THE ROYAL ENGINEERS JOURNAL.

Vol. XVIII. No. 3. SEPTEMBER, 1913

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Elementary Notes on

Wireless Telegraphy.

PAMPHLET.

31 PAGES. **33 ILLUSTRATIONS.**

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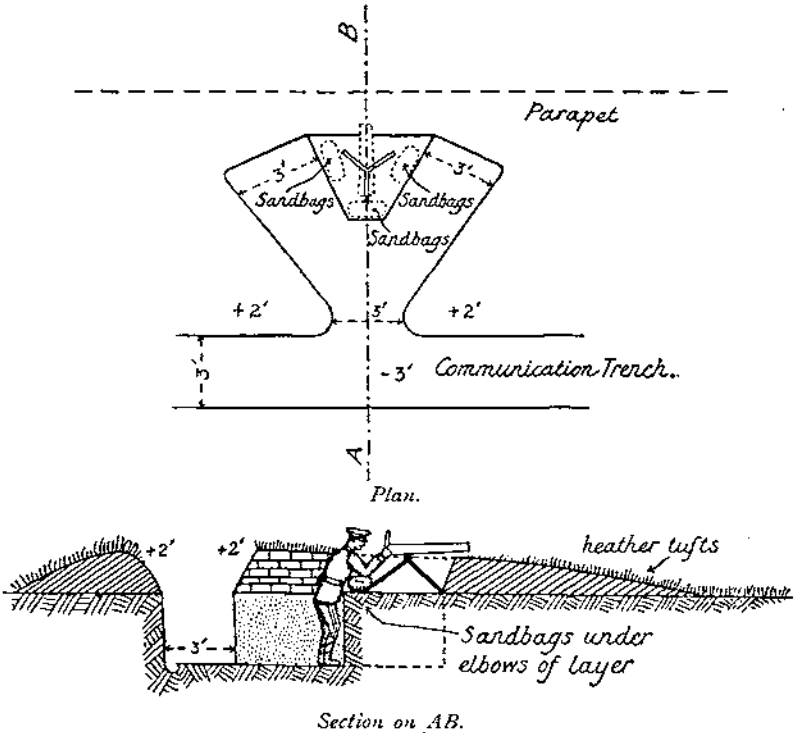
SOME NOTES ON FIELDWORKS.

By MAJOR R. N. HARVEY, D.S.O., R.E.

THE following notes have been compiled from the fieldwork reports of 1912—and will probably prove of interest. For facility of reference they have been divided into four subheads, viz.:—Field Defences, Bridging Expedients, Demolitions and Miscellaneous. Under the last of these are given the results of experiments in sapping, high wire entanglements, etc., as well as some new ideas for alarms and sap shields, and for the use of wire netting for various purposes in defence.

FIELD DEFENCES.

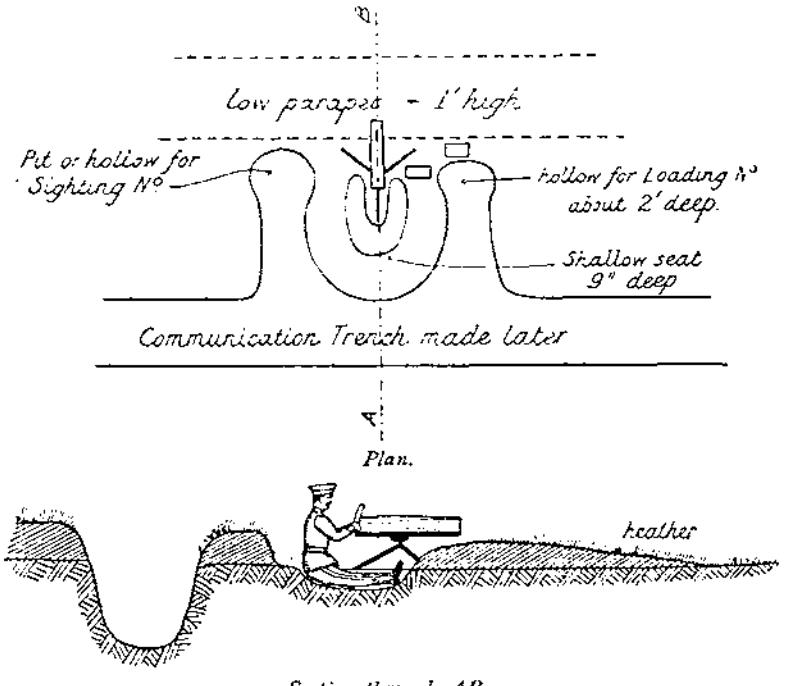
Machine Gun Emplacements.—It has been found that the sandbags supporting the overhead cover in the type of emplacement shown in the *M.F.E.*, 1911, *Plate* 15, *Figs.* 3 and 4, hamper the gun. If the pit is made with a smaller radius of 2 ft., the overhead cover may be supported from the flanks without intermediate support. This has been found satisfactory. Other types made under the direction of the infantry machine gun officers are illustrated in *Figs.* 1 and 2.



Section on AB.

FIG. 1.—*Machine-Gun Emplacement.*

These emplacements depend for protection mostly on concealment, and if once discovered would soon be put out of action.

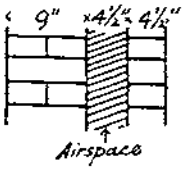


Section through AB.

FIG. 2.—*Machine-Gun Emplacement.*

Loopholes.—In brickwork it has been found that 3-in. external depth as shown in *M.F.E.*, 1911, *Plate* 10, *Fig.* 5, is not sufficient, but should be increased to $4\frac{1}{2}$ in. so that the rifle may be used at ranges over 200 yards. Loopholes in walls of the upper storey of a house should have a depth of 6 in. externally.

Time taken by One Man in Making Loopholes in Walls.—(*a*). Through wall as shown in sketch. With company chisels and hammer, one hour.



(*b*). With mash hammer and 16-in. bricklayers' chisels, 23 minutes.

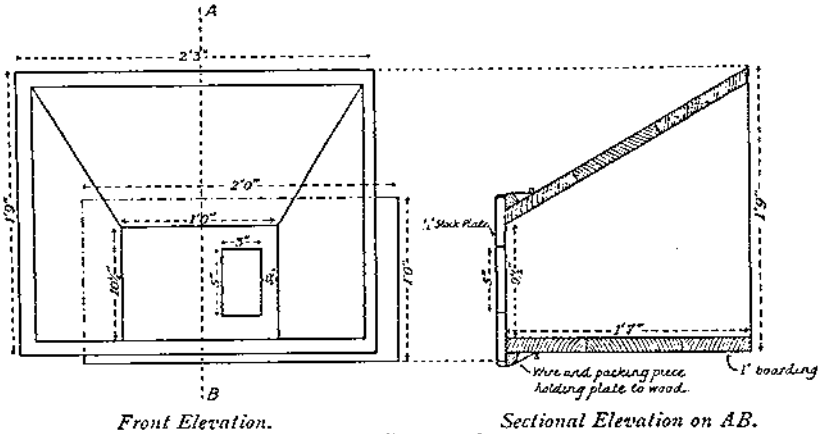
(*c*). Through 9-in. wall with crowbars, 27 minutes.

It is important to note the dimension 3 ft. 3 in. from front of overhead cover to cutting line of trench, and the dimension of 4 in. for height of opening. This latter dimension is certainly a minimum. It is of course important not to increase it unnecessarily, but in some situations 5 in. will be found necessary.

These two dimensions, breadth of head cover 3 ft. 3 in., and 4 in. or 5 in. loophole height, are interdependent; if the former is increased the latter must be increased also. The dimension 3 ft. 3 in. gives fair protection from a long range rifle bullet or shrapnel bullet entering the loophole and falling at 1/4, since, with a 5-in. loophole, a bullet just missing the top of loophole would strike the parapet a few inches in front of the man's hand, and would not reach his head or body. With this dimension (3 ft. 3 in.) it is essential to have the roof covered with hard material such as bricks or shingle, as the bullet would penetrate a foot of earth owing to the steepness of the slope. If earth only is available for the roof, then the dimension 3 ft. 3 in. must be increased to 5 ft. 3 in. and the 5-in. loophole to 8-in.

Two sheets of corrugated iron, 2 ft. 3 in. wide, will suffice for the roof when the dimension from the cutting line of trench to the front of head cover is 3 ft. 3 in., and three sheets will suffice when dimension is 5 ft. 3 in.

A box loophole combined with loophole plate as in *Fig.* 3, has been tried and is considered suitable for siege trenches. It can be placed on the parapet without undue exposure, be easily built round with sandbags, and forms a strong base on which to build a high parapet.



Front Elevation. *Sectional Elevation on AB.*

FIG. 3.—*Box Loophole.*

The device shown in *Fig.* 4 has been found successful for blinding loopholes. It consists of a hurdle covered with sods, pivots about its middle on forked sticks, and can be raised or lowered from inside by means of wires.

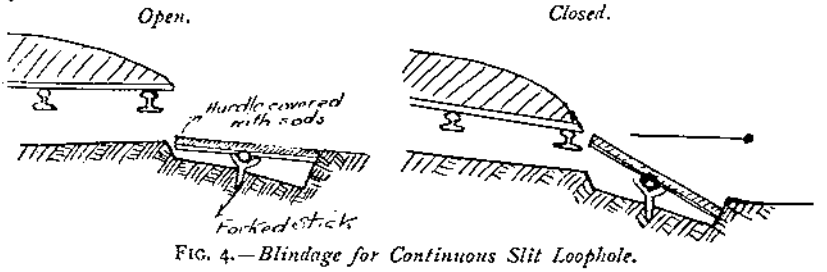


FIG. 4.—*Blindage for Continuous Slit Loophole.*

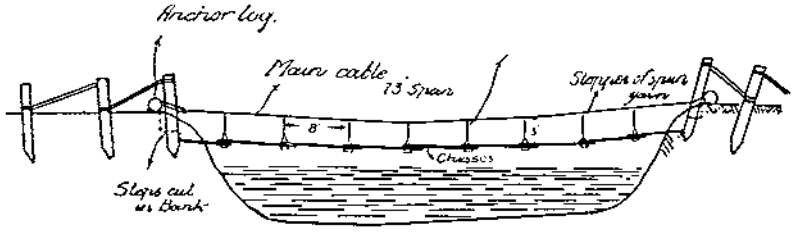
Clearing the Field of Fire for Works Inside and Near the Edge of a Wood.—A definite number of firing positions are selected in the trench, and tapes stretched from these in diverging lines to the edge of the wood. Between these tapes, all branches less than 3-in. diameter are then cut.

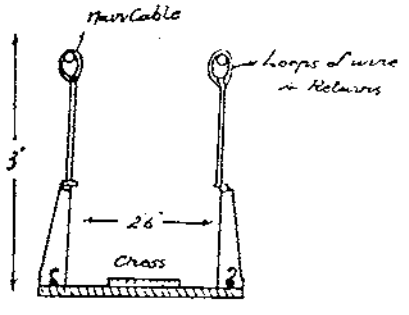
BRIDGING EXPEDIENTS.

Light Suspension Bridge to carry Infantry in Single File at 8-ft. Intervals.—Constructed out of Brennan wire and water-trough standards (*Figs.* 5 and 6).

Light Suspension Bridge of Trough Equipment.

FIG. 5.





End Elevation showing detail of standard used as slings.

FIG. 6.

Cables :—Five strands of Brennan wire twisted together.
Anchorages :—Anchor logs behind picket holdfasts.
Slings and transoms :—Trough standards and sills.
Roadway :—Bridging planks laid lengthways and lashed to sills.
Dip :—After loading with eight men in centre 30 in. per 20-ft. span.
Time.—Twelve men, one hour, stores being available on the spot.

Portable Suspension Bridge.—Constructed out of Brennan wire and gabion pickets (*Figs.* 7 and 8). Span 72 ft. Weight of bridge when rolled up, 200 lbs. Time to erect :—12 mins. 10 secs., the bridge being rolled up in wagon with all necessary stores.

Brennan Wire Suspension Bridge.

FIG. 7.

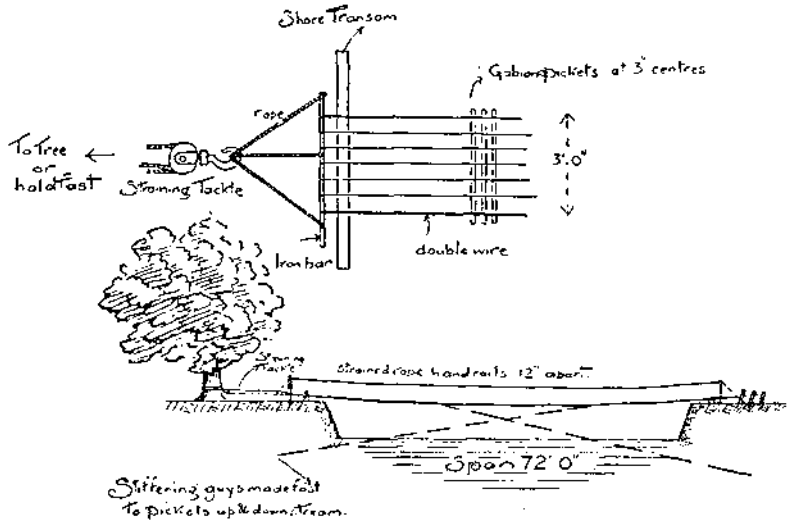


FIG. 8.

Light Bridge with Field Company Equipment.—Gap 85 ft. over water. Rate 8 mins. per 6-ft. bay.

Light Pile Bridge for Infantry in File.—Piles 4 in. by 4 in. Transoms 7 in. by 1½ in. Rate 15 mins. per 6-ft. bay.

Boat Made of Brushwood and Tarpaulin Wagon Cover, held four men sitting down (*Fig.* 9).

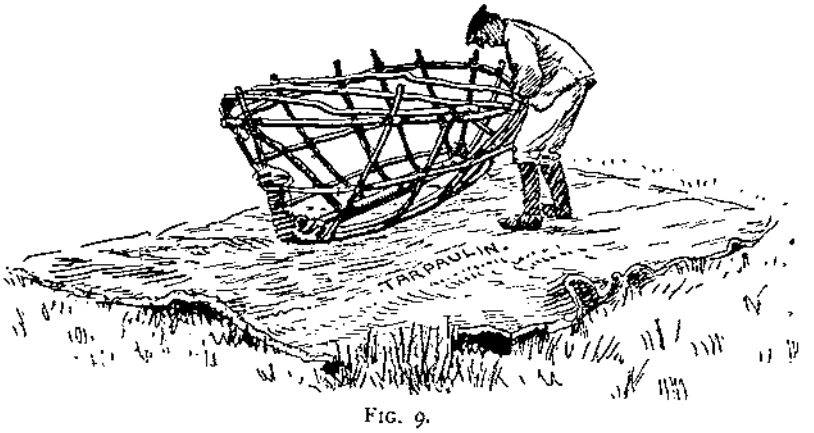


FIG. 9.

Boat Constructed Out of Trough Equipment (*Figs.* 10 and 11).—This boat can be made by four men in half an hour. It will hold nine men and with this load draws 4 in. of water.

Stores used:—Five trough standards, one trough, 12 sandbags, spun yarn, two spars 18 ft. by 3 in., four banneroles, four 1-in. lashings, five pick helves.

Light Boat of Trough Equipment.

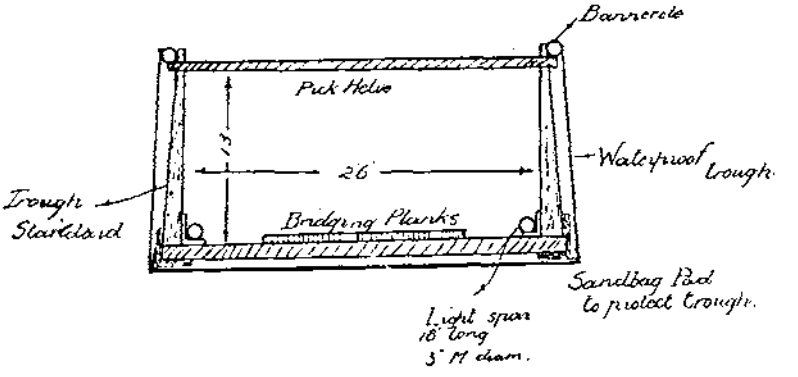


FIG. 10.—*Section.*

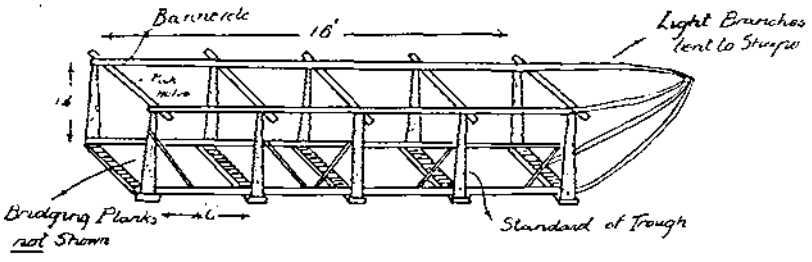


FIG. 11.—*Framework of Boat.*

Raft Made with Brushwood and Tarpaulin.—To hold 16 men (*Figs.* 12 and 13). In making the raft the tarpaulin is laid over a pit, 9 in. deep and the brushwood is placed across the pit, the lower layers with the butts in pit and the upper layers with the butts outside.

Brushwood and Tarpaulin Raft.

FIG. 12.

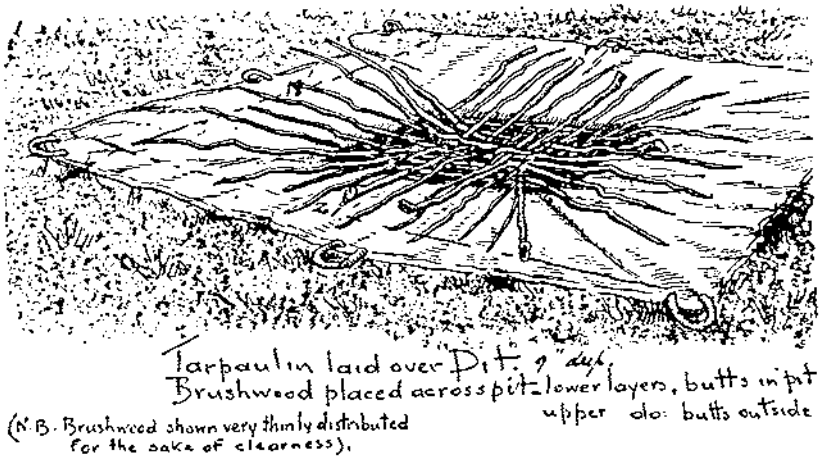


Fig. 13.—Raft afloat.
The above raft held 16 men.

Getting a Line across a River.—An otter has been found to work only in an even current; thus in the Mohmand Expedition in 1908 across the Cabul River, a distance of 200 yards with maximum current of 6 miles an hour, an otter was got across successfully at the first attempt; but with the Abor Expeditionary Force, 1911–12, across the Dehang River which kept boiling up in eddies, it was impossible to get the otter across.

Signal rockets may be used for this purpose. The 1-lb. signal rocket fired at an angle of 45 degrees elevation will carry a tracing line across a gap of 100 yards. Great care must be taken to lay out the line directly behind the rocket and at right angles to the direction in which it is to travel, as shown in *Fig.* 14. As the back fire of the rocket may burn the end of the line a length of wire about 6 ft. long should be made first to the roof of the rocket and the stick and to this wire the line should be made fast.

The rocket and stick should be laid in a wooden trough.

Night Bridging.—A medium bridge, of two pontoons and two trestles was made in 1 hour 25 minutes. Trestles, ready made on either side of gap 84 ft. wide. Time taken 3 hours.

An Extemporized Catamaran Bridge for infantry in single file was made over a gap 160 ft. wide with level banks. With labour and material handy the time taken was 1½ hours.

Method of Launching Weldon Trestle.—Two trestles have been launched from a raft of two pontoons at the same time by launching one from a cantilever made of two ribands, and by upending the other on the baulks between the two pontoons and allowing the legs to drop. The transom of the latter trestle is then raised, the baulks taken out and the pontoons floated clear.

Improvised Capstan.—Two capstans have been improvised suc-

NOTES ON FIELDWORKS

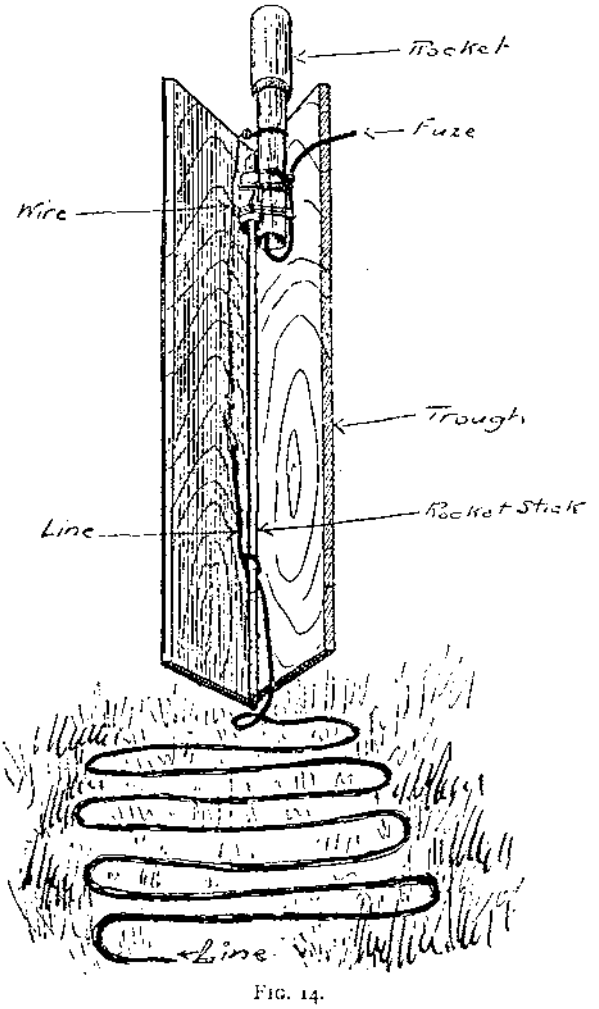


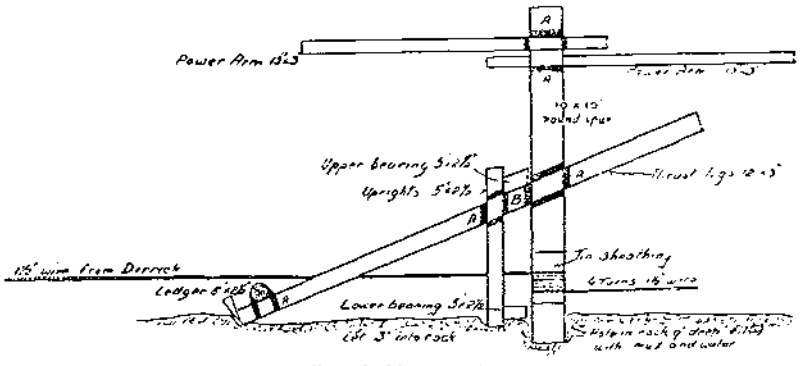
FIG. 14.

cessfully to work in connection with two swinging derricks, one with $1\frac{1}{2}$-in. wire rope, the other with 3-in. hemp rope. They gave a power of approximately 24 to 1, two men with ease lifting three 15-ft. by 10-in. spars; the capstan winding the wire gear to the derrick was in continual use for a week without giving any trouble (*Fig.* 15).

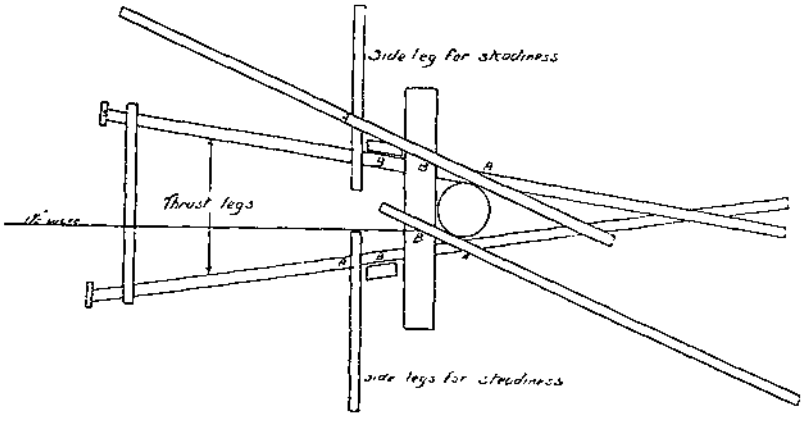
Method of Tightening Main Cables of Suspension Bridges.—*Fig.* 16 shows a new method of fixing a block to the cable which has been tried and found successful.

Method of Making a Cable from Wire.—In order to lay up the rope evenly so that each strand will take its proper share of the strain, the selection of the number of wires is important.

Figs. 17 and 18 show, (1) that three strands of any gauge wire will lay up evenly, and (2) that six strands will lay evenly round a centre wire run straight. This latter 7-strand cable can be enlarged by adding successive layers of 12, 18, 24, and 30 wires making respectively 19-strand, 37-strand, 61-strand, and 91-strand cable.



Elevation.



Plan.

FIG. 15.—*Improvised Capstan.*

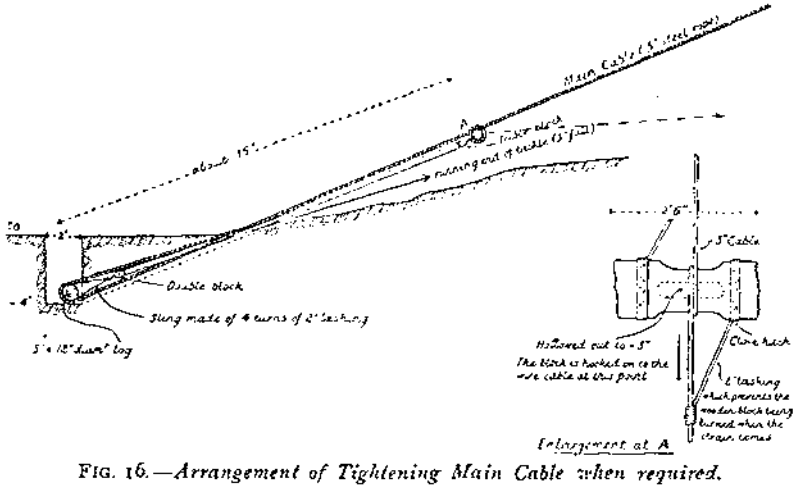


FIG. 16.—*Arrangement of Tightening Main Cable when required.*

Making Wire Rope in the Field.

FIG. 20.

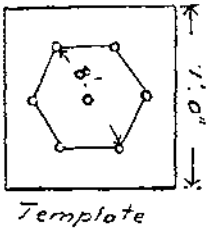


FIG. 17.

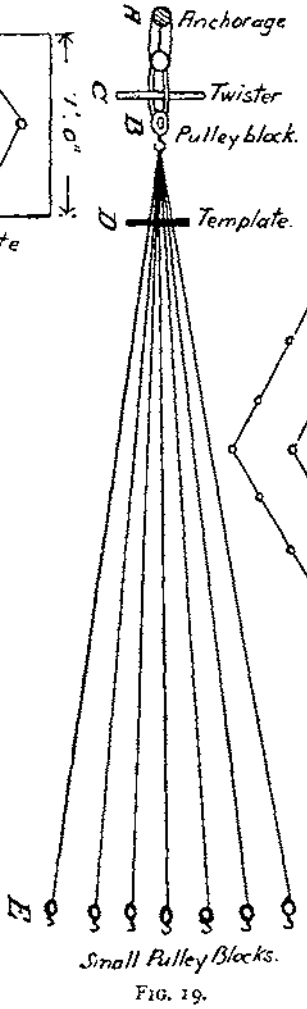


FIG. 19.

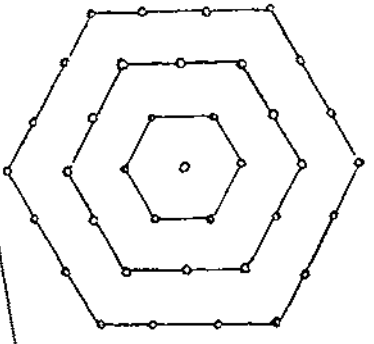


FIG. 21.

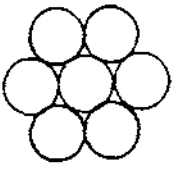


FIG. 18.

The following method of making the cable has given good results:

An anchorage " A " is set up, and a pulley block " B " and a picket " C" 3 ft. or 4 ft. long is attached to it (*Fig.* 19). One end of each wire is attached to one of the small pulley blocks " E," and the other end is passed through the template D and made fast to the block B. The template D (*Fig.* 20) can readily be made out of a square foot of 1-in. wood, hard wood being preferable. The holes should be bored symmetrically in the shape of a hexagon, and on a circle of about 8-in. diameter, with one hole in the centre for the core wire. The pulley blocks E are each held by one man, who lays back on his wire to keep an even strain on it. The slackening of any wire during the process of twisting, will at once produce an uneven rope.

The men should be from two to five paces apart according to the length of rope to be made.

Two men twist on the picket C, and two men hold the template at right angles to the centre wire, about 18 in. from where the wires come together. The swivels of the pulley blocks E should be well oiled so that the twist in each wire may be taken out, the men occasionally giving the blocks a turn to make certain that this is done. This is particularly necessary in the case of the centre wire.

By using alternate holes and omitting the centre hole, the same template can be used to lay up three wires together.

For a 19-strand or 27-strand cable a larger template must be used as shown in *Fig.* 21. The practical difficulty of finding enough pulley blocks or a big enough template will usually preclude the laying up of more than a 19-strand cable in one operation, and in this case the third layer may be put on separately. The same difficulty will usually limit the number of layers to three, but a larger cable can be made by laying up 3-strand or 7-strand cables instead of single wires. In this case, there is more waste of material, as in calculating the breaking strain on the finished cable, the centre core must be omitted. In larger cables, however, old hemp rope or some other material may be found for the centre core.

The following is a summary of the cables that can be made up:—

No. of Strands.	Method of Laying Up.	Breaking Strain. X = Breaking Strain of Single Strand.
3	Twisted together without centre core ..	3X
7	Six strands laid up round centre core	6X
19	18 strands laid up round centre core in two layers	18X
21	6 3-strand cables laid up round a centre 3-strand core	18X
37	18 strands laid up round a 19-strand cable ..	36X
49	6 7-strand laid round a 7-strand	42X
57	18 3-strand laid up round a centre 3-strand ..	54X
61	24 wires laid round a 37-strand	60X

Etc.

Demolitions.

Demolition of Two Old M.L. Guns (*Fig.* 22).—The charges could

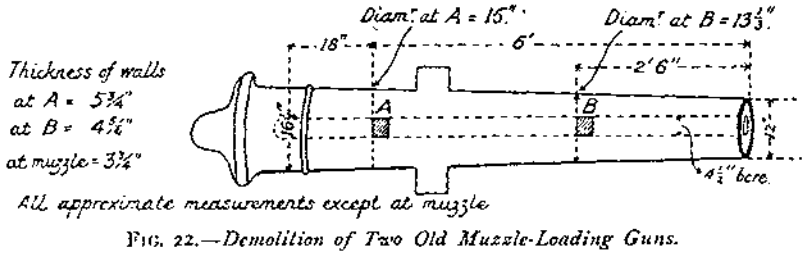


Fig. 22.—*Demolition of Two Old Muzzle-Loading Guns.*

not be placed in the bore owing to obstructions in the bore which could not be cleared, and to the danger of using force to push down the charge.

Charges used :—

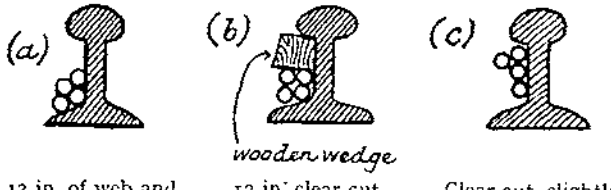
No. 1 Gun at A 1¾ lbs. wet G.C.
No. 2 Gun at B 2 lbs. dry G.C. (primers).

Results :—

No. 1 Gun. Blown into large pieces, which were not thrown far.
No. 2 Gun. Violent explosion, fragments thrown 300 yards in a direction at right angles to the axis of the gun.

Tree Felling.—A large fir tree has been felled in a given direction (to block a road) as follows:—Two side guys attached at right angles to line of fall. One back guy, about 6 ft. above base, loosely tied behind. Diameter of tree 23 in. Book charge, for soft wood, 12 oz. dynamite. Actually used, 14 oz. dynamite, in two 1-in. auger holes 18 in. deep connected by another hole at right angles. A slight pull on the foreguy brought the tree down in the required direction.

Rails.—Using charges as shown below for 60-lb. flat-footed rails laid in track on wooden sleepers, the following results have been obtained :—



12 in. of web and bottom flange cut. | 12 in. clear cut. | Clear cut, slightly better than in (*b*).

Charges in each case :—Four cartridges (8 ozs.) of dynamite.

(*d*). With 10 ozs. dynamite against the webs of the rails of an unfished joint—5 in. to 6 in. broken off each rail.

(*e*). With 1½ lbs. gun cotton against a complete fished-up joint—the two rails bent a maximum of 3 in. out of the line.

(*f*). With half a slab (¾ lbs.) gun cotton placed in *M.F.E., Plate* 63—rail not cut.

With 40-lb. rails, 12 cuts have been made by charges of ⅛ slab of gun cotton, fired by 1-oz. dry primer, only one failure occurring where the top flange had not been cut.

Small Steel Girder.—The calculated charge being ¼ lb. gun cotton, four 1-oz. primers, placed as shown below, have been tried, the result was a failure, the web being only bent, and with one puncture in it, thus proving that the primers only acted along their line of contact.

Steel Axle.—A 2-in. mild steel axle, having resisted several previous charges, has been broken by 1 lb. dynamite placed as in *Fig.* 23, to give maximum shear. This method has also been tried on a bolt rail, and though the shattering effect was spread over 2 ft., the rail was not so completely broken as when the charge was concentrated.

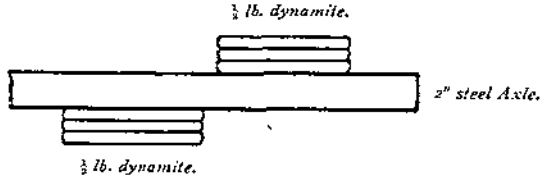


FIG. 23.

Masonry Piers.—To demolish thick masonry piers, both sides of which are open to attack, a great economy in gun cotton is effected by considering the pier half the thickness, applying the charge on both sides, and firing simultaneously. This has been found quite as effective as the usual and more costly method.

Letting off Mines under Trains.—The following methods have been tried of automatically letting off mines under trains :—

1. A No. 8 Detonator, placed on the rail or protruding vertically at a joint ; this usually fails under slowly moving trains.
2. A commercial cap gave a similar result.
3. Six non-safety match heads inserted in the split end of instantaneous fuze, enclosed in small waterproof covering and laid on the rails. This was found to be the best mechanical method, 70 per cent. of the tests being successful.
4. Electrical as shown in *Fig.* 24, the contact being made by the deflection of the rail, and being adjustable so as to admit the passage of a trolley, but not of a train.

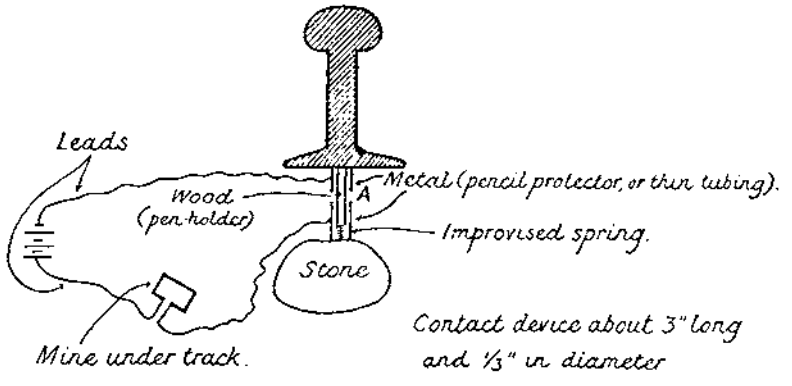


FIG. 24.—*Electric Contact Mine under Train.*

Austrian Fuze.—This has been found to work well with a commercial cap, but cannot be used with a No. 8, Mark IV., Detonator.

Failure of Two G.C. Primers to Detonate.—The cause of this failure has not been ascertained. All the other primers in the tin detonated properly. Both primers were blown to pieces by the detonator, and in one case the charge as well, but in the other it remained whole.

Failure of Gunpowder Demolition.—To demolish a masonry wall, eight charges of 12½ lbs. of gunpowder each were connected up in series and fired electrically. The charges were at 3-ft. intervals and tamped. Two only of the eight charges exploded, and these two had their *electric fuzes still intact* though the heat had burnt the paint off them. All the fuzes were dug up and tested for continuity, and did not show any signs of disconnection, and they were afterwards fired successfully. One fuze was found with the leads touching, thus short-circuiting that charge but this does not account for the failure of the whole circuit. No reason has been found for this or for the explosion of the two charges, which left their fuzes intact.

MISCELLANEOUS.

Sapping.—The difficulty of removing earth from a deep sap about 50 yards in wheelbarrows in wet soil has been overcome by converting the wheelbarrows into handbarrows as follows:—

The top of the barrow is taken off, and slings are attached with loops projecting over the sides. The earth is pitched direct into the barrows at the sap head, and two bamboos are placed through the loops for carrying purposes. Handbarrows can thus pass one another in the sap where wheelbarrows cannot do so.

Rates of work:—

Deep sap with wheelbarrows 5 ft. in 4 hours.
With handbarrows 6 ft. in 3½ hours.
Shallow sap 4 ft. in 1 hour.

Drainage of Saps.—To facilitate the drainage of a sap which continually filled with water, sumps, as shown in *Fig.* 25, have been constructed out of two branch gallery mining cases, and the water pumped out of these periodically.

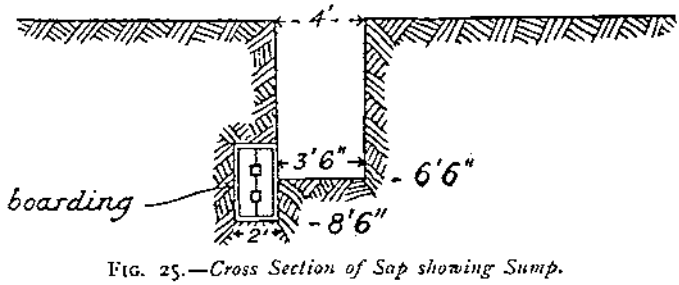


FIG. 25.—*Cross Section of Sap showing Sump.*

Trip Wires and Alarms.—*Fig.* 26 shows a type of electric alarm which has been found successful. A bell and battery are taken from a house and connected as shown; the bell placed in the defender's trench being muffled so that the enemy will not know when the alarm is given. It is a simple alarm, not easily discovered, and acts when any of the wires in the fence are either pulled or cut. *Fig.* 27 shows another type of alarm which has been found successful.

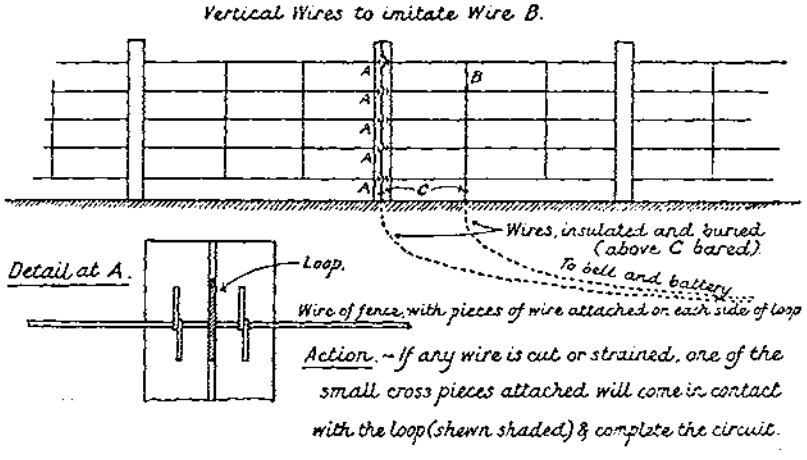
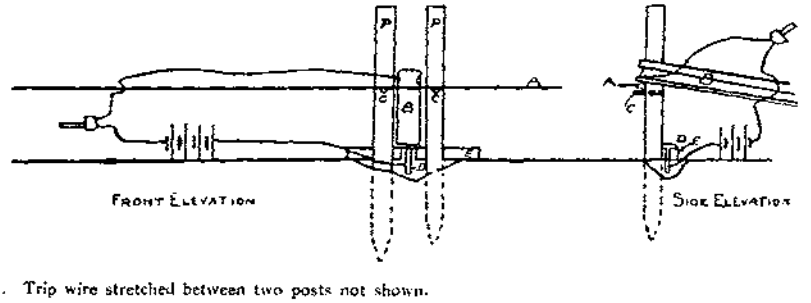


FIG. 26.—*Electric Alarm.*



A. Trip wire stretched between two posts not shown.

B. Rail resting on A held up on two pins C (made of short lengths of wire) driven into posts P, which act as guides.

D. Spike resting on a block of wood E bored to allow the shank to pass through.

Action.—If the wire is *cut*, B is allowed to fall and strike D, thus completing the electrical circuit. If the wire is kicked it falls off the pins C and allows the end of B to clear the trip wire, and so to fall.

FIG. 27.

High Wire Entanglement.—Stout posts 6 in. in diameter, have been driven by four men working on a hand monkey weighing 100 lbs. (*Fig.* 28). Two men hold the crowbar, which is let into the first

9 in., in position with ropes; and the other two lift the monkey, standing on two light 4-legged trestles to do so. A few turns of wire are put round the top of the posts to prevent them splitting. Time in ordinary soil about five minutes.

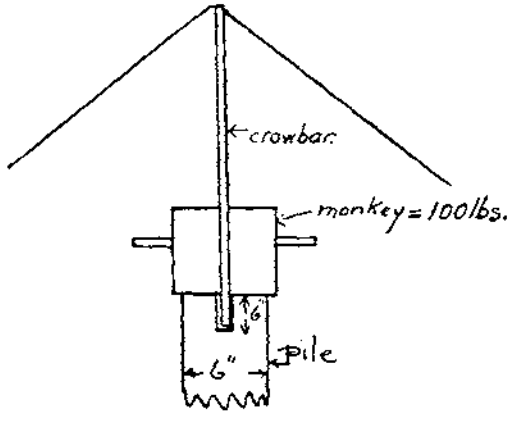


FIG. 28.

Reaching an Obstacle under Cover, or concealed from the defenders. The following methods have been tried. A man covered with bushes and heather tied on to him was able to crawl very slowly to some abatis without being noticed by the defenders. He could then have fired the abatis. A shield as shown in *Figs.* 29 and 30, which can be passed up to the advance trench, and put together there, was pushed out from the trench by a sapper up to the obstacle. One criticism against this is that the wheels might be shot away by rifle bullets, and the shield collapse before the obstacle is reached.

Experiment in Demolishing a House.—The building in question was a very old wooden hut of the ordinary type, single storey, wood floor, and clap-boarding sides, built on brick footings. The roof was wood covered with tarred felt. The timber was cleared about 100 yards from site. The cube of building was about 36,000 cubic feet.

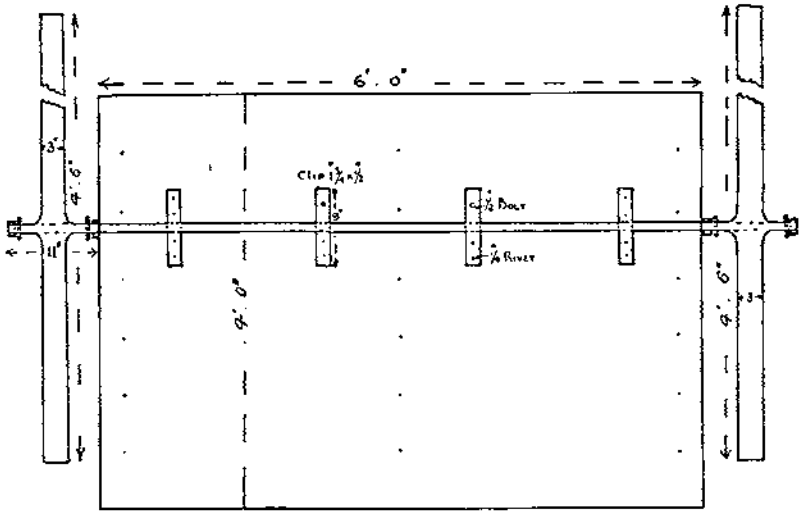
Time and labour=900 man-hours. Rate 40 cubic feet per man-hour.

Visibility of Troops Digging in Dry Soil.—The presence of troops digging in dry soil has been given away at distances from 2 to 5 miles by dust from shovelfuls of earth falling upon the parapet. At night, sparks in stony ground were very visible.

Making Communications inside Buildings.—Using two hammers, three men were able to break an aperture of 2 ft. 6 in. by 2 ft. 6 in. through a 9-in. wall in 45 minutes.

Sap Shield.

FIG. 29.



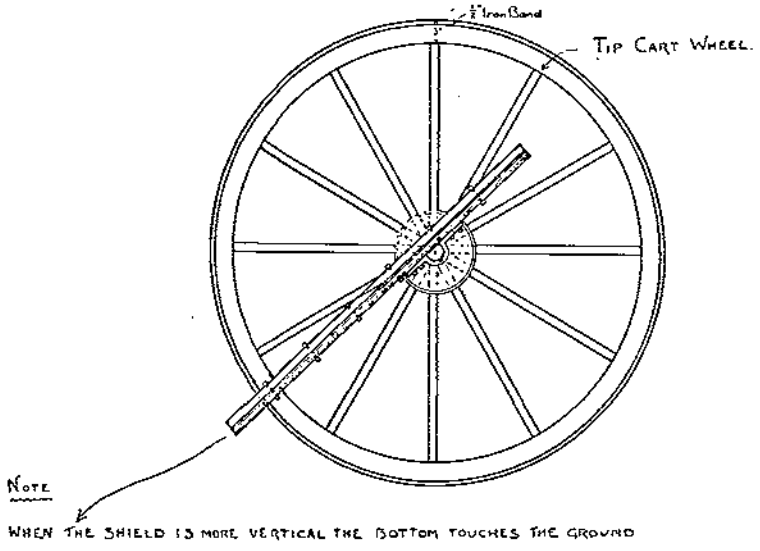


FIG. 30.

Use of Wire Netting.—Wire netting of 1-in. mesh, 3 ft. wide, and weighing 21 lbs. per 50 yards, has been used for the following purposes:—

(*a*). As a screen for guns, etc., to conceal them from view from an aeroplane.

(*b*). As a screen to conceal the movement of troops from an enemy's view.

(NOTE.—In each of the above cases furze or other material was twisted into the meshes of the netting, the materials varying with the background).

(*c*). As a revetment for earth.

(*d*). As a fence to keep animals away from sources of water supply.

(*e*). As an obstacle.

(*f*). In sheets 6 ft. long as ways for crossing wire entanglements; described in Part I., *Field Defences.*

AERIAL RECONNAISSANCE, ITS POSSIBLE EFFECT ON STRATEGY AND TACTICS.

(*Extracts from a Lecture given by* CAPT. W. A. DE C. KING, R.E., *at Devonport on 23rd January*, 1913).

AERIAL Reconnaissance may be either strategical or tactical, and it is proposed in the following notes to consider it principally under these two heads.

Turning first to Strategical Reconnaissance it is evident that the work should be carried out either by powerful dirigibles or by aeroplanes carrying guns for protection. When a long over-sea journey has to be made a dirigible would seem to be absolutely necessary as it can take advantage of favourable winds and wireless telegraphy will enable the information to be sent back, so that a speedy return is not essential. When both forces are close to one another, it may be preferable to use an aeroplane. For a medium journey, the question as to whether an aeroplane or an airship should be used will be settled when wireless is installed in the aeroplane; at present the aeroplane has to return in order to deliver its message, whilst the dirigible can send it back by wireless, and this is naturally a very important consideration. The value of information obtained depends upon the rapidity with which it can be delivered.

Tactical Reconnaissance on the other hand may be carried out either with airships, aeroplanes, captive balloons or kites.

Aircraft can carry out protective reconnaissance, and it would appear that, when the forces are not in contact, an aerial reconnaissance carried out before nightfall will be of incalculable service to a force on the march. At night, however, cavalry cannot be superseded, and this arm must be used when the forces are in contact. Captive balloons and kites, in the absence of aeroplanes, could be used with an advanced guard.

The question of the service of intercommunication is a very important one, and it must be remembered that there may be a lack of telephone or telegraph lines, wireless messages may be blurred by interference, and existing lines may be damaged.

A single-seated aeroplane of the swiftest type would evidently be most suitable for such work, but it must concentrate its attention on speed and cannot afford to fight. In the Russo-Japanese War, at the Battle of the Yalu, the failure to let the Russian commander

know the state of affairs on his left flank, viz. of the retreat in a wrong direction, contributed to his defeat. Messages were sent, but in one case the messenger was drowned and in the other the message was delivered $3\frac{3}{4}$ hours after its despatch.

Aerial reconnaissance can also be of great use for topographical work.

Although it appears to be a popular idea that an observer in an aeroplane or airship can see every thing for miles round, this is only possible in very open country. In England troops can easily be screened by hedges, etc., and it is evident therefore that, in a straight flight between two points, an observer cannot discover troops at any great distance on his flanks. This means that it is almost necessary to reconnoitre every main road, and one observer cannot possibly be expected to scour a large area in a short time.

Observers should always be given very definite orders and should be familiar with the different march formations, vehicles, guns, etc. There is consequently no limit to their technical and tactical preparation. An observer, to be of real use, must have plenty of practice in reconnoitring from aircraft, and, at a good height, a novice will take some time to find his bearings, etc. One way of practising such reconnoitring is by observation from free balloons as it is thus possible to get long runs at high altitudes.

As compared with the other arms the use to which aerial reconnaissance may be put is as follows :—

Cavalry.—It is accepted that it would be possible to carry out in about four hours an aerial reconnaissance which would take officers' patrols, sent out from the strategic cavalry, at least three days, while the prospect of acquiring the information by the patrols would be less. A popular idea is that aerial reconnaissance will do away with the necessity for the employment of cavalry in reconnaissance, but this is of course an entirely mistaken one. Various reasons have been put forward why cavalry cannot be replaced by aircraft for reconnaissance work; for instance the impossibility of flying in very bad weather, or of seeing in foggy weather or at night. But without doubt this arm may possibly be relieved to some extent of the duty of providing for long distance patrols.

Surprise in war is a great factor; to lead an enemy to believe that there are troops where none exist, or *vice versâ*, is to gain an advantage. Aerial reconnaissance will render this surprise very problematical and bluff will no longer be possible or at least much more difficult. In the Russo-Japanese War the Japanese screened their movements with a force of all three arms and the Russian cavalry were unable to penetrate this screen. It is likely therefore that this method will be adopted in the future.

To obtain reliable information cavalry must fight; to screen a large force it must be spread over a large front, which means con-

centration on the one hand and dispersion on the other. It also keeps touch with the enemy by day and night, but it has less chance of finding the enemy's masses.

It is laid down in *Cavalry Training*, 1912, that it will depend mainly upon the general situation and the strategical object in view, whether the greater part of the cavalry is employed in the first instance upon protective or other duties, and that, if the first consideration is to obtain accurate information, the commander will usually send forward as strong a body of cavalry as possible for reconnaissance. On the other hand, if the first consideration is to cover one's movements, the greater part of the force will be employed on protective duty. Surely by means of aeroplanes it will be possible to economize as regards protection and reconnaissance, and so increase the strength of the independent cavalry.

Artillery.—The question of aerial reconnaissance in connection with artillery is a most important one.

It will be necessary to attack aircraft from the ground as well as from the air, and the units of an aerial fleet should be armed so as to take the offensive; in fact there should be "destroyers" and "scouts." It is considered by some that it will be impossible to hit an aeroplane travelling at a high speed, but the experience gained in Tripoli and the Balkans seems to prove the contrary. An aviator at Adrianople stated that once, when at an altitude of over 4,000 ft., he was fired at, the shell passed above him and burst, but, owing to the speed the machine was travelling, he cleared the fragments; the trail of the gun had been sunk in a pit.

Constantin was shot whilst making a flight before the Chatalja lines, and was found dead beside his machine. The wings of the biplane had also been hit, although the barograph registered 3,965 ft.

Petroff is reported to have stated that he had been flying regularly twice a day over Adrianople, and on two occasions shrapnel burst close to his machine when he was flying at a height of about 3,500 ft. He said that he usually flew at about 4,000 ft., and at that height he was fairly safe, but if he descended the least bit lower the shells became annoying. One day a shell burst just above his aeroplane.

Effimoff, another aviator, is reported to have said that when above Fort Karagach at a height of over 4,000 ft., four bullets hit his aeroplane, and it was also struck by splinters of shell.

In Tripoli an Italian airship used to pay visits to Azizieh and drop bombs. The Turks tried a mountain gun but with no effect. They then obtained a 9-c.m. Krupp, which they mounted specially and it is reported that on the next appearance of the airship, the gun being fired when it was above it, the airship immediately rose rapidly, sailed off to Tripoli and never returned.

It does not seem reasonable to expect that hostile aircraft can be destroyed or driven away by armed aircraft only. The artillery

must also assist, and to be of use it should be provided with some sort of automatic sight.

The impossibility of doing without the aid of artillery can easily be realized when we consider that a swift destroyer will arrive four minutes after it has been sighted. Can it be expected that destroyers will be continually patrolling and in sufficient numbers to meet such an attack, or that one on the ground will be capable of ascending in time to prevent it? Again, what will happen if the enemy has obtained a local command of the air?

The enemy may take advantage during a gale to despatch with the wind a powerful airship to discover some important move, for it will be in bad weather that such moves will probably be made. The report can be sent back by wireless. Our aeroplanes will probably not be able to manœuvre in the gale, consequently we must rely on our guns.

Aeroplanes and airships will be most useful to artillery in finding targets, and, although they will be able to report the general result of the fire, they will not be as useful as captive balloons and kites for observation, as the observer in a captive balloon or kite can be in direct telephonic communication with the battery commander. In the Italo-Turkish War, it is reported that the Italian artillery with the help of an aeroplane, flown by Capt. Moizo, succeeded in locating the position of the Turkish artillery, and "opened a violent fire which the aeroplane reported as correct and efficacious." At the Battle of Sciara Sciat on 26th October, it is reported that two aeroplanes directed the firing of the mountain artillery and also that of the battleship *Carlo Alberto*.

The following is reported to be the first official communication by the Italians in regard to the use of aeroplanes, dated November 5th, from Tripoli:—"Yesterday Capts. Moizo, Piazza, and De Rada carried out an aeroplane reconnaissance, De Rada successfully trying a new Farman military biplane. Moizo, after having located the position of the enemy's battery, flew over Ain Zara and dropped two bombs into the Arab encampment."

At the Battle of Mukden, the Russians bombarded for several hours a hill where a Japanese battery had been sited the day before; they eventually sent up a balloon and found their mistake, the battery having been withdrawn the previous evening! Every round had been wasted. At an attack in the vicinity of Mukden, a Japanese battalion marched up a hollow road to the north, where it remained under cover; the Russian batteries shortly shelled the spot where it was lying concealed, and it had evidently been discovered by the Russian captive balloon which ascended about half an hour before.

It will of course be necessary to make special arrangements when aircraft are carrying out any special work in connection with artillery. For instance, it will not be possible for an observer to

correct the fire of a battery if several batteries are firing at once. If an observer is required to observe individual shots he must be connected by telephone to the battery commander, and a captive balloon or a kite only can therefore be used for this purpose. On the other hand aircraft could if necessary indicate hidden targets to several batteries.

Infantry.—A commander may place great reliance on his aircraft, and keep his troops concentrated at important strategical points or railway junctions until required. He could then move them to the desired points by rail if possible, thereby increasing the fighting power of the troops by saving them from fatigue of continual marching. Another point to consider is what would be the least conspicuous formation for the approach to the battlefield?

Infantry would do well to hug the hedgerows whenever possible whilst on the march and when moving forward to the attack. It is possible that it may have to adopt some method of rapid extension from single file, as troops in extended order are difficult to see.

Troops on the march, on the approach of aircraft, would do well to scatter to the sides of the road and remain still. They must remember that it is very easy to pick out a road, as it appears more or less white against the fields, and that a column immediately attracts the eye.

Convoys, etc., when halting, should draw up close behind, or in a wood, as there will be less chance of their being observed if they are close up behind trees, even though the aviator crosses them; guns and limbers at regular distances and in a straight line are easily picked up.

As regards the possible offensive action of aircraft dropping bombs on the troops in defence whilst the final infantry attack is taking place, it appears probable that at this stage of the attack aircraft armed with machine guns could support the infantry especially after the supporting artillery had ceased to fire.

Advantage will often be taken of darkness and inclement weather to carry out important moves, and night marches will probably be the rule in future.

Suppose a commander's plan to have been disclosed to the enemy as the result of an aerial reconnaissance, he will attempt to upset his opponent's plan by moving his troops during the night. Camp fires may have to be abolished, although fires may be lit to deceive the enemy—a ruse successfully used by the Boers when fighting the Basutos some years ago. For this reason travelling kitchens will be a necessity.

If in the Russo-Japanese War the Russians had possessed aircraft at Telissu, the march of the 4th Division would certainly have been discovered. It was undoubtedly the action of this division that resulted in the defeat of the Russians who had no idea of its where-

abouts. The Russian cavalry stated that they did report its arrival; but the actual fact appears to have been that, owing to lack of sun, the heliograph message did not get through.

It has been recorded that at Liao Yang a captive balloon was used with success by the Russians, and that it was possible to discover from it the Japanese guns even though hidden in the high millet.

If both armies, during the Russo-Japanese Campaign, had had recourse to aviation, it is possible that the operations might have been entirely altered. It has even been suggested that the Battle of Liao Yang might never have taken place.

During the war in the Balkans, a Turkish aviator on one occasion carried out a most useful reconnaissance along the whole front of the Chatalja lines. It had been reported that Derkos had been taken, a very serious matter for the Turks, as in that event the Bulgarians would probably have got through to Constantinople. The aeroplane reconnaissance, however, showed that far from the place having fallen, the Bulgarians had been repulsed in that quarter. It has been very truly stated that information is the groundwork of a sound plan. A commander may have to support his cavalry with a considerable force of infantry and artillery when the opposing armies are close to one another. The infantry will then have to fight to obtain the required information. But by means of aerial reconnaissance it will be possible to obtain reliable information, thus relieving the infantry, and avoiding the extra marching which the "Fog of War" so often entails. Less marching means more rest, the result obtained may have far-reaching effects.

Sieges.—It is very doubtful whether the aircraft of the besieged would be able to compete with that of the besieger, as they would have to ascend from a confined space, and would be the centre of a circle of hostile artillery and aircraft. But communication between a besieged fortress and the outer world could, no doubt, be kept up by means of aircraft.

The besieger, moreover, until he had obtained command of the air, would be forced to have his main standing camps and depôts well out of range of the guns which would otherwise be directed upon them. The Japanese at Port Arthur were able to conceal their camps well within range of the Russian guns, as there were no balloons in Port Arthur.

The Russo-Japanese War gives yet another example of what might have been done with a captive balloon. In order to destroy the fleet in Port Arthur, the Japanese had to take 203-Metre Hill, which was required as an observation station, at a loss of thousands of men. With the aid of one captive balloon a mile or two in rear of their guns, they could have shelled the ships in harbour without this hill and would thus have saved the great loss they suffered.

At the commencement the Japanese had a balloon at Port Arthur, and it is difficult to understand why it was not tried. On the capture of Namako yama, a hill close to 203-Metre Hill, a valuable point was gained from which to direct their fire against the Russian war vessels. Thinking that there was no further need for their balloon, the Japanese despatched it to the north. The warships generally suffered from the 11-in. howitzer shells; but by collecting in the basin and as close as possible to the south end of Quail Hill, some of the larger ones managed to escape observation to a certain extent. It was therefore considered necessary to take 203-Metre Hill.

Finally it may be possible to carry out firing at night as the aircraft could approach unseen, whilst ships lying at anchor in harbour on a moonlight night could, I think, be easily seen. Also aircraft could drop bombs into a fortress, and this was done frequently at Adrianople causing considerable annoyance.

Savage Warfare.—It may be assumed that there will be neither artillery nor long range rifle fire to contend with in savage warfare. In tropical Africa where the forest is very dense, villages are built in clearings and are connected by narrow tracks. All natives usually adopt the same tactics by erecting stockades across paths close to the villages. Small dirigibles might be used to carry out a reconnaissance, and if considered advisable drop incendiary bombs which would quickly destroy the villages, but aeroplanes could not possibly be used in dense bush as they would have no place to ascend from. For this reason it would be useless to expect any reconnaissance work in the dense forest other than that already described, except where good broad tracks exist.

In a desert country, and also where the thorn bush exists, aircraft would be of great service; in some bush countries, when it may be impossible on the ground to see more than 100 yards ahead, the aerial observer would be able to see quite clearly, as the small thorn trees are not close enough to give cover from above. In such country aeroplanes could, of course, be used.

It is reported that, in Tripoli, the engines suffered from the sand, but the French appear to have used a captive balloon for protective duty in Morocco, with great success.

Finally, the following is a short summary of the conclusions at which we may arrive:—

1. Undoubtedly aerial reconnaissance will have an important influence on strategy and tactics.

2. The independent cavalry will more frequently be liberated from reconnaissance work, and will consequently be able to devote its attention to offensive action.

3. The numbers on protective duties, especially in the absence of the enemy, will probably be reduced. Cavalry will also be kept more concentrated.

4. As regards field artillery, it is probable that aerial reconnaissance will favour the attack. The attacking artillery will probably be superior to the artillery in defence and the object of the former will be to discover and engage the latter, whilst the latter will probably, to a certain extent, withhold its fire and avoid an engagement until the decisive attack. The attacking artillery want guns as targets. The aim of the defenders will be to conceal themselves and reserve their fire for the infantry: it is the work of the aerial observers to find the targets for the attackers. Artillery generally will, no doubt, have a great effect on the issue of the battle in future; and aerial reconnaissance will directly assist this arm.

5. A commander will be in possession of accurate and positive information as to the enemy's dispositions at practically the same time as the dispositions are patent to the observers—certainly before the situation has changed materially. He will be able to form his plans with certainty, and he will be able to concentrate his forces.

6. It will be possible to keep the commander in close touch with the course of events on the battlefield: also with the position of the enemy's reserves, and so enable him to strike with his reserves at the right place and at the right time.

7. A commander who has lost command of the air, or whose air service is insufficient, will practically be fighting encounter battles and his tactics will in consequence be cramped.

FIELD TROOPS.

A Lecture delivered to No. 3 Senior Officers' Class, S.M.E., by CAPT. E. W. COX, R.E.

I. *Historical Sketch.*—Field Troops are the engineers that accompany the British Cavalry Division.

The need of mounted sappers has been felt since the Peninsula Wars. A detachment of sappers of the Guard was sent across country on horseback, to clear a bridge over the Sambre for Napoleon's light cavalry in their advance on Charleroi.

In the American Civil War the cavalry generals on both sides made constant use of mounted pioneers to interrupt communication on their famous raids.

In the Franco-Prussian War the mounted pioneers with the German cavalry were credited with a large share in the victory of Wörth, as, by cutting the railway between Saargemünd and Bitsch, they prevented the arrival of French reinforcements, while the 6th German Cavalry Division used its mounted sappers to destroy the railways radiating from Vierzon, and to bridge the Rhine-Marne Canal.

Gourko, in 1876, used mounted pioneers to assist the passage of his wagons over the Balkan Pass, and afterwards in destroying railways and telegraphs.

In the later stages of the South African War, every column had either a field troop or a detachment of mounted sappers from field companies attached to it.

At the present day mounted engineers, under various names, are allotted to the cavalry divisions of France, Germany, Austria, and Russia, so that there can be no doubt that the need of them is universally recognized.

In order to appreciate the true value of field troops as they are to-day, it is necessary to review very briefly their origin and their history. In the Egyptian War of 1885 it was decided to try the experiment of adding a detachment of mounted engineers to the corps of mounted infantry. This experiment proved so successful that a permanent "mounted detachment" was created in 1887, as the nucleus of a larger force to be raised in war. This "mounted detachment" was gradually increased between 1887 and 1898, and the first year of the South African War saw it expanded into four field troops.*

At the end of the war three troops returned to England, and

* A short summary of the employment of the field troops during the South African War is given in an appendix.

one remained in South Africa. One of the home troops was soon disbanded, leaving three troops to provide for three cavalry brigades.

In 1904 the peace establishment was reduced, but in 1907 two more troops were formed, making five in all—four for the cavalry division at home, and one for the cavalry in South Africa.

Before these two extra troops were sanctioned, the possibility of a reduction in the peace establishment must have been considered very carefully. No reduction was made, however, and it was not till five years later, *i.e.*, in the spring of 1912, that a further reduction was ordered, at a gross saving on all the troops of some £10,000 a year.

Such is a very rough outline of the history of the field troops. Is there anything to be learnt from it? One fact stands out clear beyond all others: that peace is the only enemy the field troops have to fear. The same may, perhaps, be said of every arm, but it can be said more truly of the engineer arm than of any other, and of the field troops most truly of all.

II. *Duties of Field Troops compared with those of Field Companies* (*F.S. Regns., Part I., Sec.* 5, *paras.* 1 *to* 3).—It is laid down in *Field Service Regulations*, Part I., Section 5, para. 1, under "The Fighting Troops and Their Characteristics," that engineer field troops are allotted to a cavalry division to assist the mounted troops in the passage of rivers, in the improvement of roads and other means of communication, in placing localities in a state of defence, and in interrupting the enemy's communications by the destruction of bridges, railways, and telegraphs.*

It should be noted that only two of these duties are ever carried out on manœuvres, namely, water supply and rafting. The pace of both the advance and the fight is accelerated to such a degree that cavalry cannot wait for work that would have to be done in war.

Paragraph 2 defines the characteristics of field companies, which form part of an infantry division, to be the construction of works of defence, and the improvement, or construction, of roadways and bridges.† Both troops and companies assist in the preparation and maintenance of watering arrangements.

These two paragraphs emphasize very distinctly the chief difference between the duties of field troops and field companies. The troops are too small, except for demolitions, to do more than assist and supervise working parties of dismounted cavalrymen or civilian labourers, while field companies are expected to work without, as well as with, help from other sources. Special prominence was given to this duty of supervision by Sir Douglas Haig in his report on the Cavalry Divisional Training of 1909.

Another difference is the restriction which is placed on the work of field troops by the pace at which cavalry move. A troop cannot

* These duties are amplified in *Engineer Training*, Sections 114 and 115.
† See also *Engineer Training*, Sections 113 and 115.

undertake work which would delay it to such an extent that it would lose touch with the force to which it is attached.

Again, a field troop is not expected to take part in siege warfare, whereas sapping and mining form one of the most important duties that may fall to the lot of a field company.

III. *Organization and Equipment of Field Troops compared with those of Field Companies.*—In order that the field troops may be used to the greatest advantage in war, the four troops at home are organized as cavalry divisional engineers, and a lieutenant-colonel, with an adjutant, is appointed to superintend their training in peace and to command them in war. As, however, the brigades of the cavalry division are quartered at different stations, the field troops are not kept together in peace: each is attached to a cavalry brigade, in order that both arms may be in the closest possible touch, one with the other, and to give the cavalry brigadiers an opportunity of learning the possibilities of field troops, of using them in brigade training, and of keeping them up to a high standard of horsemastership.

Each troop consists, in peace, of a captain, a subaltern, 31 non-commissioned officers and sappers, and 20 drivers, with 20 riding and 26 draught horses. This establishment is increased in war by 1 subaltern, 14 non-commissioned officers and sappers, and 7 drivers, with corresponding additions to the number of horses. In war, the officers, the non-commissioned officers, and 18 sappers are mounted, while 15 sappers ride bicycles.

Entrenching, cutting, and carpentering tools are carried in two double tool carts, together with water supply stores and explosives. The tool carts are drawn by 6-horse teams and are expected to keep up with the mounted men. In order that field troops may be equal to any emergency, certain tools are always tied on to the bicycles or carried by the mounted sappers in tool buckets, small quantities of explosives can be carried in sandbags *en banderole* by both mounted men and cyclists, and five pack horses are available for heavy tools, large quantities of explosives, and electric generators.

A collapsible boat equipment is carried in a special wagon. This equipment provides a raft which will take the heaviest-horsed vehicle in the cavalry division. Under the most favourable conditions it takes 35 minutes to unload the wagon and get the first raft load across a river 100 yards wide.

Lastly, there is a G.S. wagon for odd stores and baggage, in addition to the usual supply wagon, cook's cart, and water cart.

The organization and equipment of a field company are naturally somewhat different. At present there are two companies to each infantry division. The need of a third has been felt so keenly that a special enquiry was set on foot, to see whether some reductions could not be carried out in other branches of the corps, in order to cancel the additional expenditure which the six new companies would

entail. The reductions have been effected, but the infantry divisions are still waiting for the third field companies.

The peace establishment is 3 officers and 116 sapper non-commissioned officers and men, expanded in war to 6 officers and 157 sapper non-commissioned officers and men.

A field company is therefore more than twice as strong as a field troop.

The sappers are dismounted, except for 32 cyclists, and their engineering equipment is carried in four double tool carts, while four pack horses are provided for emergencies.

The chief difference between the equipment of a field troop and that of a field company lies in the river-crossing equipment. A troop has only a raft, while a company has 75 ft. of pontoon bridge, which can be joined up with the equipment of the other divisional field company and of half a bridging train, to form a bridge 120 yards long; in all normal cases, therefore, the waste of time that is inevitable in rafting or bridge building is avoided.

IV. *Recruiting and Training of Field Troops compared with those of Field Companies.*—Sappers who enlist for service in field troops are sent to Aldershot, and are trained in the depôt in drill, musketry, riding, and military engineering, before they are posted to units.

Dismounted sappers, on the other hand, are sent to Chatham on enlistment, and are put through their recruit's courses of drill, musketry, and military engineering, in the Training Battalion. The terms of service are "six and six" for both mounted and dismounted sappers.

The drivers of every unit in the corps are enlisted and trained at Aldershot, their terms of service being "two and ten."

The training of both troops and companies may be roughly divided into two distinct periods during the year—technical training at trades during the winter and spring, and military training during the summer and autumn.

The military training of a troop is rather different from that of a company. Every sapper, whether in a troop or a company, must be, first of all, a skilled field engineer; but a field troop sapper, in addition, must be able not only to ride, to look after his horse, to shoot and to swim, but also to read a map, find his way at night, and act, under any circumstances, on his own initiative.

A brief summary of the annual training of the Aldershot troop is as follows:—

When the annual manœuvres are over, every sapper settles down to work at his trade till the end of the year. In January or February he undergoes half troop training; each half troop in turn is trained for a month in riding (up to M.I. standard), horse-mastership, elementary field engineering, musketry (preliminary training), map reading by day and night, and semaphore, with daily lectures on the various subjects.

The sappers of the half troop which is not under training are either working at their trades or on furlough. March is devoted to drills, both mounted and dismounted, and the annual musketry course.

Thirty working days in April and May are spent on the annual military engineering course, at the end of which the sappers return to their trades, while the non-commissioned officers give a three weeks' course to 15 cavalry pioneers from each regiment in the brigade. The sappers remain at their trades, and the non-commissioned officers work at day and night reconnaissance, till the troop, with the cavalry pioneers, goes under canvas for three weeks of summer training, *i.e.*, bridging, rafting, the use of every kind of expedient for river crossing, and horse swimming. This is followed by three weeks of combined training, during which the three troops stationed in England are trained, under the officer who will command them in war, both in practical engineering and in tactical schemes which have been submitted to a cavalry officer on the General Staff. Then follow brigade training, cavalry divisional training, and the various manœuvres.

V. *Examples of Employment of Field Troops in Narrative Form.*—It is extremely difficult to grasp the possibilities of a unit, the characteristics and duties of which are unfamiliar, if the only information that can be obtained is confined to the generalities laid down in *Field Service Regulations*, Part I., and *Engineer Training*.

The duties that may fall to field troops will therefore be enumerated in greater detail, and the less obvious ones will be illustrated from the schemes set during the combined training of the last two years.

(*a*) Entrainment and Detrainment.—Approaches would be made or improved, ramps constructed, and sidings laid down.

(*b*) Passage of Rivers.—The troops would be responsible for the rafting of the limbered G.S. wagons and the R.H.A. guns and wagons; the cavalry regiments and all the gunner horses would swim.

Field troops are able to practice horse swimming much more regularly than cavalry regiments; every horse, both riding and draught, on every day of summer training, is made to swim across a river and back, and it is suggested that these well-trained horses should be used to give a lead, whenever cavalry regiments are likely to lose valuable time through the refusal of their horses to take the water.

(*c*) Engineering Reconnaissance.—It has been already explained that field troops cannot carry out any piece of protracted engineering, but they may often be able to send back to the C.R.E. of an infantry division in rear not only a report of the work that awaits him, but valuable information about tools and materials.

In the unusual event of mounted troops investing a locality, the engineering reconnaissance would take the form of impressing tools, materials, transport, and possibly labour.

The work of a field troop in carrying out the three duties that have already been outlined is so obvious that no illustration is necessary.

(*d*) Rapid reconnaissance of a position and deliberate preparation for defence.

(*e*) Defence of river crossings.

(*f*) Defence of close billets.

(*g*) Bridge demolitions and hasty defence of localities.

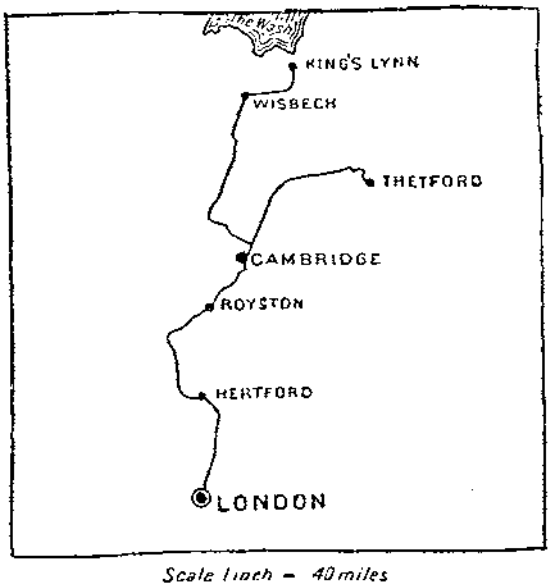
(*h*) Raid on railway communications.

(*i*) River crossing at night.

(*j*) Fighting.

These duties (*e*) to (*j*) will be illustrated by a short narrative.

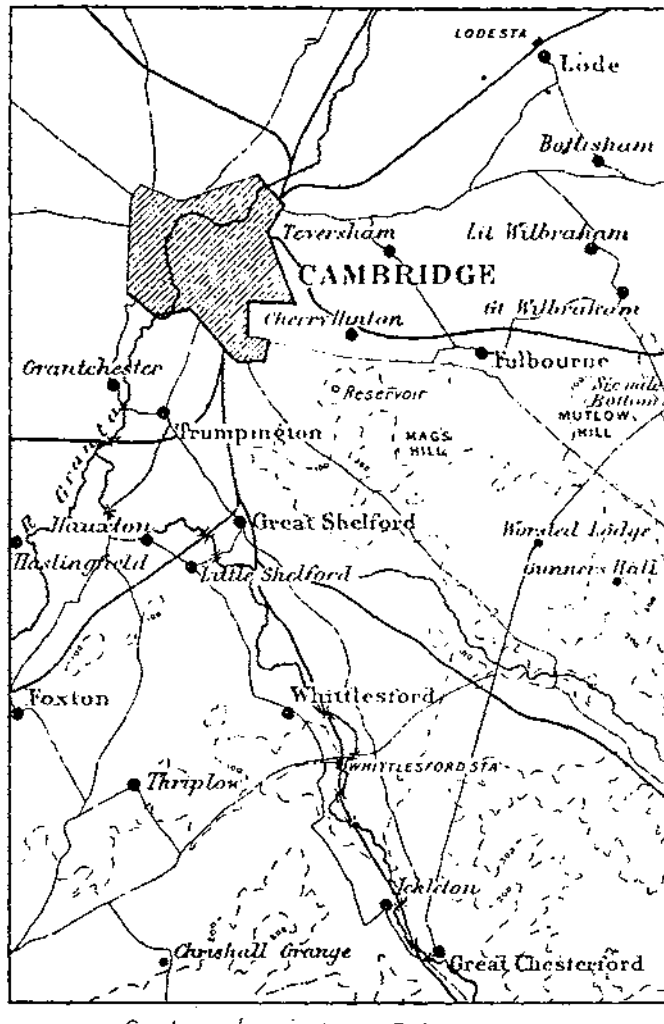
On June 1st, 1912, war broke out on the Continent between Blueland and Blackland. Blueland quickly gained control of the sea north of the English Channel, and, just as England had completed the mobilization of her one cavalry and six infantry divisions, and was preparing to send them to the Continent to help Blackland, Blueland invaded England with a force of one cavalry division, cyclists, and two corps, which landed at King's Lynn and marched on London. England concentrated her infantry by rail south of Cambridge, with the cavalry division about Royston (Map A).



Scale 1 inch = 40 miles

MAP A.

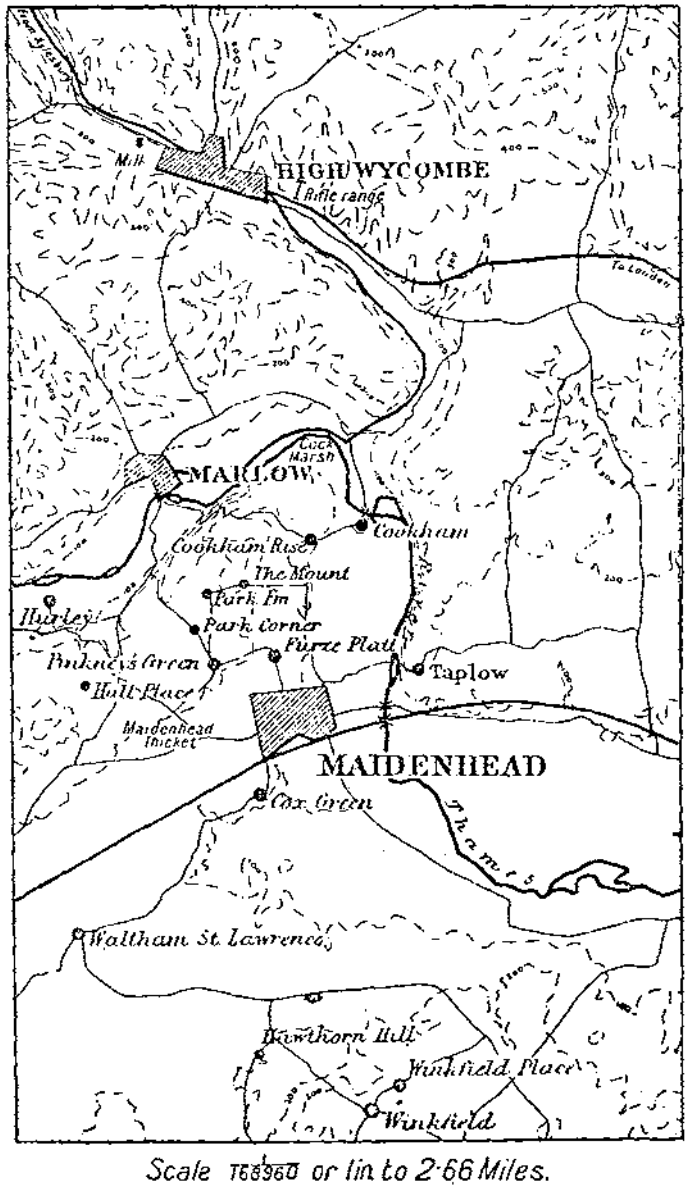
On June 15th the cavalry division moved forward to make good the high ground between Gunner's Hall and Cherry Hinton (Map B), and the field troops were ordered to strengthen the position between Worsted Lodge and Reservoir.



Scale ~~1/63360~~ or 1in to 2 66 Miles

Mile 1 ½ 0 1 2 3 4 5 6 Miles

MAP B



Scale 1/63360 or 1in to 2·66 Miles.

Mile 0 ½ 0 1 2 3 4 5 6 Miles.

MAP C

The C.R.E. allotted sections to the troop commanders and ordered them to meet him with their reports at a central rendezvous.

The troop commanders had to reconnoitre their sections at the trot in order to reach the rendezvous in time. While the C.R.E. wrote his report the troops collected tools and materials and began work. On receipt of the report the G.O.C. detailed one regiment as a working party, and sent the report to the C.-in-C. in rear, to inform him of the possible expansion of the line.

The cavalry division held the defensive position on June 16th, but were hard pressed towards the evening, and on the 17th the field troops were ordered to hold the river crossings over the Granta while the division retired to the line Grantchester-Whittlesford. Three squadrons were detailed to assist the field troops, who had no time for more than the most hurried reconnaissance before the retirement began. As the regiments crossed the river they were met by mounted sappers who led them to their positions.

On the next day the infantry columns began to arrive and the cavalry division recrossed the Granta and went into close billets at Six-Mile Bottom, Little Wilbraham, and Lode. The field troops were attached to brigades for the night, arranged water supply, and assisted the brigades to prepare their billets for defence.

On June 19th and 20th the cavalry division drove the enemy back to Thetford (Map A), but on the afternoon of the 20th, reinforcements for the enemy were reported to be advancing on Cambridge from Wisbech. The C.-in-C. decided to change his line of communications to the line Hertford-Cambridge, and on June 22nd, the field troops were ordered to destroy all bridges over the Granta from Whittlesford Station to Great Chesterford, to prevent any crossing between those points, and to hold Ickleton. The C.R.E. allotted bridges and detailed patrols. The bridges were blown up on receipt of an order from the commander of the rear guard.

To illustrate a river crossing at night and a railway raid, another narrative is necessary.

In July, 1911, war broke out between two states north and south of the Thames.

The south were ready, the north unprepared.

To cover the mobilization of their regulars, the north assembled a large force of local levies, which, with 1 cavalry brigade, 2 batteries Royal Horse Artillery, and a field troop, crossed the frontier, and on July 10th encountered the enemy some 30 miles south of Maidenhead (Map C).

Heavy fighting took place on the 11th and 12th, and by 4 p.m. on the 12th the northern forces were driven back on the line Hurley-Maidenhead Thicket-Maidenhead.

Maidenhead was held by one cavalry regiment, while Cookham

and Marlow bridgeheads were defended by infantry from the local levies, who had prepared the bridges for demolition.

At 6 p.m. the local M.I. were ordered to retire across the Thames at Marlow and blow up the bridge.

The cavalry brigade covered this retirement, intending to cross at Cookham and blow up the bridge there, while the regiment in Maidenhead was ordered to hold on until the bridges at Marlow and Cookham had been destroyed.

At 11 p.m. Marlow Bridge was blown up, and shortly afterwards the R.H.A. and field troop, who were waiting at Park Farm, were ordered to retire to Cookham. Just as they passed through Cookham Rise a violent explosion was heard from the east, and word was brought back that Cookham Bridge had been destroyed.

The field troop was ordered to get the guns across the river at Cock Marsh. Volunteers swam the river with their horses, and with this lead the majority of the horses swam over free. The rest were taken over behind the raft, which made 30 journeys, ferrying the last wagon over at 4.30 a.m.

From July 13th to 15th the south made several unsuccessful attempts to force the passage of the river, and on the 16th the cavalry division moved to the west to cross above Reading, leaving a holding force of one cavalry brigade, one battery of horse artillery, and one mounted sapper detachment on the line Hurley-Maidenhead.

At 6 p.m. on the 16th information was received that large quantities of stores were being removed by rail from High Wycombe to London and Aylesbury. Scouts reported that the outpost line along the river had been weakened, and that the turning movement at Reading was beginning to cause a general retirement of the northern force.

The O.C. mounted detachment was ordered to cut the railway east and west of High Wycombe that night.

Three parties, each of one officer, one non-commissioned officer, and two sappers, swam the river as soon as it was dark, and went across country on foot. One party was captured, the other two got through—one blowing up a short rail at a curve, and the other dropping an iron girder over a culvert.

They hid in the woods on the enemy's side of the railway during the next day, and rejoined the unit the next night.

VI. *Further Examples of the Way in which Field Troops can help Cavalry in War.*—It has already been stated that water supply and rafting are the only duties in which field troops can prove their value on peace manœuvres. An attempt has been made, by quoting from history, and by giving an account of present-day training, to illustrate the *rôle* of field troops in war, and the various ways in which they can be of assistance to cavalry. There are still some points, however, which have escaped attention, and these can best be illustrated by

imagining the questions that a cavalry commander might be expected to ask himself, when studying, in peace, the best way of getting the utmost out of his field troops in war.

(i.). What is the best place for the troops on the line of march?

The answer to this depends of course very largely on local circumstances, but certain principles are clear. A field troop officer, with, possibly, six mounted N.C.O.'s and sappers, should invariably accompany the foremost troops of the advanced guard.

This is laid down very distinctly in *Engineer Training*, Section 96, para. 3. A well-trained officer will notice at once any opportunity there may be of helping the cavalry, and by sending word back to the C.R.E. will enable the latter to prepare for work before he actually reaches the scene of it.

This implies that the C.R.E. must be in the closest touch with the headquarters staff. The necessity is self-evident, and is anticipated in *Engineer Training*, Section 95, para. 1. Until there is work for the troops, the C.R.E. must be where he will get information and orders without delay in their transmission. This principle should be maintained when a field troop is allotted to a detached cavalry brigade. The troop commander is then the C.R.E. of the brigade, and should invariably be with his brigadier until he gets work for his unit.

The main body of the Sappers, with tool carts and pack horses, may very well follow the gunners, unless it is more expedient to use them to assist the transport or train. The latter duty should never be assigned to the troops in peace, as it is unnecessary and would discourage both officers and men.

The heavy G.S. wagon, and the boat wagon, should be relegated to the train, the boat wagon being kept with the 1st line transport only when there is a possibility of using it.

A cavalry commander can, in this way, free his fighting troops from all encumbrances, as they would be accompanied by nothing less mobile than mounted men, cyclists, and limbered wagons.

Another case may arise. If the enemy is met unexpectedly, and the 1st line transport is uncomfortably close, it might be a sound plan to send the main body of the Sappers back to the transport, with orders to take it to the nearest defensible position, such as a village, and to prevent its capture.

A cavalry commander should never forget that he possesses over 40 rifles in each troop, which might be invaluable at a *point d'appui*. Musketry training in field troops has been raised to the same standard as that of cavalry regiments, and it is expressly stated in *Engineer Training*, Section III., that fighting is one of the duties of engineers.

This possibility should be borne in mind even if it is not con-

sidered necessary to take special precautions for the safety of the transport.

The rifles of the field troops could be used, as they often were in the last war, to escort machine guns, or R.H.A., or even to assist dismounted cavalry.

Peace manœuvres would be rendered much more interesting to field troops if cavalry commanders would remember this, and would occasionally give them some other order than to follow the guns.

Lastly, when the cavalry are going to billets or bivouacs for the night, the troops should be sent on well ahead, so that they can have something ready, in the way of water supply, by the time the cavalry begin to arrive. This is laid down very clearly in *Engineer Training*, Section 96, para. 8.

It is a point that can be practised every day on peace manœuvres, but only if the C.R.E. is with the headquarters staff, and gets his orders without any loss of time.

(ii.). What is the best use to make of field troops in the cavalry fight ?

This question has been answered mainly under (i.) above. Further uses will depend chiefly on the nature of the country. In open country the mounted sappers, all of whom carry tools, might be used as an escort to machine guns or R.H.A. In enclosed country, some mounted sappers with cutting tools should certainly be with the regiments, while the remainder, with the cyclists, should be with the R.H.A., in order to cut gaps in hedges, break down fences, and generally facilitate their movements.

Whether the country is open or enclosed, the tool carts and pack loads should be left under cover, or, possibly, sent back to the 1st line transport. They are not wanted with the fighting troops.

(iii.). How can field troops be of assistance when infantry begin to relieve cavalry from the defence of a position ?

They should be detailed to improve lateral communications on both flanks, so that the regiments and guns can move off easily and quietly, without exposing themselves in close formations to hostile fire.

(iv.). What is the object of training cavalry pioneers, and how will they be used in war ?

This can only be answered in detail by a study of the reports on cavalry pioneer courses, but the three main objects of pioneer training may be said to be :—

(*a*) To render cavalry regiments independent of any other arm in the passage of rivers. Experiments are being made with an air-bag equipment which, it is hoped, may be issued to cavalry regiments in some mobile wagon, but, apart from this, pioneers are trained in every river-crossing

expedient. That this training is essential may be gathered from the fact that a field troop cannot raft one R.H.A. battery across a river 100 yards wide under two hours. The cavalry must be independent, therefore, unless valuable time is to be lost at every river crossing.

(*b*) To enable cavalry to carry out small demolitions, such as the destruction of telegraphs, telegraph and railway offices, railway plant, permanent way, etc.

(*c*) To give pioneers an elementary knowledge of field engineering, and to accustom them to the use of their pioneer equipment, so that, when it is necessary for the C.R.E. to call upon the cavalry for a working party, the men who are detailed will have a good idea of what they are expected to do.

VII. *How Cavalry can Help Field Troops.*—True co-operation depends on intimate knowledge and mutual confidence.

Cavalry commanders can inspire confidence by using field troops, not only theoretically on brigade and divisional staff tours, but practically on manœuvres, on the lines already indicated.

An intimate knowledge of field troops will induce cavalry commanders to press for certain reforms which are essential for the efficiency of the units. These reforms may be outlined under the headings :—

A.—Equipment.

B.—Establishment.

A.—(i.). The collapsible boat equipment can, at present, only be used as a raft. It should be so altered and strengthened that it could be used in bridge. The cavalry divisional river crossing equipment would then be 75 ft. to 80 ft. of bridge, which would save many valuable hours in the passage of small rivers and canals.

With the present troop equipment the cavalry division (fighting troops and 1st line transport) will take over eight hours to cross a small river, even if the regiments are entirely independent of the field troops.

(ii.) The present pack equipment is impossible for fast work. Not only is the principle of pack transport for fast moving units wrongly applied,* in that five horses are loaded up with 2 cwt. each from the command "Mobilize," instead of being loaded only to meet an emergency, but the equipment is bad in every detail; the weight is too high, which means a badly balanced load and a sore back, the loads are noisy, the entrenching tools need elaborate lashing to prevent them falling out even at the walk, and none but an unnaturally long-backed horse can carry the loads without being galled on either the neck or the quarters.

* When pack horses were first introduced into field troops, they carried empty cases and racks.

The mortality among pack horses with cavalry in South Africa was exceptionally high, but undoubtedly there will be occasions when pack horses are indispensable.

An improved saddle, such as the wireless pattern, should be substituted for the present pack saddle, and the loads might be carried in two limbered G.S. wagons until required, when they could be transferred to the backs of the lead pairs in the 4-horse teams.

This would give increased mobility, and would have the further advantage of providing the troops with a vehicle that could be used for carting, the need of which was constantly felt in the last war.

The proposal would mean a reduction of the present war establishment by one man and six horses, so presumably there would be no financial objection.

(iii.). Under present arrangements there is no reserve of explosives nearer than the advanced depôt. A reserve of 100 per cent. of the war equipment should be carried in the horse artillery ammunition column.

There is no need to labour this point. Every campaign since the beginning of the last century has proved that raids on communications and the demolition of bridges are the most effective of a field troop's duties. The quantity of explosives carried by a field troop is so small that one-third of it might be expended on one raid alone, and the remainder would not blow up more than two bridges of normal dimensions.

In a matter of such vital importance it is wrong to rely upon the cavalry regiments to supply a reserve for the field troops. Their explosives are for their own pioneers, and are not brigaded, but scattered in squadron wagons. The matter cannot be left to chance; the C.R.E. should know exactly where to put his hand on a large reserve of such an essential store.

(iv.). It would seem wise to provide the bicycles with clips for heavy tools, and leather or canvas bags for small stores. Spare parts should also be issued, as experience shows that the passage of one regiment alone over a side road is sufficient to puncture 30 per cent. of the bicycles.

B.—Reforms in the equipment, however, are of secondary importance.

Battles are won by men, not *matériel*.

The last reduction in the peace establishment of field troops reacts to the detriment of both technical and military training. The effect on military training will be considered first, as it is one that may not be discovered till the outbreak of war.

(i.). How is the training of the officers affected?

It may be assumed that the subaltern detailed to join a field troop on mobilization will be selected for his special qualifications, but, even so, his training with the men he is to lead in war will be limited to the three weeks in the year during which he attends combined

training, and he will join with but the most superficial knowledge, not only of his duties, but also of the men under his command. Yet the experience of war shows that in the first week of a campaign he may be called upon to carry out a task, such as a railway raid at night, for the proper execution of which he must have established the utmost confidence between his men and himself.

As regards the officers posted to the troops in peace, there can be no continuity in training when a troop commander is posted to another unit, no officer can be spared to attend courses at Netheravon or elsewhere, either as an instructor or as a pupil, and the subalterns are deprived of all the advantages of responsibility and initiative which the half troop organization involved.

The case of the N.C.O.'s and men is equally striking.

It is accepted as an axiom in every modern army that, as mounted men deteriorate very rapidly in the reserve, the peace strength of a mounted unit should never, under any circumstances, be less than two-thirds of the war strength. The peace establishment of a cavalry regiment is in excess of its war establishment; the peace strength of the gunners of a horse artillery brigade, even on lower establishment, is over 80 per cent. of their war strength. The condition of the cavalry and horse artillery, therefore, is a happy one. But the peace establishment of the sappers of a field troop has been reduced to 60 per cent. of the war establishment, which is well below the recognized minimum.

Field troop sappers must be individualists to an even greater extent than the men of any other arm; they never work in large parties, and a man who is untrained, or has grown rusty on the reserve, is worse than useless in war.

(ii.). But by far the worst result of the reduction in peace establishment is the impossibility of keeping the Sappers at their trades in winter.

In some quarters the field troops, in this very question of trades, are undoubtedly suspect.

It is said that technical training is sacrificed to riding and drill. Whatever may have been the ground for such a charge in the past, there has been no ground whatever in recent years. There is not a field troop officer who does not know that the well-being of his unit in peace, and its efficiency in war, depend primarily on skill at trades.

Good tradesmen, unless they are convinced that they will have an opportunity of improving their skill regularly every year, will not enlist for mounted service, and yet the field troops, in order that they may be equal to all the demands that may be made upon them in war, must be able to draw upon the most intelligent class of men that enlists in the Royal Engineers.

APPENDIX.

FIELD TROOPS IN THE SOUTH AFRICAN WAR.

I.—FORMATION AND EXPANSION.

December, 1899.—1st Field Troop (headquarters and three field sections) landed; no other field troops existed.

April, 1900.—2nd Field Troop formed from field and fortress sappers, with N.C.O.'s and men of M.I.

April, 1900.—3rd Field Troop formed from 2nd Balloon Section, for work with mounted brigade in Natal.

June, 1900.—4th Field Troop formed from 3rd Field Section of 1st Field Troop, for work with Broadwood's Cavalry Brigade.

II.—SUMMARY OF EMPLOYMENT.

December, 1899, to February, 1900, Cape Colony East.—Dismounted action with cavalry—machine gun emplacements—road making—ammunition lift on Coleskop—improvement of drifts—water supply.

February to May, 1900, Relief of Kimberley and March to Bloemfontein.—Destruction of ammunition—gun emplacements—river crossing with collapsible boats—railway and telegraph cut at Ferreira Spruit—successful raid on railway north of Bloemfontein—repair of captured engines and of permanent way—defence of outposts—accessory buildings for hospitals.

May to June, 1900, Advance on Pretoria.—Successful raid on railway north of Kroonstad—telegraph and railway cut at Roodepoort—railway cut at Rustenberg Road.

June to September, 1900, Advance from Pretoria to Koomati Poort.—Infantry positions fortified at Uitkijk and Rockdale—railway reconnaissance—repair of engines and permanent way at Barberton.

September, 1900, to April, 1901, Drives.—Normal troop duties as above.

April, 1901, to end of war, Guerilla Warfare.—Erection of blockhouses.

N.C.O.'s and men of Field Troops were awarded 1 Victoria Cross and 7 Distinguished Conduct Medals.

EARLY INDIAN CAMPAIGNS AND THE DECORATIONS AWARDED FOR THEM.

(*Continued*).

By MAJOR H. BIDDULPH, R.E.

OPERATIONS IN THE DECCAN, 1803.

THE operations in the Deccan were undertaken by two forces acting in conjunction, viz. :—that commanded by Major-General the Hon. A. Wellesley, and the Hyderabad Subsidiary Force commanded by Colonel Jas. Stevenson, of the Madras Cavalry.

Wellesley's force was portion of an army of observation, 19,000 strong, assembled at Hurryhur on the N.W. Frontier of Mysore in November, 1802, under the command of Lieut.-General J. Stuart.

Wellesley marched from Hurryhur on the 9th March, 1803, through the Mahratta territory *en route* for Poona, and on the 15th April was in touch with Stevenson's force at Akloos on the Neera River.

The composition of the two forces, March, 1803, was as follows :—

Wellesley's Force.

Cavalry :—Colonel T. Dallas, 4th Madras N. Cavalry (succeeded by Lieut.-Colonel P. Maxwell, 19th Light Dragoons, who was killed 23. 9. 03).
H.M. 19th Light Dragoons (412 sabres).
4th, 5th, and 7th Madras N. Cavalry (1,297 sabres).

Artillery :—Capt. M. Beauman, Madras Artillery (108 gunners, 206 Lascars).

Guides :—Ensign G. Rowley, Madras Engineers. (Died 28. 6. 03).

Pioneers :—1st Battn. Madras Pioneers (704 R. & F.). Capt. W. P. Heitland, 6th M.N.I.

1st Infantry Brigade :—Lieut.-Col. W. Harness, H.M. 80th Foot. H.M. Scotch Brigade (1,013 R. & F.). 1-2nd, 2-3rd, and 2-12th Madras N. Infantry (3,003 R. & F.).

2nd Infantry Brigade :—Lieut.-Colonel W. Wallace, H.M. 74th Foot. H.M. 74th Foot (754 R. & F.). 1-3rd, 1-8th, and 2-18th Madras N. Infantry (3,120 R. & F.).

Attached :—2,400 Mysore Horse; 3,000 Peishwa's Horse.

Hyderabad Subsidiary Force.

Colonel Jas. Stevenson, Madras Cavalry.

Cavalry :—Lieut.-Colonel Hon. A. Sentleger, 6th Madras N.C. 3rd and 6th Madras N. Cavalry (1,018 sabres).

Artillery :—Capt. U. Burke, Madras Artillery (168 gunners, 310 Lascars).
Pioneers :—2 Companies 2nd Battn. Madras Pioneers (206 R. & F.)
1st Infantry Brigade :—Lieut.-Colonel H. Maclean, 2-9th M.N.I. 2-2nd, 1-6th and 2-9th Madras N. Infantry (3,849 R. & F.).
2nd Infantry Brigade :—Lt.-Col. J. Haliburton, 2-7th M.N.I. 2-7th, 1-11th and 2-11th Madras N. Infantry (3,333 R. & F.).
Attached :—7,000 horse, 5,000 infantry, 40 guns, Nizam's Army.

Certain changes were made in the composition of these forces, which may be noted here :—H.M. 78th Foot sailed to Bombay from Fort William, and joined Wellesley early in May, replacing the Scotch Brigade in the 1st Infantry Brigade, which had been transferred to Stevenson's force on 16th April under orders from Lieut.-General Stuart.

Poona was reached on the 20th April, just in time to save its destruction by the Mahrattas, and arrangements were made for the return of the Peishwa to his capital from Bombay, whither he had fled ; and a garrison consisting of 5 companies H.M. 84th Foot and some Native troops installed there. At this time Wellesley's artillery was strengthened by the addition of the 3rd and 5th Companies, Bombay Artillery, and Capt. J. Johnson, Bombay Engineers, joined his Staff as Chief Engineer.

The first offensive action against Scindiah was the capture of the town and fort of Ahmednuggar, 8th—11th August, 1803, by Wellesley's division, 4 British officers and 26 other ranks being killed, and 2 British officers and 109 other ranks wounded.

The garrison left in Ahmednuggar consisted of a detachment of artillery, 30 men of H.M. 84th Foot, and the 2-3rd Madras N. Infantry from Wellesley's 1st Brigade. The next move was to try and bring to battle the forces of Scindiah and Berar, which had invaded the Nizam's territories. Wellesley had an interview with Colonel John Collins, recently Resident at Scindiah's court, an extremely able officer, nicknamed "King" Collins from the regal pomp which he maintained. Being an old man of curious appearance and dress, he excited a good deal of amusement in the young Major-General, 34 years old, and his Staff. "King" Collins's parting piece of advice to Wellesley was, "Well, General, as for their cavalry, you can ride over them, but their guns and their infantry will astonish you." The staff officer, who was present and records this incident, adds that as they rode home laughing at Colonel Collins, they little thought how soon they were to realize the truth of his warning.

The pursuit of Scindiah continued into September, till early on the 23rd September Wellesley was within striking distance of the combined armies of Scindiah and Berar.

The plan had been for Wellesley's and Stevenson's divisions, which were practically in touch with each other, to make independent marches and attack the enemy simultaneously. They had met on the 21st September and arranged for a joint attack early on the 24th. Owing to the confusion that occurred between the name of the village and the district of Bokerdun, the unexpected difficulty of the country which Stevenson had to traverse, and the attack being commenced by Wellesley on the 23rd, this plan miscarried. Stevenson's force was unable to come into action at all, and Wellesley hardly gained the victory of Assye at the cost of nearly one-fourth of his force. Scindiah's artillery and regular infantry fully justified the opinion that Collins had expressed; their drill and fire discipline almost turned the scale against the British.

The enemy were found to be in line behind the Kaitna River, close to its junction with the Juah River, which was in their rear; and Wellesley, making a flank march from the right to the left of the enemy's front, determined to attack their left flank, as he judged from the relative positions of two villages (Peepulgaon and Waroor) that there must be a ford across the Kaitna at this point.

This proved to be the case, but while this was going on, the enemy changed front to their left with rapidity and precision, and Wellesley's force was shut up in the narrow **V** formed by the junction of the Kaitna and the Juah, with the enemy in line across the top of the **V**, from river to river, their left flank resting on Assye.

The right of the line, consisting of the picquets of the previous night, followed by the 74th Foot, led the attack directly on to the village of Assye, which was held strongly by the enemy. This attack was in a direction towards their right front, and was led by Lieut.-Colonel Wm. Orrok, 1-8th M.N.I., the officer commanding the picquets. Wellesley (who had intended the attack to be clear of Assye) acknowledged that it was impossible for any man to lead troops into a hotter fire than was done by Colonel Orrok, whose name he himself does not disclose; and the results justify the statement. With the exception of the 1-2nd M.N.I. which remained in rear with the baggage guard, the losses of the picquets are lumped with their regiments, but the casualties of the picquet of the 1-4th M.N.I. amounted to 21 killed, 22 wounded and 3 missing, out of a strength of about 50. The 74th which supported the picquets lost 11 officers, and 113 men killed, and 6 officers and 271 men wounded, a total of 401 casualties out of about 550 of all ranks. The right of the British line was practically destroyed by the fire of the enemy's artillery which was massed on this flank.

The British attack formation was one of two lines of infantry with the cavalry in reserve in the third line; the artillery was posted in the intervals between the regiments. The cavalry did good service during the day by their brilliant charges, and lost their

brigadier, Lieut.-Colonel P. Maxwell, 19th Light Dragoons, toward the close of the battle in a final but unsuccessful charge. The advance of the centre and left of the British line was unchecked, the 78th Foot being on the left, and the line wheeled round to the right, pivoted on their shattered right and the village of Assye.

The enemy's artillery, being drawn by bullocks, was captured during the advance, but many of the Mahratta gunners remained by their guns prone on the earth and had the audacity to open fire again on the rear of the advancing British line, after the infantry had passed over them, and inflicted great damage. A considerable part of their infantry left the field in unbroken order, across the Juah, but the loss of their guns, 102 pieces in all, was a serious one; seven stand of colours were also captured. The British casualties numbered 428 killed, and 1,138 wounded, no less than 53 British officers being among them. The numbers under fire were about 6,000 rank and file; these figures do not include the irregular cavalry which lost only one man that day.

The 1-3rd and the 2-18th M.N.I. were not present at the battle, as they had been sent towards Poona on the 20th September, three days before; while on the other hand the 1-4th and 1-10th M.N.I., which had been despatched with convoys by Lieut.-General Stuart at different dates, were both engaged. The 2-3rd M.N.I. was of course absent, as it had been left at Ahmednuggar.

The losses among the *personnel* of Wellesley's artillery were so heavy that it had to be immediately strengthened by drafts from Stevenson's force. His division was also too shattered by its losses to be able to make any pursuit, a duty which devolved on Stevenson.

The force defeated at Assye was composed of 16 regular battalions (10,500 men) trained by Europeans, and in a small measure officered by them, with over 100 well-equipped and well-served pieces of artillery, in addition to a large number of irregular infantry and cavalry, presumably about as useful on the battlefield as the British irregular allies. The comparative merits of the two armies may probably be judged by the respective strengths of their regular troops engaged in the battle, and there is no doubt that the enemy's artillery was first-rate. The baggage guard declared that the fire of the enemy's guns was maintained with a regularity and persistence resembling the firing of regular infantry.

On the 21st October the fortress of Asseerghur surrendered to Colonel Stevenson for a consideration. The British casualties were 2 killed and 6 wounded, and it is extraordinary that this occasion should have been commemorated by a special clasp in 1851, and the more so when it is remembered that in 1819 it stood a prolonged siege by the British who sustained heavy losses in reducing it. It is interesting to note that in 1851 several survivors of the Siege of Asseerghur in 1819, put in claims for the clasp for 1803.

On the 22nd October the 1-3rd M.N.I. rejoined Wellesley, as he had sent to recall it three days after the battle of Assye; and the united forces of Wellesley and Stevenson came into contact with the diminished forces of the enemy on the plains of Argaum, 29th November, 1803.

The British troops engaged consisted of Wellesley's division that had fought at Assye, plus the 1-3rd M.N.I. which had been recalled since, and the whole of Stevenson's division as given above, including H.M. Scotch Brigade (94th Foot). (N.B.—There is some doubt as to whether the 5th Company, Bombay Artillery, was still with Wellesley's division).

The enemy were in line, infantry and guns in the centre, flanked by cavalry and light troops; the British were in two lines, infantry in front, and cavalry in echelon on the flanks.

The attack was delayed owing to two Native regiments of Wellesley's division, which had lost a large number of their British officers at Assye, falling into confusion early in the fight. This necessitated Wellesley rallying and re-forming them in person, which he effected most skilfully without hurting their *amour propre* by pretending to imagine that they had misunderstood their orders. H.M. 74th and 78th were attacked by a large body of "Persian" troops, who were destroyed entirely, and the 1-6th M.N.I. having repulsed Scindiah's cavalry on our left, the enemy's line was broken and retired in disorder, leaving 38 guns and all their ammunition in the victors' hands. The cavalry took up the pursuit till late at night.

Whether by accident or design, Lieut.-Colonel Orrok, the fire-eater of Assye, was with his regiment on baggage guard on this occasion. Colonel Stevenson, who was a most capable officer but in a bad state of health, commanded his division in action from the back of an elephant, an unusual mount for a British divisional commander.

The British casualties numbered 346, nearly one half being sustained by the few British corps; the 74th Foot having 52.

The combined British force marched at once to the siege of the fortress of Gawilghur, which was stormed on 15th December after a nine days' siege, during which the British casualties numbered 126. The troops engaged were the same units as those present at Argaum.

These successes, combined with those of Lake, broke up the confederacy, and compelled Scindiah and Berar to sue for peace, which was concluded early in 1804, and it will be remembered that Lake's campaign of 1804, which has been recounted before, was directed against Holkar, and later against Bhurtpoor.

Incomplete List of Engineer Officers engaged in the War.

Capt. Jno. Johnson, Bombay Engineers, Chief Engineer with Wellesley. Joined at Dharwar. Siege and Capture of Ahmednuggar, Battles of Assye and Argaum, Siege and Capture of Gawilghur, Chandore and Gaulna.

Ensigns G. Rowley, Madras Engineers, commanded the Guides. Died 28. 6. 03, J. Blakiston, Madras Engineers, Siege and Capture of Ahmednuggar, Battles of Assye and Argaum, Siege and Capture of Gawilghur, Sam. Russell, Madras Engineers, with Hyderabad Subsidiary Force, Reduction of Asseerghur, Battle of Argaum, Siege and Capture of Gawilghur.

THE NEPAUL WAR, 1814-16.

The Nepaul War, occasioned by the encroachments and insolence of the Nepalese, consisted of two distinct phases, the first from October, 1814—May, 1815, and the second from December, 1815—March, 1816.

The first phase of the war was carried out by four divisions (and various detached forces), acting somewhat independently on an extremely extended frontier. They were as follows :—

3rd or N.W. Division :—Colonel D. Ochterlony in command.
2-1st, 2-6th, 1-19th and 6 Companies 2-19th Bengal N.I. (Colonel J. Arnold).
Artillery :—Detachment (Major A. McLeod).
Pioneers :—3rd and 4th Companies.
Cavalry :—2nd Bengal Cavalry, 1 rissala Skinner's Horse.
Reserve :—2-3rd Bengal N.I. and Light Battalion (formed from corps of the Division).
Reinforcements :—2-7th, detachment of 1-14th, and 1-15th Bengal N.I., Nusseeree Ghurkas and Sikh levy.
Original strength, 5,993 ; augmented to 7,112 ; irregulars, 4,463.

2nd Division :—Major-General R. Gillespie (killed at Kalunga 31. 10. 14). Colonel S. Mawbey (temporarily). Major-General G. Martindell (succeeded 20. 12. 14).
Detachment H.M. 8th Light Dragoons. H.M. 53rd Foot. Detachment Bengal Horse Artillery and Foot Artillery (Capt.-Lieut. W. Battine). 5th and 6th Companies Pioneers. 7th Bengal Cavalry, and 1 rissala Skinner's Horse. 1-6th, 1-17th and 4 Companies 2-19th Bengal N.I.
Reserve :—1-7th B.N.I. and Light Battn. (Light Companies of 1-6th, 1-7th, 1-17th, 2-16th, 2-26th, 1-1st, 1-5th and 1-27th B.N.I.).
Reinforcements :—1-13th, 4 Companies 1-27th, 2-26th, 2-27th and Light Company 1-26th B.N.I., also 10th B.N.I.
Original strength, 3,513 ; augmented to 10,422 ; irregulars, 6,688.

Benares Division.

Major-General J. S. Wood.

H.M. 17th Foot. Left Wings 1-14th and 2-14th B.N.I. and 2-17th B.N.I.
Artillery :—Capt.-Lieut. J. MacDowell, and later Capt. G. Pollock. 8th Company Pioneers. 8th Bengal Cavalry and 1 Troop 6th Bengal Cavalry.

Reserve :—4 Companies 2-8th B.N.I., Grenadier Companies 1-17th and 2-17th B.N.I., 4 Companies 2-12th B.N.I.
Reinforcements :—Right Wing 1-14th B.N.I.
Original strength, 4,494 ; augmented to 4,698 ; irregulars, 900.

Dinapore Division.

Major-General B. Marley, succeeded by Major-General G. Wood.

H.M. 24th Foot.
1-8th, 1-18th, 2-15th, 2-25th and Left Wing 2-22nd B.N.I.
Ramgurh Battalion.
Detachment Chumparun L.I.

} Two brigades commanded by Lieut.-Colonel T. Chamberlain, 24th Foot, and Lieut.-Colonel G. Dick, 9th B.N.I.

Artillery :—Major G. Mason.
Pioneers :—1st, 2nd and 7th Companies (Capt. J. Swinton).
Gardner's Irregular Horse.
Reinforcements :—H.M. 14th and 17th Foot, and detachment Bengal European Regiment, 1-12th B.N.I., 2 Companies 1-25th and 4 Companies 1-9th B.N.I. Patna Provincial Battn., Chumparun L.I. Dromedary Corps.
Original strength, 7,989 ; augmented strength, 13,424.

Tirhoot Frontier.

Major P. Bradshaw.
Dets. Gardner's Horse, 2-5th, 2-15th B.N.I. and Chumparun L.I.

North Frontier, East of the Koosi.

Capt. B. Latter.
Rungpore and Patna Provincial Battalions ; detachments of 1-9th, 1-18th, 2-21st B.N.I. and of the Purnea Provincial Battalion.
Detachment Artillery.
Original strength, 2,218 ; augmented strength, 2,723.

Kumaon.

Colonel W. L. Gardner, succeeded by Colonel J. Nicolls.
1-4th, 2-4th, 2-5th and Grenadier Company of 2-27th B.N.I. Flank Battalion from the Dhun. Rohilcund Irregulars. Corps of Pathan or Mewatti Infantry.

The achievements of these various forces were as follows :—

Gillespie fell in a futile attack on Kalunga on 31st October, 1814 ; Colonel Mawbey who succeeded him made a second unsuccessful assault, sustaining even heavier losses than at the first ; but the fort was evacuated finally by the Ghurkas.

Major-General Martindell (who was appointed to the command vice Gillespie killed) carried out some very unsuccessful operations against the Fort of Jyetuck, and having sustained severe losses

settled down to blockade the place, which was evacuated in 1815 on account of Ochterlony's successes elsewhere.

Major-General J. S. Wood made an unsuccessful attack on the post of Jeetpore, withdrew his forces, and contented himself with a passive defence and some futile demonstrations. His force returned to cantonments in May, 1815.

Major-General Marley's force lost two advanced posts held by detachments, which were attacked and defeated with heavy loss. These disasters unnerved General Marley to such an extent that, despite strong reinforcements, which included two King's regiments, he *deserted his division* early on February 10th, 1815, without warning or handing over. Colonel G. Dick assumed command at this crisis, until the arrival of Major-General G. Wood from Calcutta. General G. Wood proved as inactive as other commanders and effected nothing.

Ochterlony began his operations in November, 1814, and directing them against Nalaghur, Ramghur, and Mallown, with skill and decision, took the enemy's positions one by one, until the principal position at Mallown fell on 11th May, 1815; this led to the fall of Jyetuck as mentioned above. His division was the only one handled with skill, and which achieved its object, and for his valuable services he received deservedly the K.C.B. and was created a baronet.

The minor operations conducted by Latter, Bradshaw, and Nicolls were generally successful, and Nicolls captured Almora. The Nepalese Government then entered into negotiations, which lasted many months, but towards the end of the year it was discovered that they did not intend to ratify the treaty that had been agreed upon. This led to the second phase of the war, and Sir D. Ochterlony was directed to resume military operations and was placed in chief command of the invading force.

2nd Phase.—December, 1815—March, 1816. Major-General Sir D. Ochterlony in Command.

Right Column :—Colonel W. Kelly, 24th Foot.

1st Brigade :—H.M. 24th Foot. 1-18th and Right Wing of 1-21st and Left Wing of 2-21st B.N.I. Chumparun Light Infantry. Strength 4,200.

Centre Column :—Sir D. Ochterlony.

3rd Brigade :—Lieut.-Colonel F. Miller, 87th Foot. H.M. 87th Foot. 2-12th, 2-22nd, and 2-25th B.N.I.

4th Brigade :—Col. G. Dick, succeeded by Lt.-Col. J. Burnett. 2-4th, 2-8th, 2-9th, 2-15th and Right Wing of 1-30th B.N.I. Strength 7,843.

Left Column :—Lieut.-Colonel C. Nicoll, 66th Foot.

2nd Brigade :—H.M. 66th Foot. 5th and 8th Grenadier Battalions B.N.I. 1-8th and 2-18th B.N.I. Strength, 4,280.

Attached to the main army and distributed amongst the brigades :—
Artillery, Engineers, 2 Companies Pioneers, and 5 rissalas of the 1st Rohilla Cavalry. Strength 3,070.

Colonel J. Nicoll's Division :—Seetapore and Kumaon.

Artillery, Engineers and 6th Company Pioneers.
Wing of H.M. 67th Foot. 2-10th, 1-22nd, 1-25th and 4th Grenadier Battn. B.N.I. Light Companies 1-1st, 1-2nd, 2-2nd, 1-11th, 1-15th and 2-24th B.N.I.
2nd Rohilla Cavalry (6 rissalas).
Detachment Sirmoor Battn. and half 72nd Experimental Dromedary Corps. Strength 6,617.

Major-General J. S. Wood's Division :—Goruckpore Frontier.

Artillery.
H.M. 17th Foot. Detachments 1-14th and 2-14th B.N.I., 2-17th B.N.I. Detachment Mirzapore Battn. Goruckpore Hill Corps, and Gardner's Horse (2 rissalas). Strength 4,866.
Additions :—2-8th, 2-12th, 5th Grenadier Battn. and detachment 2-17th B.N.I. Detachments Mirzapore Battn. Goruckpore Hill Corps and Artillery. Strength 5,143.

Tilyala.

Capt. B. Latter.

Artillery.
Detachments 1-9th, 1-30th and 2-30th B.N.I. and Rungpore Battn. Strength 2,489.

The campaign was short, sharp and decisive. Sir D. Ochterlony advancing in February with the centre column, turned the enemy's position at the Chiriagati Pass, by a difficult and brilliant flank march, defeated them with heavy loss, and occupied Muckwanpore.

The right and left columns also advanced, but only the right column experienced any serious fighting in the capture of Fort Hariharpur. The British successes led to another treaty being drawn up, and this time signed, by which the Nepaul Government ceded even more territory than had been demanded in the first treaty. For these brilliant services Ochterlony received the G.C.B., the first officer of the Indian Army to be thus honoured. The company's medal for the war was given in silver to all Native officers and to such Native non-commissioned officers and men who were recommended for the distinction, who had actually served in the hills.

In 1851 the Army of India Medal and clasp " Nepaul " was granted to all survivors, European and Natives (other than those Natives who had received the Company's medal), who had served *in the field*.

This excluded certain troops from the grant, and the European

regiments thus excluded were the 14th Foot and the detachment of the Bengal European Regiment, who formed part of the reinforcements ordered up to strengthen the Dinapore (Major-General Marley's) Division in January, 1815.

The British regiments that received the medal and clasp were

Detachment 8th Light Dragoons,

H.M. 17th Foot, 24th Foot, 53rd Foot, 66th Foot, one wing of the 67th Foot, and the 87th Foot,

of whom the 17th and 24th Foot alone served in both phases of the war; while the 87th Foot took a conspicuous part in the brilliant operations that brought it to a successful conclusion.

An Incomplete List of Officers of the Bengal Engineers who served in the War.

Captains H. W. Carmichael Smith. (With Colonel Mawbey's Column, 1814–15). R. Tickell. R. Smith.

Lieuts. E. Garstin. (1814–15 Campaign). P. Lawtie. (With Ochterlony's division. Died from fatigue 4. 5. 15. A most distinguished junior officer). W. E. Morrison. (With Major-General J. S. Wood's division. Died of wounds 6. 1. 15).

Ensign G. Hutchinson.

REVIEWS.

AUTOMATIC FIREARMS.

By CAPT. CORDIER.

A VERY useful publication for anyone who wishes to study in a condensed form the latest ideas—whether these have yet taken practical shape or not—as to the construction of automatic firearms. The details are clearly described and are accompanied by numerous diagrams. All classes of weapons are dealt with, pistols, rifles, repeating rifles, machine guns, and repeating guns, and the greater or less degree of automatism, called for by considerations of the tactical employment of each weapon, is fairly fully discussed. Descriptions are given of various methods of obtaining the necessary motive power from the discharge of the cartridge, trigger systems, methods of opening and closing the breech, extraction, ejection, safety appliances, repetition, rapidity of fire, cooling the barrel, etc. The present position of the question, and the difficulties still to be overcome are touched upon in the last chapter.

A.R.R.

FIELD ENGINEERS HANDBOOK.

WELLS AND CLAY.—(Publishers: Edward Arnold, London).

THE authors while acknowledging the existence of many excellent treatises on surveying, consider them quite unsuitable as handbooks for Civil Engineers. In an endeavour to supply this want this handbook has been compiled. It is compact and of a convenient size to be carried in the pocket.

Chapter I. deals with the Use and Adjustments of Instruments.
" II. Chain Survey.
" III. Levelling.
" IV. Traverses.
" V. to IX. Curves, Railway Survey, Location and Construction (North American Practice).
" X. Tacheometry.
" XI. to XIV. Astronomy—Determination of Azimuth—Time and Latitude.

Appendix I. The General System of Land Survey in Canada.
" II. Latitude Formulæ.
" III. Spherical Trigonometry.

There are also tables giving curves and their radii, tangent distances, etc. The book contains a good deal of useful information, especially with regard to railway surveying, location and construction.

E.F.D.

ILL-TRAINED AND ILL-PAID OFFICERS.

RECENT articles in the *Journal des Sciences Militaires* have criticized certain French Army customs. The author of this pamphlet supplies, as a contribution to the discussion of the subject, a review of an article by Mr. Howard Hensman, which was published in *Pearson's Magazine* for May, 1912, under the above title. He also gives certain extracts from the *Journal of the Royal United Service Institution* of April, May, and June, 1911, on the subject of Military Education. With regard to the criticisms levelled in the latter publication against the Territorial officer, the author of the review asks whether these are specially applicable to the English Territorial officer, or whether they are not equally applicable to the French officer. His final remarks on the article in *Pearson's Magazine* are that the suggested remedies are formulated somewhat vaguely, and that every army must be desirous of similar reforms. He considers that the interest of the article lies in the cruel precision with which the author lays bare the faults which the English officer has to contend with. Even if the author may have drawn too highly coloured a picture, with a view to striking public opinion, he must be congratulated on his evident sincerity. This gives promise of an amelioration which may be realized quickly, and, in the opinion of all those who study the progress of the British Army, will quickly place it on a level with the best.

A.R.R.

INSTRUCTION MÉTHODIQUE DES CADRES ET ÉLÈVES-CAPORAUX (THE METHODICAL INSTRUCTION OF CADRES AND ASPIRANT CORPORALS).

By LIEUT. BIETRON.—(8vo. 71 pp. Paris, 1912. *Chapelot*. 1s. 3d.).

IN the French Army, as soon as the yearly contingent of recruits has settled down and the officers have learned something about them, the best men are picked out and, in addition to the ordinary instruction of their class, are given a special course in order to fit them to be corporals. This course is both theoretical and practical, and it may be carried out either by the company or the battalion as convenient. The individual instruction of the men is perfected, they are trained to command and correct faults and generally to act as non-commissioned officers.

The author's aim in his pamphlet, in view of the very scanty contents of the training manuals which deal only in generalities and leave all initiative in the matter to the officers concerned, is to present a few ideas and indicate some methods by which the work of the instructors will be lightened.

"E."

LES ARMÉES DES PRINCIPALES PUISSANCES AU PRINTEMPS DE 1913.

(8vo. Pp. 465. Paris, 1913. *Chapelot*).

THIS annual contains an accurate and convenient summary of the statistics relative to the 38 principal armies of the world, including those of Afghanistan and Abyssinia. Thirty-one pages are devoted to Great

Britain and its dependencies. The general headings dealt with are budget, recruiting and effective commons and administration, *personnel*, staffs and departments, troops, higher units, instructional establishments, remounts, *matériel*, armament, supply, transport, clothing and equipment.

Apart from its value as a book of reference, it is useful as giving the correct translation of a number of military phrases, *e.g.* :—Warrant officer is *adjutant*; field confrère *compagnie montée*; signal company, *compagnie de signaleurs*.

"E."

MAPS AND SURVEY.

By A. R. HINKS, M.A.

IN his preface Mr. Hinks states that experience in teaching has shown him the need there is of a book, which will give a general account of the many-sided art of survey, and be a supplement to the present *Text Book of Topographical Surveying* and the *Manual of Map Reading and Field Sketching*, and as such his *Maps and Survey* is of very great use. In Chapter I. he clearly shows the waste there is in making surveys for special purposes in a country which has not been mapped, and the necessity for its survey at as early a date as possible. The chapter on map analysis contains valuable information which otherwise could only be obtained by reference to a large number of official publications, etc. In perusing it, the student has placed before him the various systems of mapping adopted by the Ordnance Survey of Great Britain, as well as by Foreign Governments. The only fault to be found (a small one which can be remedied in the next edition) is that the illustrations are, in a good many cases, bound several pages away from the letterpress. This is especially noticeable in *Plate* XX. which faces p. 150 and is referred to on p.194 and in *Plate* XXII. facing p. 176 and referred to on pp. 184 and 200. The Plane Table and Sight Rule illustrated on *Plate* XV. and called the "School of Military Engineering" pattern is the "Service" pattern.

NEW CONTOUR MAP OF THE NEAR AND MIDDLE EAST.

(E. W. Bacon, 127, Strand, W.C. 7s. 6d.).

THE above is a new map, 40″×30″. It gives a graphic delineation of the entire Middle East contained between Lat. 50 and 10 S., from the Balkan Peninsula, Sicily, and Tunis in the West to the Pamir Plateau, Peshawar, and Karachi in the East. The map is on the scale of 1:6,019,200, or 95·6 miles to 1 inch, with an inset of Palestine on the scale of 1:685,000. Heights and depths are depicted by means of colours, and the various journeys of St. Paul, Alexander, and Pompey are clearly indicated. Both ancient and modern names of places are shown. It is sold in styles suitable for the wall or for folding.

NOTICE OF MAGAZINE.

RIVISTA DI ARTIGLIERIA E GENIO.

March, 1913.

THE ENGINEERS OF THE FRENCH ARMY.

(*A*). *Peace Organization.*

The engineer arm comprises the engineer troops and a special staff. The latter in peace time is formed of a *personnel* that provides for the engineer service in France, in Algeria, in Tunis, and in the Colonies and which in time of war forms part of the united mobilization.

The engineer troops comprise :—

1st.—The sapper field companies for fortification works and bridging; the construction and maintenance of roads; the destruction and repairs of ways of communication, and also for the attack and defence of fortresses.

2nd.—Fortress sapper and miner companies which are specially intended for work on permanent fortifications, and for the defence of strong places.

3rd.—Railway companies for working the railways, for the construction of new trunk lines, and for railway service in the zone near the enemy.

4th.—Telegraph companies for telegraphic communication in the advanced zone.

5th.—Detachments of sapper pigeon-post for the employment of trained pigeons between forts and the country, and for communicating with cavalry.

6th.—Detachments of "Alpine sappers" specially intended for mountain work and attached to the Alpine troops.

7th.—Companies of "transport sappers" for the transport trains which carry the necessary engineer material for the troops, the bridging equipment, and the engineer parts.

A statement of the number of special detachments and their actual composition is also given in the Journal. A note in this statement refers to a new order that will modify the present organization and which will be discussed in Parliament. While at present the engineer field companies are distinct in divisional companies (46) and army corps (19), the new proposal tends to suppress the army corps companies, and to increase the divisional companies which would be available at the time of mobilization.

Aeronautical Observers.

The *France Militaire* states that the War Minister, in a circular of the 28th February, has issued the regulations for the courses of instruction of aeronautical observers for the present year.

Instruction in observing from aeroplanes is given (1) to officers with brevets from the war school, who have completed their observation course during the last year; (2) to officers of the staff who have not yet received instruction; and (3) to a certain number of cavalry lieutenants who have not obtained the brevet.

The instruction for officers of the staff as observers from balloons will comprise: (*a*) practical aeronautical reconnaissances; (*b*) ascents in free spherical balloons; (*c*) ascents in dirigibles for officers who have the simple aeronautical brevet.

Applications from officers who desire to enter for these courses, with the necessary medical certificates and recommendations from their superiors, should be submitted to the Minister. The circular also lays special stress on the importance of the greatest possible number of officers with brevets, receiving instruction as observers.

Personal Navigation for Military Aviation.—The *Bulletin Officiel* of the 10th March states that commanders of army corps, should transmit to the permanent inspector of military aeronautics by the 25th of March, applications from officers and men of the troops who wish to receive instruction as aviation pilots in 1913.

Officers must have completed two years' active regimental service, and the application must be accompanied by a medical certificate of physical ability and of their weight; there must also be a note of their proficiency in physical exercises, of their knowledge of mechanics, and of their aptitude for a short course in radiotelegraphy. All superior officers who have to submit these certificates upon the qualities of the candidates, should at the same time report upon their zeal in the service, their character, and their degree of nervousness, and impressionability.

The requirements for the men are:—

(*a*). For under officers, two years' service, age below 30 years, and an engagement to remain in the army two and a-half years after the date of being appointed to the aviation service.

(*b*). For corporals and privates, six months' service, and an engagement to remain in the army for two and a-half years from the date of being appointed to the aviation service. Those who have the brevet of military aviator have only a compulsory service of 18 months. The appointments will be made by the Minister, to whom the permanent inspector of aeronautics will submit the applications with his opinions.

Switzerland.

Mountain Artillery.—In accordance with the new orders, the number of mountain batteries are to be increased from six to nine,—comprised in four groups. The three new batteries are, under orders from the military department dated the 13th February, to be raised in the ensuing spring. The groups will then be as follows:—1st group—1st and 2nd mountain batteries; 2nd group—3rd and 7th mountain batteries;

3rd group—4th and 8th mountain batteries; 4th group—5th, 6th, and 9th mountain batteries.

These batteries are stationed for mobilization and instruction as follows:—1st group at Sion, 2nd group at Brieg, 3rd group at Seewen, and the 4th group, with the exception of the 5th battery, at Bevens, 5th battery at Thusis.

Special courses of instruction for each group successively will be held near Thun until the 21st of April, so as to allow for the constitution of the new batteries. Each of the four groups of mountain artillery is attached to one of the four mountain infantry brigades.

April, 1913.

RECONNAISSANCE WITH AEROPLANES IN FIELD WARFARE.

The *Militär-Wochenblatt* of the 29th March publishes an article with the above title, in which the importance of the subject is fully and ably treated. The service of aviation constitutes one of the finest pages of the recent campaign in Libia. This new means of warfare was employed here for the first time on a large scale and showed its usefulness. This was most creditable seeing how short a time has elapsed since the aeroplane has become an efficacious means of exploration for the commander of troops.

It was held at first that the management of the aeroplane and the reconnaissance should be concentrated in the same person. France especially gave the preference to light and rapid aeroplanes carrying only one person, and possessed a large number of officers of the general staff with the brevet of pilot. The need for flying high so as to escape the fire of artillery and rifles, in addition to the increased skill and vigilance required by the pilots, soon showed the necessity for a special observer. The simplest method would seem to be to select the observers from the pilots. With two pilots in an aeroplane a change of duties between the pilot and the observer would be rendered possible in long and fatiguing runs. In any case it is obvious that the observer should possess a certain fund of technical knowledge. He should, in particular, be acquainted with the mechanism of the motor, and should be able to give competent assistance to the pilot. The observer seated in the aeroplane should trust implicitly in the pilot, and the latter on the other hand, by his guidance of the machine, should work in conjunction with the observer.

The observer's duties are, (1) direction and reconnaissance, (2) throwing of projectiles, and (3) the use of defensive weapons. He should also possess a certain practical knowledge of the management of photographic apparatus, of optical signalling apparatus, and of telegraphy.

To the uninstructed the direction of the aeroplane would seem to be a simple affair. In calm weather it certainly is not difficult to fix the route by means of the map. The network of the ordinary roads and railways, the rivers and lakes, the localities and the woods supply valuable references. On the other hand, the inequality of the ground in comparatively flat districts cannot be recognized from great heights. But directing an aeroplane in a voyage through clouds, rain and mist

is a very different matter. In long distances traversed in very few minutes and with the wind in rear, the number of kilometres is double the number of minutes. If the observer, owing to atmospheric changes, should not be able to see clearly, and loses even for a short time his orientation, it is most difficult to find his position when he can again see the country over which he is passing. The observer should be able to see well, to take in rapidly what he sees, to judge the ground correctly and should be well practised in reading maps.

Observation is difficult over ground which is much intersected by roads, but which is deficient in rivers, water courses, or woods. The observer may easily be mistaken in a road over which he has to pass on his aeroplane, when the locality is devoid of characteristic signs recognizable from a height.

It is only with intense attention that an observer can know his direction with exactness. The pilot of the aeroplane, even in the normal conditions of peace, is not too pleased at having to come down owing to the observer missing his direction; in war, alighting on the field of operations of the enemy would of course mean the loss of the aeroplane.

The duties of the observer differ considerably, and depend on whether the aeroplane is proceeding on strategical reconnaissance, a tactical one, or is subsidiary to the artillery. The strategical reconnaissances are the most important as they compel the aeroplane to fly beyond the field of the enemy's operations. The discovery of the enemy's flanks and of the columns of the supports and reserves are of vital importance. In all cases, the observer must not only see, but must also be able to judge what he has seen. The commander of troops not only wants to learn from the observer that a column is marching on a road, but also to ascertain its strength. A column on the march can be easily discovered in fine weather, but not when the weather is cloudy or rainy. Only a trained and quick eye and a knowledge of the formations of troops can give to the observer an exact idea of what he has seen. It is not easy to recognize the number of the battalions, or to distinguish the mitrailleuses, or the light from the heavy guns, and the difficulty is increased by the dust from the roads. The observer should know the tactical situation exactly, so as to be able to judge on what roads there are likely to be troops on the march, and those on which convoys of parks or other carriages would be moving.

Reconnaissance on the battlefield imposes great stress upon the observer. The field of view is limited, and the discovery of small detachments of troops is so difficult that only an observer endowed with a sound tactical intuition can arrive at a satisfactory conclusion. The battle tactics of various armies and of the different arms, the manœuvring of great units in attack and defence, the rules for the formation of the reserves, should all be familiar to the observer.

Reconnaissances to discover an enemy's artillery require a knowledge of the principles on which the selection of relative positions are based. With a well-conducted reconnaissance of masked artillery, an observer can render valuable service to the commander of the troops.

Reconnaissance and observation by means of the aeroplane will in the future become very useful, especially for artillery. While in the

past it was necessary to expend much ammunition to counteract the enemy's artillery, the position of which was not known, now, by the aid of aeroplane reconnaissances, the position of the masked batteries can be rapidly ascertained under favourable circumstances.

Aeroplane observations of the shots directed on a target, and the transmission by visual signalling of the results, limit the dispersion of fire in a marked degree. But only a trained eye can succeed in noting from a great height the bursting of the shells and the places struck by the shot. In fact only complete instruction in peace time can prepare for a campaign.

Trials have shown that rifle bullets, or chance shrapnel bullets have not caused important damage to an aeroplane, provided that the pilot or the more delicate parts of the machine are not struck. To escape the fire, the aeroplane should rise to as great a height as possible without exceeding the limit from which observations can be made; a limit depending upon the sight and aptitude of the observer. The trials of last year have shown that aeroplanes provided with good apparatus for aiming and throwing bombs, can strike targets covering about the same area as masses of troops in railway stations, on roads, or in the open country.

The services of the observer in an aeroplane have not yet been sufficiently appreciated, the general attention being always fixed upon the pilot to whom all the credit is given. But the success of a voyage of reconnaissance in an aeroplane depends entirely upon the co-operation of the pilot and the observer.

GERMANY.

Conditions required from the Manufactories of Aeroplanes for Military Purposes.—The following conditions laid down by the Inspector of German Military Aerial Navigation for the construction of aeroplanes acquired for military purposes, are taken from the *Militär Zeitung* of the 15th February.

1st.—The aeroplanes must be constructed by German labour and with German material.

2nd.—The aeroplane is to be provided with seats for the pilot and the observer. The seats are to be placed so that the pilot and the observer can communicate easily with one another.

3rd.—The pilot and the observer should be protected as much as possible from the wind, and should have free movement of the arms. The car should have sufficient space for a bomb-throwing apparatus, and for the projectiles, and should permit of free photography.

4th.—It is of great importance that the aeroplane should have automatic stability, and that the working parts should be under easy control.

5th.—The apparatus which conforms to the conditions of military pilotage should have the preference.

6th.—Care should be taken for a good arrangement for the various instruments required for navigation (barometers, compass, timekeeper, etc.). It should be possible during a flight to verify the expenditure of benzine and lubricants.

7th.—The velocity of the aeroplane should be about 90 k.m. per hour.

From such velocity or greater it should be able to descend at 75 k.m. per hour without interfering with the horizontal flight.

8th.—With a view to facility of repairs the dimensions of the aeroplane should be contained within the following maximum limits:—width 15·50 m., length 12 m., height 3·50 m.

9th.—The aeroplane should carry enough petrol for a flight of four hours.

10th.—The motor should not exceed 100 H.P. In equally efficient aeroplanes, the preference will be given to the motor with the lesser power.

11th.—The petrol should be stored in the least dangerous position. The tanks should not be placed either above or below the people in the aeroplane.

12th.—The aeroplane to be provided with apparatus for the march.

13th.—The propeller of the motor should not be at less than 45 c.m. from the ground.

14th.—The aeroplane should be able to ascend 800 m. in 15 minutes.

15th.—On level ground the aeroplane should be able to take flight in a distance not greater than 100 m., and to stop after alighting in not more than 70 m. It should also be furnished with apparatus for changing its direction on the ground.

16th.—Taking flight and alighting should be exhibited at the military aviation ground at Döberitz.

17th.—The aeroplane should be capable of carrying about 200 k.g., including the pilot and observer, but not the petrol, the tools, or the instruments.

18th.—At the trials, the aeroplane should descend with free flight and with shut-off motor from a height of 500 m., and should be able to turn to the right or left.

19th.—The aeroplane should be put together or dismantled with ease and readiness; five men should take two hours for the mounting and one hour for dismantling. It should be capable of being loaded on a railway and on ordinary wagons and its shape should be limited to the dimensions allowed for railway transport and for ordinary roads.

20th.—The aeroplane should not be affected by changes of temperature.

21st.—The different parts of the aeroplane should be easily interchangeable.

22nd.—The motor should be provided with a silencer.

Attainment of great velocity is not considered of very much importance and it is not thought necessary to exceed 90 k.m. per hour. But it is thought necessary to increase the velocity of ascension which is now laid down at 800 m. in 15 minutes instead of 500 metres as hitherto.

E. T. THACKERAY.

RECENT PUBLICATIONS OF MILITARY INTEREST.

REVIEW OF BOOKS.

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HISTORY.

THE SIEGE OF PORT ARTHUR. ITS TACTICAL LESSONS. (Le Siège de Port Arthur. Enseignements Tactiques). By Commandant A. H. 182 pp., 3 maps at end. 8vo. Paris, 1912. L. Fournier. 3s. 4d.

This book deserves the favourable reception which the Continental Military Press has accorded it. It consists of twelve chapters, of which the last is devoted entirely to comments. The narrative chapters, which also contain observations, are clear, concise, and, generally speaking, very accurate; pp. 1 to 12 give a topographical description of the town and its environs; p. 14 shows the state of the principal defences on the outbreak of war. On p. 25 is given the distribution of the defenders along sections of the defensive perimeter, and attention is called to the extensive breaking up of larger units which took place. The author is mistaken (pp. 52 and 54) in ascribing the failure of the Japanese night attacks during the August general assault to searchlights; it was rockets and star shells that produced the effects named along the north-eastern sector of the defences. The author states (p. 67) that the Japanese had emplaced six 11-in. howitzers by September 18. The first round from these pieces was fired by the Japanese on October 1.*

In Chapter VI. (p. 71 et seq.) and elsewhere, when referring to the operations there described, the assaults on the advanced positions about Shui-shih-Ying and the first attack on the 203-Metre Height are placed in the period October 19 to 23, whereas they took place during the corresponding days in September.† From p. 98 it might be inferred that the night attack (November 26 to 27) on Sung-shu Supporting Battery by Nakamura's forlorn hope was part of the original plan for the assault on the north-eastern sector (November 26), whereas it was determined on, only after the failure of the preceding day's frontal attacks against this sector, with the object of turning one flank.

Minor errors are: (General) "Matsumaru" for "Matsumura" (p. 74); (Lieutenant-Colonel) "Okouno" for "Okubo" (p. 102).

The following are noteworthy extracts from the last chapter (Lessons):—

> "Although well informed concerning the Russian defences the Japanese had not realized the solid nature of the provisional works constructed by their adversaries. However well informed an attacker may be beforehand, a reconnaissance at the last moment is necessary in order to ascertain the exact condition of the defences. It is impossible to base a plan of attack entirely on data obtained in peace. The ignorance on the part of the Japanese of the depth of ditches and state of accessory defences, as well as their erroneous anticipations as regards the effect of artillery fire on the works were the cause of heavy losses and initial checks."

As regards artillery, the author holds that the siege proved the need of light indirect fire pieces on the defender's side, in order to reach attacking infantry in dead ground just in front of the works. He states that Krupp is constructing a gun of this nature. Of heavy artillery, he says that it must be mobile, not only with a view to attaining

* See *The Official History (Naval and Military) of the Russo-Japanese War*, Vol. II., p. 547.

† See *The Official History (Naval and Military) of the Russo-Japanese War*, Vol. II., pp. 524—542.

concentrated effect, but also in order to escape damage. "Long range cannot always compensate for mobility; instead of concentrating pieces, relatively safe positions should be sought for them whence enfilade and oblique fire can be brought to bear." On p. 114, when describing the October (*sic*) attacks on the 203-Metre Hill and neighbouring heights (which actually took place September 20 to 23), he quotes an instance where Japanese artillery fire drove out of a position its own infantry which had effected a lodgment. The enemy thereupon re-occupied the position. On p. 170 he refers to this incident and says that it would not have occurred if telephone communication had been established more promptly.

For machine guns in siege warfare he recommends shields; he dwells on the importance of at once placing some machine guns in freshly captured positions; but thinks that for destroying sapheads, etc., they are insufficient unless supplemented by light guns.

He points out that for 3 divisions of 2 brigades each, plus 2 independent brigades, the Japanese had 9, and later 14 engineer companies. According to him engineer units were always kept up to strength by drawing at once on infantry units to replace losses. He then proceeds:—

> "However numerous engineers may be, they cannot perform all the duties usually allotted to their arm. Infantry must execute the bulk of these, under skilled supervision if necessary. Engineers must be used for special and difficult tasks such as mining, constructing and demolishing obstacles, preparations for crossing ditches, making breaches."

Those who think that most field engineering tasks are beyond the capacity and outside the scope of infantry, and who hold that this arm should construct only simple trenches, should bear this lesson in mind.

On p. 84 attention is called to the way in which captured positions were *immediately* put in a state of defence. Elsewhere he says:—

> "Infantry should be as well trained in the use of pick and shovel as in that of rifle and bayonet."

Of cover he says that shelters with light head cover, situated on reverse slopes, can only be damaged by artillery after a long time and at the expense of much ammunition; that, on the other hand, parapets of ordinary fire trenches, within view of attacking guns, are always demolished in the end by artillery projectiles, which, moreover, sweep the trenches. "Enfilade and high angle fire, and also high explosive projectiles brought about the use by both sides of narrow deeply-sunk trenches, with traverses only 15 to 20 ft. apart. This type is now regulation in Russia and Germany." The statement (p. 147) that wire entanglements, of barbed wire where possible, were very extensively constructed is somewhat misleading; actually, owing to lack of material, barbed wire was very little used.

When dealing with infantry tactics he relates how at certain spots, where the opposing troops were very close to each other, the Russians were warned of an impending attack by hearing bayonets fixed. He adds that the necessity of training infantry in the use of the bayonet is one of the chief lessons of the siege "and one not lost upon the Germans."

The following observations on the taking of colours into action echo the impressions of all those who witnessed the fighting in Manchuria:—

> "It is necessary to call attention to the use which the Japanese made of colours* planted on positions captured or on the point of being taken, in order to warn artillery to lengthen its range. Moreover, the sight of the colour had a considerable moral effect on neighbouring troops; *e.g.*, attack on East Panlung, August 22."

Page 175 gives percentages of shell, bullet, and bayonet wounds on the Japanese side.

* It is not clear from this quotation whether the author refers to the regimental colours or to the numerous flags having a red "rising sun" on a white background which Japanese units carried with them.

Of the three maps, Nos. 1 and 2 show the ground, the former east of the River Lunho and the Mandarin Road, the latter west thereof. No. 3 shows the organization (fighting front, parks, communications, etc.) of each army.

These maps—clear and accurate as the text—would puzzle many owing to the nomenclature employed. In order to remedy this difficulty, which is common to all works on the Russo-Japanese War, the author has added an annexure showing various renderings, Russian, Chinese, etc., of place names.

This list, as amended and amplified to adapt it to the requirements of British readers, is reproduced below :—

Literal Translation of or Actual French Rendering in Book.	*Russian Rendering.*	*Name or Names used in British Official History of the Russo-Japanese War, Part III.*	*Japanese Rendering (frequently used in British Attachés' Reports).*
Golden Hill ..	Zolotaya Gora ..	Golden Hill ..	Ogonzan.
Montagne de la Croix	..	Not given. Height South of Fort Pai-yin on which No. 21 Work stands	
Fort No. I.	As in French ..	Fort Pai-yin ..	Hakuginzan. (Lit. "White Silver Hill"). Not Hakougiou Chan, as given in French work.
Grande Montagne ..	Bolshaya Gora ..	Height 686 (ft.) ..	..
Ouvrage No. 2 ..	As in French ..	Chikuan South-East	Higashi Keikwanzan Tonan or To Keikwanzan To Nan. Not Tanki-Kouanchan, as given in French book.
Batterie B	As in French ..	Chikuan Battery ..	..
Batterie derrière B	Zaliternaya ..	Not named ..	"R" Work.
Lunette Kouropatkine	..	Not named. Between Chikuan Battery and Fort Chikuan	"Q" Work.
Petit Nid d'Aigle (Small Eagle's Nest)	Maloe Orlinovoe Gnyezdo	Not named ..	"M" and "N" Works.
Grand Nid d'Aigle (Big Eagle's Nest)	Bolshoe Orlinovoe Gnyezdo	Wangtai. (The Chinese rendering)	Bodai. (Not Vangtai, as given in French Work).
Montagne sans Nom (Nameless Hill)	Bezimyannaya Gora	Not given. An entrenched ridge N. of Naval Ridge	..
Crête Marine ..	Morskoi Kryaj ..	Naval Ridge ..	..
Fort No. II. ..	Same description as French	Fort Chikuan ..	Chikuan North Fort
Caponnière No. 2 ..	Same description as French	..	"P" Work or Fort Ichinohe.
Redoute No. 1 ..	Ditto	East Panlung ..	Banriusan. (The Japanese equivalent of Panlung).
Redoute No. 2 ..	Ditto	West Panlung ..	
Caponnière No. 3 ..	Ditto	..	"G" Work or Hachimakiyama.
Batterie derrière, Les Redoutes	Zaredutnaya ..	..	"H" Work.
Batterie de Mortiers du Loup	Volchya Mortirnaya	..	"I" Battery.
Mont Mitrophane	Mitrofanskaya Gora	Not given. N.W. of Naval Ridge and S. of Fort Erhlung	..

Literal Translation of or Actual French Rendering in Book.	*Russian Rendering.*	*Name or Names used in British Official History of the Russo-Japanese War, Part III.*	*Japanese Rendering (frequently used in British Attachés' Reports).*
Fort No. III. ..	Same description as French	Fort Erhlung ..	Niriusan. (Erlounchan, given in the French Work, is the Chinese equivalent).
Crête Rocheuse ..	Skalisti Kryaj ..	Not given. Height immediately S. of Fort Sung-shu	..
Ouvrage No. 3. (No. 3 Work)	Same description as French	Fort Sung-shu ..	Shojusan.
Batterie du Tertre. (Battery on the Hillock)	Kurgannaya Batarea	Sung-shu, Supporting Battery	Shojusan, New Battery.
Redoute de l'Aqueduc, or Redoute Kouropatkine	Vodoprovodni Redut	Waterworks Redoubt	Fort Kuropatkine, or the Red Redoubt.
Redoute Rocheuse	Skalisti Redut	..	Referred to as "Fort S. of Lunyen." Japanese name for Lunyen is Riugan.
Redoute de la Pagode	Kumirnski Redut	Temple Redoubts A.B.C.D. ("B" is the Work meant)	Referred to as Lunettes S. of Suisiei A.B. (the one meant) C.D.
Chouichiin	..	Shui-shih-ying ..	Suisiei.
Montagne der Loup (Wolf Hill)	..	Feng-huang-shan	Hozan.
Vantaichan (p. 36)	..	Kantashan	Udaizan.
Tchanlinsa (Map 3)	..	Chang-ling-tzu	Choreishi.
Panlounchan ..	..	Heights 305 and 331 (ft.) S.W. and W. of Shui Shih Ying.	Heights 93 and 101 (metres) S.W. and W. of Suisiei.
Montagne de l'Angle (marked 183 metres), *i.e.*, Angle Hill	Uglobaya Gora	174-Metre Hill (thus described also by Attachés)	..
Montagne Longue	Dlinnaya Gora	Namako Yama	Namako Yama.
Montagne de la Division	Divisionnaya Gora	Division Hill ..	Called the Rocky Ridge or Horseshoe Spur in Attachés' Reports.
Montagne Plate (Flat Hill)	Ploskaya Gora ..	Akasakayama ..	Akasakayama.
Montagne Haute (High Hill)	Visokaya Gora ..	203-Metre Hill ..	Nireisan (means two nought three) Royosan or Height 691 (ft.).
Montagne Fausse (False Hill)	Falshvoaya Gora	No name given. Ring Contour S. of 203-Metre Hill	..
Fort No. IV. ..	Same description as French	Fort I-tzu-shan ..	Isuzan.
Ouvrage No. 4 ..	Ditto	Fort An-tzu-shan	Anshizan.
Batterie G	Ditto	An-tzu-shan East	..
Fort No. V. ..	Ditto	Ta-yang-kou North Fort	Nishi Taiyoko.
Batterie D	Ditto	Ta-yang-kou South	Minami Taiyoko.
Ouvrage No. 5 ..	Ditto	Fort Chakuatzu ..	Fort Kokoshi.

BOOKS RECEIVED.

LES ARMÉES DES PRINCIPALES PUISSANCES AU PRINTEMPS DE 1913. La librairie Chapelot vient de publier l'édition annuelle de son ouvrage. Prix, 4 fr.

APERÇU DE LA CAMPAGNE DE THRACE. Colonel Desbrière. Paris. 1913. Chapelot. 1 broch. in-8, 54 p., avec 5 croquis. 1 fr. 25.

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THE ARMY ANNUAL AND YEAR BOOK, 1913. Edited by Lieut.-Colonel H. M. E. Brunker. 3s. 6d. net. William Clowes & Sons, Limited, 31, Haymarket, S.W.

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