung dynasty came to an end, and all authority fell into the hands of the tribal chiefs, who made and removed the kings of Sennaar at their pleasure. The internecine wars continued up to the time of the arrival of the Egyptians in the Sudan, and greatly facilitated the advance of the latter.

This advance of the Egyptians was due to the policy of Mahomed Ali Pasha, the Turkish Governor of Egypt, who had greatly increased his power by a successful campaign in Arabia in 1812-18, when he succeeded in capturing Mecca and Medina, and made himself master of the country. He then turned his attention to the Sudan, and decided to take advantage of the local troubles and to add Sennaar and Kordofan to the Egyptian dominions. In 1820 he sent an army up the Nile, under his son Ismail, who took possession of Dongola and the country adjacent to the river, as far as the junction of the Blue and White Niles, and, after seizing Sennaar, marched up the Blue Nile to Fazokl, on the Abyssinian frontier. Kordofan was also occupied, and the capital of the new Egyptian province was placed at Khartum, the point where the two Niles met, which took the place of the old capital of Sennaar; but no attempt was made to take possession of the country along the White Nile to more than about one hundred miles south of Khartum. So little was that river known beyond this, that, when Linant Pasha succeeded in sailing up the river as far as the Island of Aba, he was supposed to have arrived at the furthest point reached by a European since the first century.

No further advance was made for a few years, but, in 1838, Mahomed Ali decided to try to open up the White Nile, and an expedition under Major Selim, of the Egyptian Army, succeeded in making its way through the marsh district, and in reaching a point about 6° 30' North latitude on the Bahr-el-Gebel, while another expedition in 1842 got as far as Gondokoro. It was thus proved that the marshes were not impenetrable, and trading stations began to be opened up, both on the Behr-el-Gebel and the Bahr-el-Ghazal. On the former river, however, the traders could not at first proceed further than Gondokoro, as the rapids, which commenced a few miles south of that place, made navigation by sailing vessels impracticable, so the merchants had to establish their depots at Gondokoro and depend upon the natives bringing ivory from the south. Тο these natives the opening of the river proved a great evil, as the legitimate traders were soon followed by slave-hunters, who carried thousands into captivity, while killing many others. By the ill-will thus created the difficulty of exploration was increased. In the end, the source of the White Nile was discovered not from the north, but from the south, when Capt. Speke, who, in company with Capt. Burton, was exploring Central Africa from the east coast, heard of a great lake lying to the north, and succeeded in reaching the south end of the Victoria Nyanza Convinced that he had found the long-desired source of the in 1858. Nile, he started on another expedition, accompanied by Capt. Grant, in 1860, and, after marching round the Victoria Lake, reached Gondokoro in 1863. Here he met Sir Samuel Baker, who had started from Khartum in 1862, in the hope of discovering the Nile sources. The information given by Speke and Grant showed that they had forestalled him; but he continued his journey, and in 1864 succeeded in reaching the Albert Nyanza, the second great lake from which the White Nile derives its water.

Thus, at length, after a lapse of many centuries, the truth of the statements made by Ptolemy and other ancient geographers was justified, and the lakes shown by them were restored to the map of Africa, while the White Nile was proved to be the real Nile, and the Blue Nile was relegated to the position of being the most important tributary.

During the period of the travels of Speke and Baker the slave trade had been rapidly increasing, and the traders had practically taken possession of the country, and made themselves independent of the Egyptian authorities in Khartum. These slave traders cared nothing for geography, and had matters remained as they were at that time, it is probable that a State hostile to Europeans would have been established, and all chance of further exploration would have been lost.

But in 1860 the Khedive Ismail, who had succeeded as ruler of Egypt in 1863, and had obtained largely increased powers from the Sultan, decided to restore his authority on the White Nile, and appointed Sir Samuel Baker as Governor of the country south of Gondokoro, with instructions to establish Egyptian rule as far as he could, to the south of that point. But nature fought against Baker, and the difficulty of sailing up the White Nile had been enormously increased by the formation of the sudd, that strange vegetable barrier which at times completely closes the river channel, and he did not reach Gondokoro until two years had elapsed from the time of his departure from Khartum. There he hoisted the Egyptian flag, and then proceeded to occupy the country to the south. But he was not successful, as the force at his disposal was quite insufficient, and, though he established a few stations on the road from Gondokoro to Foweira, on the Upper Nile, little effective had been done when he returned to Gondokoro in April, 1873. Neither was he able to do much in the way of geographical research, and, greatly to his regret, was unable to revisit the take which he had discovered on his first journey.

In 1874 Colonel Gordon was appointed to succeed Baker, and, leaving Khartum in March, reached Gondokoro in twenty-four days, the sudd, fortunately for him, having been cut through by the Egyptian officials only a month before his arrival in the Sudan. Gordon ruled the equatorial provinces until October, 1876, and during that time did much to tranquillize the country, as he had a remarkable influence over the natives. He moved the headquarters of the government from Gondokoro to Lado, and established a chain of posts along the Nile to Duflé, and thence to Nyamyongo, in Uganda, about eighty miles below the Ripon Falls. He also placed two steamers and two sailing-boats on the Albert Lake to facilitate communication. Gordon devoted much attention to the geography of the district, and prepared a map of the White Nile from Khartum to Urondogani, superior to any that had preceded it. This map included a plan of the Albert Nyanza, based on surveys made by Gessi and Mason, both of whom circumnavigated the lake. Mason reported the existence of the river, now called the Semliki, entering the lake from the south, but was unable to enter it, as the water was too shallow for his vessel.

Soon after his arrival at Gondokoro Gordon fully realized the difficulty of keeping up communication with Egypt by the Nile, and requested the Khedive to send an expedition to Formosa Bay, about a hundred miles north of Mombasa, on the east coast of Africa, with a view of opening up a road towards the Nile. The route he thought of was a little north of that now followed by the Uganda railway; but at the time he made the proposal the country was entirely unknown, and the difficulties would have been much greater than he anticipated. The idea, however, came to nothing, first, because the expedition was sent to the River Juba, on the border of Somaliland, which was much too far to the north, and, secondly, because it was ordered away by the British Government, which considered that it was encroaching on the territories of the Sultan of Zanzibar.

At the time that Gordon was establishing Egyptian authority in the equatorial provinces the Khedive's dominions were being extended by the conquest of Darfur, and the occupation of the province of Harrar, with a port at Zeila, in the Gulf of Aden. An excellent reconnaissance of Kordofan was carried out by Colonel Prout, of the United States Survey Department, in 1875, and a reconnaissance of Darfur was made by Colonel Purdy, another American in the Egyptian service, so that considerable additions were made at this period to the geographical knowledge of the Sudan.

But soon afterwards there was a serious setback to the Khedive Ismail's projects of conquest. Having acquired Massowah, Tajurra, and Zeila, on the Red Sea, he sent an expedition into Abyssinia in 1875, which was cut to pieces at Gundet, on the road to Adua, and another larger force sent in the following year was utterly defeated by the Abyssinians and had to retreat, with great loss, to Massowah. Some surveys were made by the American officers on the staff of the Egyptian Army, but these expeditions did but little for geography, and their fate was the precursor of the destruction of Egyptian power in the Sudan.

Colonel Gordon returned to Egypt in December, 1876, and early in the following year was appointed Gevernor-General of the whole Sudan, a post he held for nearly three years, years of incessant labour, during which, much to his regret, he was able to do little for geography; as, though he travelled many thousands of miles through his vast territories, his whole time was occupied with questions of administration. He was wonderfully successful in his dealings with the inhabitants, and had he been left alone for a few years, the history of the Sudan would have been different; but he was constantly urged to send money to Cairo, money which he could not obtain without following the example of his predecessors and oppressing the inhabitants. This he would not do, and resigned in August, 1879, when he was succeeded by an Egyptian Pasha, who revived the old bad customs of the country. His appointment led to the result that might have been anticipated, and, in 1SS1, the revolt led by Mahomed Achmed, the Mahdi, broke out, and the Egyptians were driven out of the Sudan. Then the country was completely closed to Europeans, and nothing further could be done in the way of geographical discovery until the defeat of the rebels at Omdurman in 1898. Now, fortunately, peace is restored, a peace which, it may be hoped, will be a lasting one.

To geographers, of course, the existing state of affairs is very satisfactory, as it will undoubtedly lead to an increase in our knowledge of the Sudan and its resources. That knowledge is still very limited, much more so than many people are aware, and there are vast regions which still stand in need of careful examination. Maps, especially small scale maps, are misleading, and convey the impression that more is known than is really known. Take, for example, the case of the Blue Nile, one of the most important tributaries of the great river. Of this, the head waters, Lake Tsana, first carefully examined by James Bruce, are fairly well known, and a good reconnaissance of this lake was made by Mr. C. Dupuis, of the Egyptian Irrigation Department, in 1903, a copy of whose interesting report is attached to the valuable report on the basin of the Nile, made by Sir W. Garstin in 1904.

The course of the Blue Nile from Famaka on the Abyssinian frontier to Khartum is fairly well known, although not yet accurately surveyed. But of the river between Lake Tsana and Famaka, and of its course through the mountains of Abyssinia, our knowledge is most elementary, and it is doubtful whether the line as marked upon maps is correct. Here is a chance for a resolute explorer to distinguish himself by making a really good reconnaissance of this part of the river, and following it carefully from Lake Tsana to Famaka. But it would probably be rather an arduous task, and there would be many difficulties, natural and human, to overcome.

The question of the Blue Nile is only one of the many geographical problems to be solved in the Sudan. The upper waters of other tributaries, such as the Atbara, the Rahad, the Dinder, and the Sobat, and the mountains from which they flow, are also little known, and will require years of exploration, while great areas of the level country of the Nile basin remain unvisited and unsurveyed. This can be well realized by anyone reading Sir W. Garstin's excellent report already mentioned, in which he gives an admirable summary of the hydrography, and deals with the important question as to the manner in which the water of the different tributaries of the Nile can best be utilized for improving the agricultural capacity both of the Sudan and of Egypt. Among other projects with this object he proposes the cutting of an entirely new channel of more than two hundred miles in length, so as to allow the waters of the Bahr-el-Gebel to leave the existing channel at Bor, eighty miles north of Gondokoro, and to rejoin the Nile near the mouth of the Sobat below the sudd district; but, as he justly points out, the country through which this new channel would pass is practically unknown, as the whole of the area lying between the Bahr-el-Gebel, the Bahr-ez-Zaraf, and the Sobat is a terra incognita.

Sir W. Garstin points out that there is a great loss of water from the Bahr-el-Gebel between Gondokoro and Bor, for which he cannot account, and this is another point requiring to be investigated. Reading his remarks upon this subject reminds me of the time when I was assisting in General Gordon's survey of the Nile, when, on this part of the river, at

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a point about fifty miles north of Gondokoro, I noticed a considerable branch leaving the Bahr-el-Gebel, and going apparently in a northeasterly direction. The native pilot told me that it was reported by the inhabitants to join the Sobat. It was impossible to investigate the truth of this statement, which, at the time, seemed rather doubtful, but it is interesting to note that a high authority like Sir W. Garstin records that the Nile loses a considerable volume of water near this place.

Whether the proposal of Sir W. Garstin to make this great canal will ever be carried out is doubtful; for my own part, I am inclined to think that, having regard to the amount of work to be done in the Sudan, it would be better to leave the Babr-el-Gebel alone for the present. The cost of a canal such as that suggested would be very large, and if funds were available it would be better to spend them on a railway from the Sobat southwards. Sooner or later the railway, which now runs some distance south of Khartum to the point where it crosses the White Nile into Kordofan, will be extended, and in process of time will reach the Sobat. Meanwhile it might be worth while to select a point on the Sobat suitable for a bridge, and to make that point the northern terminus of a line of railway, leading southwards to Gondokoro, and later, on to Uganda. Communication between Khartum and this terminus would, for the present, be kept up by the White Nile, which, with the exception of one or two places, is navigable for the whole year.

Looking at the question of the Sudan from the geographical point of view, there has been a wonderful increase of knowledge since the last meeting of the British Association in Dundee; but, on the other hand, there is a larger amount of work yet to be done before the whole of the vast area will have been satisfactorily surveyed, and it must be remembered that the Sudan Government has claims of greater importance at present than that of carrying out a complete trigonometrical survey. But exploration will no doubt be carried on year by year, and the blank spaces on the map will gradually be filled up. Meanwhile we must wish Godspeed to the British officers in the Sudan, who are carrying out a great work of civilization, and, at the same time, adding to the geographical knowledge of the world.

Leaving the Sudan, I would like to allude to a very important geographical undertaking which has made considerable progress during the past year. This is the production of the International Map of the world on the scale of $_{15005000}$ a project which has been under the consideration of the leading geographers of the important countries for more than twenty years, since it was first proposed at the International Geographical Congress held at Berne in 1891. The question was discussed at succeeding Geographical Congresses, but did not take definite shape until the meeting held at Geneva in 1908, when a series of resolutions dealing with the subject were drawn up by a Committee composed of distinguished men of many nations, which was appointed to formulate rules for the production of the maps, so as to ensure that they should be prepared upon a uniform system.

These resolutions were approved at a general meeting of the Geneva Congress, and were forwarded by the Swiss Government to the British Government for consideration, whereupon the latter issued invitations to the Governments of Austria-Hungary, France, Germany, Japan, Russia, Italy, Spain, and the United States of North America, asking them to nominate delegates to act as the members of an International Committee to meet in London and debate the question. This Committee assembled at the Foreign Office in November, 1909, and Colonel S. C. N. Grant, C.M.G., then Director-General of the British Ordnance Survey, was appointed President. The proceedings were opened by the Under-Secretary of State for Foreign Affairs, Sir Charles Hardinge, G.C.M.G., now Lord Hardinge, who, in his address, referred to the progress that had already been made with regard to the International Map, and expressed the hope, on behalf of the British Government, that the great undertaking might be brought to a satisfactory conclusion.

The main business before the Committee was to settle on the mode of execution of the map, especially as regards the size of the sheets, so as to ensure that adjacent sheets, published by different countries, should fit together; and also to settle upon the symbols, printing, and conventional signs to be used, in order that these should be uniform throughout. A series of resolutions, embodying the decisions arrived at concerning these various points, was approved and drawn up in English, French, and German, the first of these languages being taken as the authoritative text. As the map was to embrace the whole surface of the globe, the method of projection to be adopted was, of course, a very important consideration, and, after due deliberation, it was decided that a modified polyconic projection, with the meridians shown as straight lines, and with each sheet plotted independently on its central meridian, would prove the most satisfactory.

The surface of the sphere was divided into zones, each containing four degrees of latitude, commencing at the equator, and extending to 85° North, and 88° South latitude. There were thus twenty-two zones on each side of the equator, and these were distinguished by the letters A to V north, and A to V south. This fixed the height of each sheet. For the width of the sheets, the surface of the sphere was divided into sixty segments, each containing six degrees of longitude, and numbered consecutively from one to sixty, commencing at longitude 180°. This arrangement made each sheet contain six degrees of longitude by four degrees of latitude; but, as the width of the sheets diminished as they approached the poles, it was decided that, beyond 60° North, or 60° South, two or more sheets could be combined. Each sheet could thus be given a clear identification number defining its position on the surface of the globe, without it being necessary to mention the country included in it, or the latitude and longitude. For example, the sheet containing the central part of England is called North, N. 30.

In order to ensure that the execution of all the maps should be identical, a scheme of lettering and of conventional topographical signs was drawn up and attached to the resolutions; and it was decided that a scale of kilometres should be shown on each sheet, and also a scale of the national measure of length of the country concerned. As regards the representations of altitude it was arranged that contours should be shown at vertical intervals of a hundred metres, or at smaller intervals in the case

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of very flat, and larger in the case of steep ground, the height being measured from mean sea level, as determined in the case of each country; while the levels of the surface of the country were to be indicated by a scale of colour tints, the colours being green from 0 to 300 metres, brown from 300 to 2,500 metres, and purple above 2,500 metres. In the same manner the depths of the ocean and of large lakes were to be indicated by varying tints of blue, so as to show intervals of 100 metres. In order to ensure uniformity in the scale of colours to be used, a copy of it, as approved by the Committee, was included in the plate of topographical symbols.

The whole scheme was thoroughly well worked out, and great credit is due to the members of the International Committee for the manner in which they carried out their difficult task. Since the meeting of the Committee in 1909 the preparation of the sheets, in accordance with the principles decided upon, has been taken in hand in several countries, and a number of these have been issued, which give a good idea of what this great map, the largest ever contemplated, will be like. These sheets deserve to be carefully studied, and will doubtless be the subject of considerable criticism, as there are several points which seem worthy of examination.

In the first place, it is for consideration whether it would not have been better if the colour scheme for representing differences of altitude had been omitted, as it is doubtful whether the advantage of the result gained is commensurate with the increased cost of printing the colours. And one naturally asks for what purpose is the map intended. Is it for the use of skilled geographers, of whom there are a comparatively small number in each country, or is it for the instruction of ordinary people? If it is for the latter, it is to be feared that the colour scheme will give rise to erroneous impressions. Compare, for example, Sheet North, M 31, of France, with Sheet South, H 34, of part of South Africa. In the former, as the greater part of the country shown is less than 300 metres above the sea, the general colour of the sheet is green, while in the latter, as nearly the whole of the country included has an altitude of more than 300 metres, the map is for the most part brown. This to the less educated man will probably convey the idea that, while France is a fertile country, South Africa is a desert. The fact, too, that the darker tint of green represents the lower level and the lighter the higher, while, in the case of the brown, the lighter represents the lower and the darker the higher, and, in the case of the purple, the relative strength of the tints is again reversed, is rather confusing.

There is another point as regards the colour scheme which might be noticed, that is, that it is not the same on different sheets. For example, the scale of tints adopted in Sheet North, O 30 (Scotland), North, M 31 (France), and North, K 35 (Turkey), do not correspond. In the Scotch map the brown colour commences at an altitude of 200 metres, in the French at 300 metres, and in the Turkish at 400 metres. There may be some reason for this, but it appears not to be in accord with the resolutions of the Committee. Another reason for omitting the colour scheme for altitudes is that it might be better to keep colour work for other purposes, such as indicating political divisions, as there can be little doubt that so good a map as this, when completed, will be largely used for many purposes. It might be better that on a map of this small scale only the horizontal features, such as coast lines, river courses, railways, roads, and the position of towns should be shown, while to represent height graphically tends to obscure the former.

Another criticism I would venture to make is that the resolutions of the Committee appear to have been drawn up on the supposition that the whole world has been accurately surveyed, and no attempt seems to have been made to distinguish between those regions of which the maps are based on triangulation, such as England and parts of Europe, and the countries of which complete surveys have not yet been made. As the construction of the map proceeds and sheets are prepared of parts of the world our knowledge of which is imperfect, this want will become more pressing, but it is noticeable even with regard to the sheets already published. It is one of the evils of cartography that where anything is shown on a carefully engraved map it comes to be regarded as true, and, if it afterwards turns out to be erroneous, it is not easy to get it altered.

The scale of the map, $\frac{1}{1000000}$, appears to have been wisely chosen, as it is sufficiently large to give an adequate amount of detail, while, at the same time, the sheets will not be unduly numerous. Of course, for an International Map a natural scale was essential, although for national maps a scale based upon the national system of measures is more convenient, as, for example, in the United Kingdom, where the scales of one inch and six inches to the mile are better than scales of $\frac{1}{5000000}$ and $\frac{1}{1000000}$ would have been. They are more suited for the majority of individuals, and an ordinary foot-rule can be used for measuring distances, instead of having to take them off with a pair of dividers from the printed scale on the map.

Looked at from the general point of view, there can be no doubt that the International Map is a most important and valuable undertaking. It is satisfactory that such a leading part in the matter has been taken by the British officers of the Royal Engineers and by the Royal Geographical Society.

In speaking of this map I have referred to the advisability, if not the necessity, of distinguishing between what is accurately and what is inaccurately known, and this brings me to another matter of considerable interest, the preparation of maps based upon the observations and information collected by explorers in unknown or little-known countries. To these explorers, some of whom have not been trained in geographical science, a large amount of detail shown upon modern maps is due, and it is only a small proportion of the land surface of the globe that has, up to the present, been surveyed in a scientific manner.

It is therefore of the greatest importance that the best value possible should be obtained from the work done by explorers, and this in the past has not always been sufficiently attended to, though during the last few years it is better understood. The people who stop at home in comfortable ease do not sufficiently realize the difficulties under which the conscientious traveller works and gathers together information about the country he passes through. Formerly, he generally had to work out his own observations and compile his own maps, but now conditions in this respect have greatly improved, and when he brings home his observations, notes, and sketches he can hand them over to some body, such as the Royal

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Geographical Society, by whom they will be put in shape in a better manner than he could do it for himself. One has heard of an explorer in a little-known country sitting up all night after a hard day's work, working out his astronomical observations, and trying to put his rough surveys into shape. He would have done better to have gone to sleep and prepared himself by a good rest for the next day's journey. In fact, it would be better if an explorer never looked at the figures of an observation after he had recorded them, or read over the notes of his past work, confining himself to recording what he has actually seen day by day as accurately as circumstances permitted, and carefully distinguishing what he really saw from what he thought he had seen, or what he had heard.

It would be easy to adduce instances of the errors which have arisen from the neglect of such precautions. Perhaps one of the best known is that I have already alluded to, when James Bruce, a careful explorer, because he had made up his mind that the Blue Nile was the real Nile, passed the White Nile without taking the trouble to examine it, and recorded it as being a comparatively insignificant river. Then, there was the case of Sir Samuel Baker, who having reached the shores of the Albert Nyanza with great difficulty, relied too much on what he was told by the natives, and showed it on his map as extending many miles to the south of the equator. But great responsibility rests also upon those who have the task of compiling a map from the notes of an explorer, and the greatest care has to be taken to show only what is really known, and not what is uncertain. Geographers, whether in the field or in the drawing office, should always hold up before themselves a standard of accuracy higher than it is always easy to live up to.

Geography under its more ancient name of geometry is, of course, the mother of all sciences, although at the present time geometry has got a more narrow meaning, and is perhaps regarded by some as independent of geography, although really only a branch of it. The study of the earth upon which they lived was to the ancient nations the most important of all studies, and it is interesting to trace how astronomy, mathematics, geology, and ethnology are all so interspersed with geography that it is difficult to separate them. It is satisfactory to note how from the very first the British Association has always recognized the great importance of geography, since the first meeting of the Association at Oxford in 1832, when Sir Roderick Murchison, so well known to fame, acted as President of the Geographical and Geological Section. These two sciences remained united in the same section until the meeting at Edinburgh in 1850, when Sir R. Murchison was again the President. But, at the next meeting at Ipswich in 1851, they were separated, and while Geology remained as the subject of Section C, Geography, on account of its great importance, was made the subject of Section E, and the science of ethnology was united with it. Sir R. Murchison was the first President of the new Geographical Section, and was afterwards President no fewer than six times of Section E, showing the great importance attached by him to the study of the science of Geography. May I express the hope that the Presidents of the Section will endeavour in future to follow, however humbly, in the footsteps of that leader of science.

CORRESPONDENCE.

ROLL OF THE CORPS.

DEAR SIR,

In the *K.E. Journal* for July, 1911, there appeared a short notice of the Indian services of T. H. Elliot and F. E. Elliot, Nos. 437 and 523 respectively on the *Roll of the Corps*.

These two officers were brothers, and the sons of Mr. Hugh Elliot, Governor of Madras 1815-20, on whose staff they served. There appears to be little doubt that T. H. Elliot was present at the Battle of Seetabuldee, for in "The Life and Correspondence of Sir J. Malcolm" there occurs the following sentence which refers to Sir John's journey to join his division at the commencement of the second Mahratta War, 1817:--

"He (Sir John Malcolm) had moreover, at this time, some gnests in his camp . . . Captain Henry Elliot, son of the Madras Governor; Dr. Gordon of the Nagpoor Residency. . . On the 20th September (1817) Malcolm and his companions entered the province of Berar, and on the 24th he arrived at Nagpoor. . . On the 4th October Malcolm prepared to depart from Nagpoor."

This fits in exactly with Sir J. B. Hearsey's statement (printed in the July, 1911, number of the R.E. Journal) that the Captain Elliot present at Seetabuldee had been left at Nagpoor sick when Sir John passed the Residency there on his way to Indore; and accounts for the mistaken impression left on Sir J. B. Hearsey's mind that Elliot was Sir John's aide-de-camp.

It is an interesting fact that the Corps was represented on such a celebrated occasion, and is an apt illustration of the Corps motto.

Yours faithfully, H. BIDDULPH, *Major, R.E.*

October, 1912.

The Editor, R.E. Journal.

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RECENT PUBLICATIONS OF MILITARY INTEREST.

REVIEWS OF BOOKS.

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' HISTORY.

HISTORY OF THE RUSSO-JAPANESE WAR. Compiled by the Japanese General Staff (Nichi-Ro Senshi, Sambo Hombu Hensan). Vol. I. 746 pp. 27 Appendices, and case of maps. Svo. Tokyo, Kaikosha, June, 1912. Complete in 10 vols., £5 16s. 5d.

Although the first volume of the Japanese official account appears eight years after the events which it describes, the summary of contents shows that the work of compilation has been a considerable one. The 10 volumes contain over 10,000 pages, while there are over 800 maps outside the text.*

The difficulty that the military student must experience in extracting lessons from so large a mass of material is increased by the absence of an index (the Japanese language not lending itself to this convenience) and of comments.

It is evident that an oficial history compiled by officers who are still the subordinates of the men who took a leading part in the war cannot contain candid criticisms, and it is equally comprehensible that no nation willingly makes a gift to its rivals of the practical lessons that it has purchased so dearly. At the same time so entire an absence of self-revelation is a matter for regret. At no time, at any rate in the first volume, is the scader allowed to see into the minds of these great soldiers; and a history which merely chronicles events as they occur and orders after they are issued, is but a skeleton.

GENERAL ARRANGEMENT,

The history deals with the operations on land, the naval account being a separate publication.

The chief events treated in the different volumes are as follows :---

Vol. 1.—Causes of the war. The rival armies. Japanese and Russian plans of campaign. Epitome of the naval operations. The Yalu, Nanshan, Te-li-ssu. Landing of the roth Division.

Vols. 2-4.-Ta-shih chiao, Liao-yang, Shaho,

Vols. 5--6.-Siege of Port Arthur.

- Vol. 7.-Events after the Battle of Shaho.
- Vols. S-9.-Mukden.

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Vol. 10.—Occupation of Saghalien. Lines of communication and services in rear of the army,

Each of the 16 sections into which the whole history is divided is preceded by a summary of the events dealt with in the section in question. At the end of each chapter is an account of the Russian movements which took place during the period under notice. By the use of different type the information of the enemy that was known to the Japanese at the time is distinguished from the facts revealed by subsequent investigation.

* Succeeding volumes are advertised to appear at 1-3 monthly intervals, and the final volume in October, 1913.

1912.] RECENT PUBLICATIONS OF MILITARY INTEREST.

The maps show the positions of units with great clearness and detail, a result which is mainly due to the Japanese system of conventional signs for troops which is very complete. The nomenclature of Japanese units which are known by numbers only is also less cumbrousthan our own.

Orders of battle, lists of casualties (including losses in horseflesh), and animumition expenditure during the principal engagements and copies of orders are given in the appendix.

CAUSES OF THE WAR.

The opening chapter on the "Causes of the War" is very brief (14 pages). Remembering that a chief one was Japan's determination to show the world that she would no longer continue to be treated as a negligible quantity, there is a dignified restraint in the account of her relations with Russia before the war. The retrocession of Port Arthur in 1895 may be quoted as an illustration of this absence of rectimination over past injuries. The account of the incident occupies two lines in the original, and is as follows : "As one result of the 1894–5 campaign China ceded to Japan the Liao-tung Peninsula ; but, on the ground that the peace of the Far East was affected thereby, Russia, together with France and Germany, demanded that Japan should relinquish it. Our Government had no other course bat to accede to this demand."

A glimpse of the Japanese attitude, however, appears in the reference to the Russian naval manœuvres in the Yellow Sea and the artillery practice from Vladivostock in May, 1903, "which tried to intimidate us with the noise of their fire."

It is interesting to know what information was in the possession of the Japanese Headquarters at the beginning of February-i.c., on the eve of war-since it affords a clue to the reasons why the Japanese broke off the negotiations when they did. The history summarizes, this information as follows :--

- ¹⁴ About two battalions of infantry belonging to the Third Brigade in Kuantung with some artiflery were dispatched on the 21st January with orders to observe the line of the Valu.
- ** At Liao-yang quarters are being prepared and vehicles collected. Food and clothes, are being sent to Fenghuangcheng, and 20,000 Chinese horses have been ordered; 2,000 fresh troops have arrived at Liao-yang.
- "On the 1st February our Consul at Vladivostock was told that all Japanese were to prepare to leave.
- "The whole of the Russian fleet in Port Arthur (with the exception of one battleship undergoing repairs) have gone out to sea (destination unknown)." Russian forces in the Far East appear to be mobilizing.
- "The following information was received from Europe : Russia will form two armics-North and South-and concentrate them in South Manchuria and the Ussuri.
- "Russia intends to send the following reinforcements from Europe when necessary, viz., two Army Corps, four reserve infantry divisions and a cavalry brigade; while she is now preparing to send two infantry divisions, one division and one brigade of cavalry, in addition to the above.
- " The troops east of Lake Baikal are concentrating in Manchuria and Ussuri.
- "The Ninth East Siberian Rille Brigade is to be converted into a division and a new brigade formed. A draft left at the end of January for the purpose of bringing a portion of the 31st Infantry Division up to war strength.
- "The Tsar has entrusted Viceroy Alexiev with full powers. The latter has determined upon war, but wishes to delay until the naval reinforcements under Admiral Virenius. arrive, the 3rd Siberian Army Corps is organized, and the docks at Port Arthur are completed."

At this moment—the beginning of Felnuary—military strategy did not favour the opening of hostilities. To invade Korea while her northern ports were still ice-bound and her roads about to become impassable would, as events proved, involve many weeks' delay; nor was there any information to show that the occupation of Korea a month later would be more hazardous or undesirable from the military or political point of view. In spite of the fact that,

* This information does not appear to have been mentioned in other accounts. It is also stated in a note to the above that, as a matter of fact, the Russian fleet anchored in Talien. Bay on the night of February 3rd, and returned to Port Arthur the next day.

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in Japan, the army is the senior service, and her chiefs practically monopolized political power —the Premier was a general on the active list, Prince Yemagata (the senior of the elder statesmen) a field marshal—the paramount necessities of naval strategy were recognized. Admiral Virenius was approaching it is true, but he could not reach Port Arthur before the beginning of March. The crucial point was that the Port Arthur fleet had gone out to sea. Its whereabouts and destination were unknown in Tokyo on the 3rd February, and it is significant that at an Imperial Council the following day it was decided to begin hostilities.

With the exception of the statement that Reserve (Kobi) divisions were formed (as well as brigades), the chapter on the Japanese military forces contains no information not already available.

The total number of combatants and non-combatants that took part in the war is given as $t_1 \cos 83,996$; of these 999,868 served overseas.

, THE JAPANESE PLAN OF CAMPAIGN.

A translation—practically *in extenso*—is given below of the "Japanese Plan of Campaign" as being, perhaps, the most important chapter in the book :—

"The Japanese General Staff realized b:fore the war that, although the Russian Army was some seven times greater than their own, yet the numbers that Russia could employ in the Far East were not greatly superior . . . and would not, in fact, be more than two-fifths of her total force, owing to the necessity for protecting her interests in Europe. Difficulty of supply was another important factor limiting the number of troops that could be employed, Eastern Siberia was thinly populated and comparatively unproductive, while Mancharia could only provide a portion of the forage and rations required. Everything else must be sent from Russia by a single line of milway. Taking into consideration also the still imperfect condition of this line and the interruption caused by Lake Baikal, it could be said positively that more than 300,000 men could not be maintained in the Far East. There was also at this time a considerable amount of nurest in Russia, and this cause further reduced the force that was likely to be sent against us to about 250,000 men, a number about equal to that which we could send from Japan.

"With regard to the Russian area of concentration, although its position was uncertain, yet it must be situated so as to provide suitable lines of advance both towards South Manchuria and the Ussuri region, whichever the Japanese might choose as the field of operations for their main army.

"Although it would seem that reinforcements from Europe and Western Siberia ought first to concentrate at Harbin, yet it seemed more probable that Russia would reinforce the troops already in the Far East than allow us to overrun Southern Manchuria without resistance. (At the end of January the following was estimated to be the strength of the Russian forces in the Far East if mobilized, omitting reserves to frontier troops : 95 battalions, 75 squadrons, 304 batteries (230 guns), S engineer companies, 1 battalion, 17 batteries, and 1 engineer company of fortress troops).

"If the enemy advanced south we should concentrate our forces as quickly as possible and drive them back. If, on the other hand, the troops already in Manchuria and Ussuri were used to keep touch with us and gradually draw us northwards until the main Russian Army had finished its concentration, then it would be for us to overwhelm their advanced troops before attacking their main army when it advances.

"At the outset our chief object was to bring about the main operations in Manchuria, to search out the enemy's main strength and drive it northwards; while our fleet must defeat their Pacific Fleet and thus obtain command of Eastern waters.

 ** In accordance with these intentions the operations on land were divided into two periods, and the plan was broadly as follows :---

¹⁰ First Period. — The 1st Army to advance from Korea, debouch on the right bank of the Valu and contain the enemy; the 2nd Army, at a favourable opportunity, to occupy a point on the south-east coast of the Liao-tung Peninsula and establish a base there. The 3rd Army then to land and observe the Port Arthur fortress, and if necessary take it. While the 2nd Army was advancing north in conjunction with the 1st Army, the 4th Army was to land, either between the 1st and 2nd Armies, or on the north-east shore of the Gulf of Pechili; these three armies acting in close co-operation to take Liao-yang.

¹¹ Second Period.—If the first phase opened in the spring it should be completed by the autumn; the army would therefore winter north of Liao-yang on ground that had been won, rest, and refit. Movements would recommence the following spring, the energy sought out and crushed beyond hope of recovery.

"Saghalien to be taken at a suitable time during either of these two periods.

"Although Russia's Far Eastern fleet had been increased, her naval strength when relations between the two nations became strained was approximately equal to our own.

"We could not tell whether at the outbreak of war their fleet—or the greater part of it—would—(a) assemble in Port Arthur Harbour and await the arrival of reinforcements; or (b) seek a decision at once; or (c) operate in the Yellow Sea or Sea of Japan and await a favourable opportunity. As the adoption of either (b) or (c) would favour the Japanese, course (a) was the most probable one

"But as every day's delay was so much time gained for the Russian preparations, we decided not to await the result of a naval engagement but to send a powerful force to Korea and capture Scoul, a movement which could be carried out without risk, as our navy could thoroughly guard the Korean Straits. Moreover, calculations showed that if both sides sent a division to Scoul (*i.e.*, at the outbreak of war) we should have a considerable advantage as regards time. Consequently a detachment was to land at Chemulpo immediately after war was declated, occupy Scoul, and deliver Korea from the yoke of Russia, after which one division was to land on the south or cast coast of Korea, concentrate in the vicinity of Scoul, and there await the result of the naval engagement. The possibility of the country,

"Should our navy be successful, a strong force was to be pushed into the north-west portion of Korea, in order to complete the occupation of that country, and obtain the first victory. In other words, the main portion or two divisions of the 1st Army would land on the west coast of Korea and, joining the division previously disembarked on the west coast, advance through the north-west province of Korea into S. Manchuria . . .

"If Chinampo be chosen as our port of discubarkation and the district in the neighbourhood of Pingyang as our area of concentration, we should be able to concentrate three divisions (including the division attached to Scout) before the enemy could do so, but if the ice had not melted, Chemulpo must be our port of discubarkation, and the area of concentration must be changed to the neighbourhood of Haiju. This would involve several days' delay, but it should not be very difficult to concentrate in that area before the enemy could reach it.

"It was decided to disembark the bulk of the 1st Army after command of the sea had been obtained, Chinampo was to be the chief port of disembarkation if ice-free, otherwise Chemulpo. The 1st Army was then to advance, and when it had occupied the right bank of the Yalu the 2nd Army (3 divisions, 1 cavalry brigade, and 1 autillery brigade) was to land—covered by the 1st Army—on the south-cast shore of the Liaotung Peninsula at a point as far as possible from Port Arthur, in view of possible interference from the Russian fleet. Takushan was eventually chosen, in order that the 2nd Army might co-operate as closely as possible with the tst Army.

"The plan of campaign given above was determined before the war began, and the operations during the first period were carried out almost entirely as planned; but with the object of destroying the enemy's fleet the capture of Port Arthur was undertaken, and the length of this siege, necessitated by the stubborn resistance of the garrison, had a great influence upon the operations of the main army. The consequence was the Battle of the Shaho during the second period, and although the enemy's intention was frustrated, yet it must be admitted that, owing to lack of numbers, we did not gain the success that we hoped for . . .

"After the Battle of Mukden Russia's military resources were by no means exhausted : the capacity of the railway had been enormously increased, she had renewed her strength. On the other hand our preparations were very extended and difficult to maintain, while the conquest of Saghalien and the advance in N. Korea could not be carried out, as our fleet was required to meet the approaching Baltic Fleet. However, the victory of the Sea of Japan enabled us to carry out our original plan, Saghalien was occupied, the enemy was expelled from the north of Korea, and our troops there reinforced the army in Manchuria . . ."

It will be noted in the foregoing that; (t) Although the possibility of a Japanese advance from the direction of Vladivostock is mentioned in connection with the choice of the Russian area of concentration, we are not told whether this possibility was ever entertained by the Japanese General Staff. (2) It was recognized before the war that the Russian Fleet would probably remain in Port Arthur until naval reinforcements arrived (see above), but it was, apparently, not considered at that period that this would necessarily involve the capture of Port Arthur: "The 3rd Army . . . was to . . . observe the Fort Arthur fortress, and, if necessary, take it." (3) From the comparatively lengthy discussion devoted to the subject it appears as if the occupation of Korea was the essential and difficult thing. It is true that if hostilities began before the ice melted, then the first advance could only take place in Korea; but if the war started after the South Mauchucian coast was free from ice, it is not clear (assuming that sufficient superiority had been established at sea) why the occupation of Korea should still be the only initial operation worthy of consideration.

The following are extracts of the summary of the operations described in Vol. I., which precedes the detailed account.

After describing the advance of the 1st Army to Wiju, the employment of the 2nd Army is discussed as follows :--

"Owing to the favourable naval situation it was hoped that it would be possible to land the and Army in the neighbourhood of Talien Wan. At first the Japanese Headquarters had three alternative plans : (1) To land immediately the main army with one swoop in and near Talien Wan, quickly cut off the Kuan-tung Peninsula, and establish a large base there ; (2) to land at Ta-ku-shan or to the east of it, so as to act in close co-operation with the 1st Army ; or (3) to land in the vicinity of the month of the Ta-sha-ho. But as the enemy appeared at the end of April to have about 4 divisions in the neighbourhood of Liao-yang, 2 divisions at Feng-huang-cheng, 2 divisions between Chin-chon and Kaiping, and about 1 division in Port Arthur, Talien Wan was the most suitable place of disembarkation, as calculations of time and space showed that it involved little danger from a land attack, while its position was excellent strategically ; it was, however, very dangerous from the naval point of view. Plan (2) was not only unsuitable for disembarkation of troops, but it would cause a delay in the subsequent operations. It had, however, the advantage that it was the least risky, and would have been chosen had not the naval situation permitted the adoption of Plan (1). . . . It had originally been the intention to include a division with mountain guns in the and Army, but as the country round Talien Wan was flat and the resistance of the garrison had to be considered, mountain guns were not included.

"The Imperial Headquarters decided that if Admiral Togo's third blocking expedition was successfully carried out on or before the 30th April, the 2nd Army would immediately land near Talien Wan; if not successful, that the landing would be carried out near the mouth of the Ta-sha-ho.

"On the 22nd April, in consequence of Admiral Togo's decision, it was decided that the disembarkation of the 2nd Army would begin on the 1st May, whatever the result of the blocking expedition.

"The bulk of the 2nd Army (1st, 3rd, and 4th Divisions) assembled off Chinampo on the 30th April, and the first detachment landed on the sonth-west shore of the mouth of the Ta-sha-ho on the 5th May in conjunction with the third blocking expedition (the date was delayed on account of naval preparations). The 1st Army was instructed to debouch on the right bank of the Sha-ho before the 2nd Army landed, contain the enemy, and so prevent him from advancing south. Contrary to expectation the enemy did not move south from Liao-yang and Anping, and stranger still the Russians near Port Arthur and Chin-chou offered no resistance, so that the landing was easily effected . . .

"The landing of the roth Division should have synchronized with that of the 2nd Army, hut owing to the lack of transports it was delayed until the 19th May; and then, in consequence of the very bad landing facilities, the disembarkation although unopposed was very slow. It was the intention to land another division at Kankyodo; but as our fleet was obliged to watch the Vladivostock Squadron and transports were lacking, this plan was changed.

"As the 2nd Army and 10th Division were now established on the Liaotung Peninsula, it was necessary to prepare to organize one army to advance northwards and another to hesiege Port Arthur. The 5th and 11th Divisions were accordingly allotted to the 2nd Army. Previous to this Admiral Togo had reported that he could not clear Talien Wan of mines until the Chin-chou Isthmus had been occupied by the army. The 2nd Army was accordingly directed to attack the enemy in the neighbourhood of Nanshan. Tairen was occupied, and the 5th and 11th Divisions were gradually disembarked; the 1st and 11th Divisions formed the 3rd Army, while the 2nd Army prepared to advance northwards. At this time the main body of the enemy's fleet was lying up in Port Arthur awaiting an opportunity, and could not be neglected. The only method of operating against this fleet was to destroy its base from the land side. Tairen was also necessary as a main overseas base for the Manchurian armies. For these reasons the attack of Port Arthur was decided upon.

"At the beginning of June reports were heard that the enemy were moving south from Liao-yang and Kaiping. The 6th Division was accordingly suddenly added to the 2nd Army . . . The 1st and 4th Kobi Brigades, then in course of formation, were allotted to the 3rd Army. Owing to the continuous activity of a large force of Russian cavalry on the right flank of the 1st Army, and to the necessity for protecting that army's line of communication, a Guard Kobi Brigade (two battalions of which were already on the lines of communication) was formed, and together with three other Kobi battalions were added to the 1st Army. . The 1oth Division, which was felt to be too weak, was also reinforced by the roth Kobi Brigade.

"About the middle of junc reports were received that the enemy's Baltic Fleet was approaching. . . The Commander of the 3rd Army was accordingly instructed to capture Port Arthur as quickly as possible.

"About this time Imperial Headquarters decided that the 1st and 2nd Armics and 10th Division must defeat the enemy's main army at Liao-yang before the rainy season in Manchuria began, and in accordance with this object the following plan was laid down :—

- "(1). The 3rd Army will be reinforced by the 9th Division and, if necessary, by the 2nd Field Artillery Brigade.
- "(2). The 1st Army will push forward at once a force of about 1 division to Tsao-ho-kou, and under cover of this force 21 days 'supplies for 3 divisions will be collected at Tung-yuan-pao
- "(3). The 10th Division will collect supplies for 20 days for 2 divisions at Hsiu-yen by the 6th July. The detachment at Hsin-kai-ling will co-operate if the situation renders it necessary.

"The 10th Kobi Brigade will begin its disembarkation at Ta-ku-shan on 1st July, and follow the 10th Division.

"(4). The 2nd Army will advance on Kai-ping on the 19th June. After taking it the Army will occupy Ta-shih-chiao and Ying-kou with strong advanced parties.

"Supplies north of Hsiung-yo-cheng will be drawn from sea transport.

"If the above plan can be carried out as arranged each army will advance without interruption on Liao-yang; but if this advance does not progress as anticipated and the rainy season begins, then it will be necessary to remain in whatever positions are reached until the rains are over.

"Imperial Headquarters issued orders in the above sense, and also gave instructions on the 19th June to the 1st and 2nd Armies and 10th Division, that in accordance with the above instructions, the advance on Liao-yang was to be carried out as quickly as possible. The Inspector-General of Communications (General Kodama) was also directed to disembark supplies at the mouth of the Hsung-yo-ho as soon as Hsung-ho-cheng was occupied.

"On the 20th June General Kuroki requested leave to recall the Asada detachment. Imperial Headquarters refused to allow this until the 10th Kobi Brigade had joined the 10th Division, and ordered that no advance was to be made north of Fen-shin-ling.

"The intention of the 2nd Army to advance upon Kai-ping after Te-li-ssu was frustrated by the difficulties of transport upon the line of communication.

A HISTORY OF THE BRITISH ARMY. Vol. VII., 1809-10. By the Hon. J. W. Fortescue. 661 pp., with index and vol. of maps. Svo. London, 1012. Macmillan. 218, net.

In the present volume of his History of the British Army, Mr. Fortescue is only able to deal with the years 1809-10. This is easily understood when we recollect that the British Army was engaged in active operations not only in Holland and the Peninsula, but also in the Mediterranean, as well as in the West and East Indies.

The book begins with an account of the operations in the West Indies in 1809. The strain on British resources which their possessions in those parts entailed, combined with the
unfriendly attentions of rival Powers, was a severe one, and the selection of the best policy to be pursued was no easy matter. Mr. Fortescue explains the courses open to England, and shows how, while the question was still undecided, Napoleon's invasion of Spain so far altered the situation that the French colonies became, to all intents and purposes, the sole object or attack, every effort being made to help and protect those which belonged to Spain. It was not, however, till the beginning of the following year that, by the capture of Guadeloupe, the offensive power of France in the West Indies was practically destroyed.

The next chapter begins with a review of the military problems which faced the British Government at the beginning of the year (Soq. The resignation of the Dake of York as Commander-in-Chief, and the difficulty of filling the ranks of the Army, were but two of the many troubles which beset them at home. It is interesting to note that the military authorities came forward at this time with a proposal for absorbing the Militia into the Regular Army, Before, however, the plan which was actually accepted had had time to take effect, war broke out between France and Austria, While the British Government was anxious to aid Austria, uncertainty as to the policy which Prassia would pursue made it difficult for ministers to come to a correct decision as to the best sphere in which to employ the British Army. Mr. Fortescue explains in the clearest way the problem which they had to solve, and he makes it plain that, while concentration of effort in the Peninsula was the right military course to pursue, financial difficulties were insuperable. Fortunately the Government decided to make up the force in Portugal to the strength recommanded by Sir A. Wellesley, and to place him in command. They then had to consider how to employ the rest of the Army. Amongst the plans put forward was one for an attack on Walcheren, with a view to the destruction of the squadron known to be in the Scheldt. This scheme, which appears to have been warmly supported by the naval and equally strongly opposed by the military authorities, was finally approved. It seems practically certain that the expedition would have been a failure in any event; but, to have the faintest chance of success, it was essential that it should be despatched while the weather was favourable, should come as a surprise, and be conducted with energy. Unfortunately every one of these essentials was lacking, and friction between the naval and military commanders made matters worse.

Mr. Fortescue maintains that the real mistake made by Ministers was in committing the force to an operation of doubtful success, when by holding it in readiness for a month or two, its quality would have been improved, and a more profitable objective might have been found elsewhere. It is somewhat difficult to accept this view of the case when we remember the state of affairs abroad. As the author hinself points out, Austria needed practical support, and it was equally important to encourage the patiotic party in Prussia. While, therefore, we may agree with Mr. Fortescue's conclusion as to the unsuitability of the British Constitution for the purposes of war, we may perhaps be permitted to doubt whether in the given circumstances any other form of Government would have found a happier solution.

From Holland we are taken to the Peninsnia, and after dealing briefly with the operations in Catalonia, Mr. Fortescne passes to the events which succeeded Moore's departure. Some fresh evidence throws a new light on the difficulties with which Cradock, who was left in command in Portugal, had to contend, and the important effect of Canning and Frere's blunders which prevented a landing of British troops at Cadiz is fully explained. The following ehapter contains an account of the operations undertaken by Wellesley to clear Portugal of the French. The reasons which induced him to attack Soult at Opotto in preference to Victor at Merida are admirably explained. As an example of the study which Wellington gave to tactical methods, and of the care which the author has taken to record details which to many might appear of little or no value, attention may be drawn to the description of the novel distribution of rillement in the first order of battle, which consisted in the allotment of a company to each brigade, this being, in Wellington's opinion, the best method of combatting the french.

Mr. Fortescue is particularly happy in his description or the disturbing effect the British Army, backed by British naval supremacy, had on Napoleon's calculations, and he shows how Moore's march to Coruna first led Soult and Ney into the north-west corner of the Peninsula, and then tempted Napoleon to commit the serious blunder of keeping them there in order to close the ports of Coruna, Vigo, and Ferrol to the British fleet before he had conquered Portugal.

The Talavera campaign is next described. As Mr. Fortescue points out, the campaign was, perhaps, more remarkable for the internal quarrels of the generals on either side than for the

1912.] RECENT PUBLICATIONS OF MILITARY INTEREST.

actual fighting; and while we may agree that the British commander showed himself somewhat impetuous and over-confident, we see that he alone realized the outstanding lesson of the operations, which was that final victory would be practically assured to the army which should first overcome the difficulties of transport and supply.

Mr. Fortescue's account of the general effect of the various expeditions undertaken in 1809 on the Government and the House of Commons is both illuminating and instructive. He notes, as an interesting comment on the qualification of the Commons to deal with military matters, that a reduction of the Royal Wagon Train, on which the transport of the Army depended, was considered the best way to overcome the opposition to the passage of the estimates. Before a return is made to the scene of regular operations in Portugal, Mr. Fortescue devotes a good deal of space to describing the minor operations which took place throughout Spain during 1810, the chief characteristic of which was the futility of such as were attempted by the Regular Spanish troops, and the success of the guerilla bands which now began to make their appearance.

In Chap. 36 a very interesting description is given of Wellington's staff and the methods in which business was conducted. From this we learn that Wellington was in reality his own Chief of the Staff, that he conveyed his orders as to the movements of the army mainly by means of private letters, and that he was very jealous of any intervention by the members of his staff. In the matter of intelligence also he appears to have kept control of the various agencies employed, and to have received their reports himself. Amongst many other interesting details contained in this chapter, the relations existing between the Government and Wellington are examined and discussed. Mr. Fortescue shows that Wellington did Ministers less than justice, and while ready to admit that the Commander-in-Chief may have had grounds for mistrusting them, he contends that the men who, in spite of three military failures-on the Scheldt, on the Tagus, and in the Bay of Naples-boldly took up the reins of Government and still maintained the war, are as much to be honoured as the commander who carried out their policy. An admirably lucid description of the somewhat complicated manœuvres carried out by the British forces in the first half of 1810, culminating in the Battle of Busaco, followed by the retreat to the lines of Torres Vedras, is then given ; while the two final chapters of the volume deal with events in the East Indies.

An account of the mutiny which took place in the East India Company's force in Madras, which might have had disastrons effects had it succeeded, is included. It would appear that the disturbance was mainly due to a change of policy on the part of the Company enforced by an unwise and unsympathetic Governor.

An agreeable contrast to the above is the story of the expedition to Java under Sir S. Auchmuty, and of the operations which ended in the capture of that island.

To do justice to such a work as this within the limits of space available is impossible. All that has been attempted here has been to show the ground covered by the volume, the care with which Mr. Fortesche has examined all available sources of information, the pains which he has taken to weigh the evidence thus obtained, and the impartiality which marks the conclusions at which he has arrived.

CAMPAIGNS ON THE NORTH-WEST FRONTIER. By Capt. H. L. Nevill, D.S.O., Royal Field Artillery. 404 pp., with 6 illustrations, 5 maps in pocket, and 9 plans in the text. Svo. London, 1912. John Murray, 155.

This volume gives short but clear accounts of all the various campaigns on the North-West Frontier of India which have been undertaken by the British, with tables of the various troops engaged,

The operations of more recent years, commencing from the Hunza-Nagar campaign of 1891, are reviewed, and the more prominent factical lessons of each campaign are brought out and compared with the principles now faid down in *Field Service Regulations*, Part I.

The book concludes with an anticipation of the conditions likely to be met with in the future, and how modern science may assist us in our next operations.

Apart from tactical lessons, this book is also valuable as a work of reference, and for instructional purposes regarding the geographical and ethnographical features of the North-West Frontier of India.

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ORGANIZATION.

ORGANIZATION. By Colonel Hubert Foster, R.E. 267 pp. Svo. London, 1911. Hugh Rees. 35. 6d. net.

In his preface Colonel Foster explains how his inability to find any work dealing systematically with army organization induced him to compile the present book, and it is unquestionable that the subject has not been handled in such a way as to present any very clear idea of its real meaning and significance. In the work under review the author has confined his attention to giving a general account of organization for war only, for, as he says, the inclusion of organization in peace would open out too wide a field of discussion.

In his first chapter the author explains what is meant by organization and why it is necessary, and he then describes the various kinds of troops which go to form an army, their methods of fighting, and functions in war, these being necessary preliminaries to a consideration of the units and formations of which a modern army consists. As, however, changes have taken place in the British Service since the book was published, it is necessary to warn the reader that some of the information contained in it is not strictly accurate, and we cannot accept the view that it is impossible to group a variety of troops which are mentioned in Chapter 4 under any one of the old heads of the three arms, the effect of which would be to make "command"—which it is the object of organization to facilitate —a far more difficult question than it now is.

The author then explains how, as the result of past experience and of a forecast of future needs, the various units are combined into smaller formations, and how these again are combined into larger formations constituting what are called subordinate commands, the essence of which is that they are capable of independent existence and action. Their administrative services and staffs are also described in sufficient detail to enable one to obtain a good idea of their essential features. The final chapter of this Part explains the object and utility of war establishments, the importance of preserving the original organization of a force, the evils of improvization, and lastly, the meaning and use of an *Ordre de Bataille*.

Part II. deals entirely with British war organization, and is therefore concerned mainly with the Expeditionary Force, which has, however, been modified in certain details, chiefly those connected with transport and the service of intercommunication, since the book was published. The special features of this organization, their object, and the advantages claimed for them, are well explained.

In Part III, the author gives a brief description of the war organization of foreign armies, which, with the exception of that of the United States, follow the same general plan. This Part is followed by a short history of the developments of organization since the introduction of firearms, in which Colonel Foster shows that modern organization dates from the close of the Feudal epoch in the fifteenth century, and that Italy was the country in which it originated, and to which most military terms may be traced. Having first outlined the growth of the earliest regimental organization from the companies of which permanent Regular forces were originally composed, he proceeds to give an account of the evolution of each arm in turn, followed by a description of army organization in the seventeenth and subsequent centuries. A separate chapter deals with the evolution of the Staff and administrative services.

Part V, is devoted to a consideration of the principles of command and the psychological characteristics of armies. The reason for touching on these subjects becomes obvious when it is remembered that the chief object of organization is to facilitate command. The extent to which the method of command has been modified in consequence of the growth of modern armies is explained, and the difference between "instructions" emanating from the supreme commander and the "orders" issued by subordinate commanders is made clear.

An appendix contains an explanation of the way in which military terms came to have their present technical meaning, together with their country of origin and derivation. This appendix forms a very interesting addition to a work which, even without it, is full or much useful information on a subject that must attract every soldier who takes an interest in his profession.

POLITICS.

THE MILITARY DANGER OF HOME RULE FOR IRELAND. By Major-General Sir T. Fraser, K.C.B., C.M.G. 319 pp. Svo. London, 1912. John Murray. 88, 6d. net.

In this book the author briefly reviews the military history of Ireland from the time the Romans inhabited England to the present date ; and, basing his opinions on the experiences of the past, he concludes that it is his duty to draw the attention of his fellow-countrymen to the danger to the Empire involved by the adoption of Home Rule in Ireland.

STRATEGY AND TACTICS.

STAFF WORK. By Colonel Hubert Foster, R.E. 223 pp. Svo. London, 1912. Hugh Rees. 35. 6d. net.

The object of this book is to give instruction in the every-day duties which would fall on the commander or General Staff officer of a small force of all arms on service.

The book is, the anthor explains, the outcome of many years' experience with Militia in Canada, the United States, and Australia.

Much of the contents can be found in *Field Service Regulations*, but the latter is necessarily very terse, and moreover applies essentially to a British division. It is therefore somewhat difficult for a beginner to follow. It is with the idea of smoothing away some of these difficulties that this work is published. At the same time, the fact that British operations will be conducted under the above Regulations has been constantly kept in view.

While the book is very likely to assist students in clearing up points on which they may have been in doubt, it is necessary to caution them that portions are already out of date, owing to recent changes in organization.

[NOVEMBER

BOOKS RECEIVED.

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- STAFF WORK: A Guide to Command and General Staff Duties in Small Forces of All Arms in the Field, By Col. Hubert Foster, R.E. Hugh Rees, Ltd., 5, Regent Street, S.W. 1912. 3s. 6d. net.
- A BRIEF HISTORY OF THE KING'S ROYAL RIFLE CORPS. Warren & Son, Ltd., 85, High Street, Winchester. 1912.
- BUILDING CONSTRUCTION AND DRAWING. By Chas. F. Mitchell. Elementary Course. Eighth edition. B. T. Batsford, 94, High Holborn, W.C. 1911. 35.
- BUILDING CONSTRUCTION. By Chas. F. Mitchell. Advanced Course. Seventh edition. B. T. Batsford, 94, High Holborn, W.C. 1912. 6s.
- STONEWALL JACKSON'S CAMPAIGN IN THE SHENANDOAN VALLEY OF VIRGINIA FROM NOVEMBER 4TH, 1861, TO JUNE 17TH, 1862. By William Allan, formerly Lieut.-Colonel and Chief Ordnance Officer, 2nd Corps, A.N.V. Hugh Rees, Ltd., 5, Regent Street, S.W. 1912. 6s. net.
- ACTIVE SERVICE POCKET-BOOK. By Lieut. Bertrand Stewart, West Kent (Q.O.) Yeomanry. Fifth edition. William Clowes & Sons, Ltd., 23, Cockspur Street. S.W. 1912.
- REINFORCED CONCRETE CONSTRUCTION, Hlustrated, Advanced Course, By M. T. Cantell, LICEN. R.I.B.A. E. & F. Spon, 57, Haymarket, S.W. 128, 6d. net, 138, post free.





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By Major A. T. MOORE, R.E., 1904.

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By Major E. C. OGILVIE, R.E., 1912.

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