THE ROYAL ENGINEERS JOURNAL.—NOVEMBER, 1914. Pages 281–344.

THE ROYAL ENGINEERS JOURNAL.

Vol. XX. No. 5. NOVEMBER, 1914.

CONTENTS.

ROYAL ENGINEERS INSTITUTE.

PATRON.

HIS MAJESTY THE KING, COLONEL-IN-CHIEF.

COUNCIL.

Elected Members.

COLONEL C. F. CLOSE, C.M.G.
COLONEL F. J. DAY.
BT. LIEUT.-COL. R. N. HARVEY, D.S.O.
MAJOR H. BIDDULPH.
CAPT. C. E. P. SANKEY.
BRIG.-GENERAL N. M. LAKE.
BRIG.-GENERAL F. J. ANDERSON.
BRIG.-GENERAL S. R. RICE, C.B.
COLONEL J. F. LEWIS.
MAJOR M. G. E. BOWMAN-MANIFOLD, D.S.O., *p.s.c.*
BRIG.-GENERAL F. G. BOND, C.B.
LIEUT.-COLONEL R. H. H. BOYS, D.S.O.
COLONEL R. U. H. BUCKLAND, A.D.C.
LIEUT.-COLONEL G. H. HARRISON.
MAJOR A. H. W. GRUBB, D.S.O.

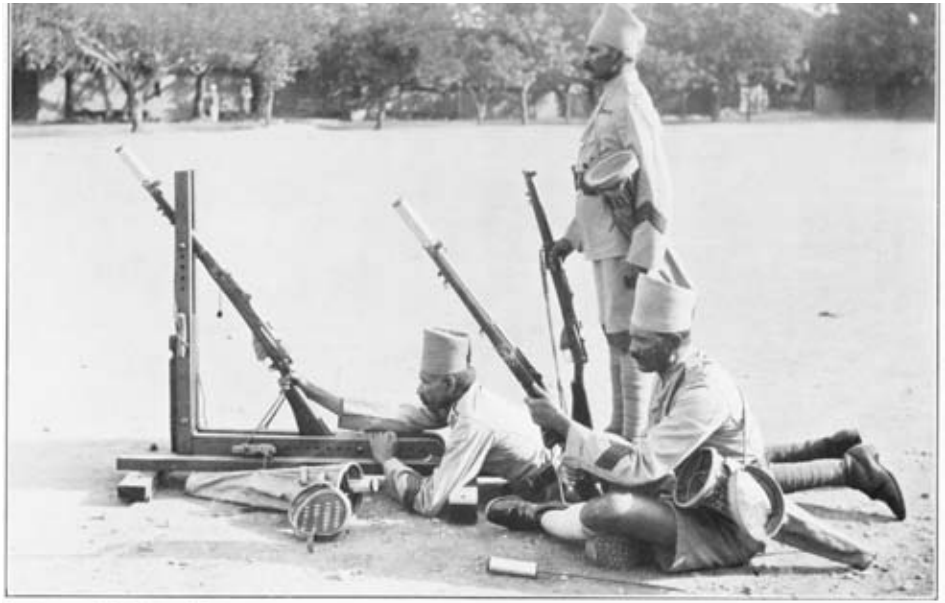
Ex-Officio Members.

MAJOR-GENERAL G. K. SCOTT-MONCRIEFF, C.B., C.I.E., *D.F.W.*
COLONEL J. E. CAPPER, C.B., *C.S.M.E.*
BRIG.-GENERAL G. H. FOWKE, *I. of R.E.*
COLONEL R. S. CURTIS, C.M.G., D.S.O., *A.A.G., R.E.*
COLONEL W. C. HEDLEY.
MAJOR R. H. LEWIS, *Sec., R.E.C.*
MAJOR W. J. JOHNSTON, *C.I.S.*
MAJOR B. H. O. ARMSTRONG.
CAPT. B. H. WILBRAHAM, *A.I. Photography.*

SECRETARY AND EDITOR.
MAJOR W. A. HARRISON *(Ret.)*.

CONTENTS.

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



To show :—I. Method of Firing—(*a*). With fixed rest; (*b*). Without rest. II. Sighting Expedients—(*a*). Indirect aiming with Plumb-Bob Clinometer; (*b*). Direct aiming along Dial Sight Pointer. III. Quiver for carrying Grenades and Range Table inside its lid.

BANGALORE IMPROVISED GRENADE (In use as Rifle Grenade)

AN EXTEMPORIZED RIFLE GRENADE.

THE BANGALORE "UNIVERSAL" GRENADE.

By MAJOR R. L. MCCLINTOCK, D.S.O., R.E.

I. PRELIMINARY REMARKS.

IN the *R.E. Journal*, April, 1913, appeared an article describing "An Extemporized Hand Grenade." The second paragraph of this article ran as follows :—

"Hand grenades are essentially articles which lend themselves to improvisation. The opportunities for their use are so rare, and they are so weighty, bulky, and costly as compared with rifle ammunition, that carting them about with an army in the field would seldom be worth while. They are accordingly most unlikely to be found on the spot when suddenly required."

The same remark applies equally to the "rifle grenade." The two are, in fact, identical, except in so far that the latter, deriving its initial velocity from a charge of cordite instead of from the muscles of the human arm, has a range tenfold greater. This comparatively long range, together with the steep angle of descent and powerful explosive effect of rifle grenades, renders them well adapted for searching cover which is proof against direct fire, and so peculiarly suitable for siege operations. Nevertheless, "Mafekings" are so rare that no army is likely to devote transport to rifle grenades, if it means displacing an equivalent weight of ball ammunition.

The remedy, as before, is to arrive at an efficient type of rifle grenade which need not necessarily be of factory manufacture, but which can be turned out rapidly by the artizans of the R.E. field companies when required in emergency.

The following is the result of a very considerable number of experiments carried out at Bangalore with this object. The principle of propulsion from a rifle by means of a rod down the barrel has been adopted from that used in "Hale's Rifle Grenade," manufactured by the Cotton Powder Co. of Walbrook. The actual *grenade*, however, is a development of the extemporized hand grenade previously described. The outcome, "The Bangalore Improvised Grenade Mark II., Universal Pattern," is not in any way intended to compete with Mr. Hale's invention ; its *rule* is merely that of a cheap and easily extemporized substitute for the latter in case of emergency. Hale's grenade is not so far an article of Ordnance Store supply, and

thus is unlikely to be at hand if required for use in a hurry—at any rate outside Europe. It is further a machine-made article of a pattern impossible to improvise in the field.

Simplicity has accordingly been made the first aim in the design of the Bangalore grenade, so that native workmen may be able to turn it out rapidly with the common tools to which they are accustomed. Similarly, the materials and explosives required in its construction have been rigidly limited to those either actually carried by a field company of Sappers & Miners, or which are readily obtainable in India.

Arrangements have further been made to adapt it for throwing by hand if necessary with either time or percussion fuzes.

II. DESCRIPTION.

1. *Body.*—The body of the grenade is a metal tube, $5\frac{7}{16}$ in. long and $1\frac{3}{4}$-in. internal diameter. The best material for this tube is ordinary block tin, but the metal from kerosine oil tins, biscuit, or cartridge boxes can also be used. A circular hole, of $\frac{3}{8}$-in. diameter, is first punched in this tube with its centre 1 in. from one end, hereafter called "the top." This hole is called the "Safety Port" *b*, *Fig.* 1.

Next, two holes are punched for the "Safety Pin" (*f*, *Fig.* 9). These come $\frac{1}{4}$ in. down from the top of the tube, one directly above the safety port (*b*), and the other diametrically opposite the first. For size of pin, see para. II., 4.

Finally, eight holes are required for the $\frac{5}{8}$-in. screws which secure the wooden plugs (*h*) and (*r*) to the tube (*vide* paras. II., 2 and 8, and *m*.M, *Fig.* 5). The exact position of these is immaterial, as long as they are evenly distributed round the plugs, and do not interfere with the wires (*w*) and (*p*), (*vide Figs.* 6 and 7).

2. *Cartridge Plug.*—This is a cylindrical plug of hard wood (*h*, *Fig.* 5) $\frac{3}{4}$ in. long and of diameter sufficient to fit tightly within the tube. It is placed inside the latter with its top surface $1\frac{1}{8}$ in. from the top of the tube. It is secured in position with four $\frac{5}{8}$-in. screws (*mm*) passing through the tin and distributed evenly round the circumference of the tube.

Through the axis of this plug a hole is previously bored, just large enough to admit and hold a Lee-Enfield, or ·450 revolver, cartridge case (*vide* para. II., 6, and *x*, *Fig.* 5). The top of the hole is slightly countersunk to let the base of the case lie flush with the top surface of the plug.

3. *Striker Plug and Striker.*—This is another cylindrical plug of hard wood (*k*, *Fig.* 5), $1\frac{1}{8}$ in. long and of diameter just sufficient to let it slide freely, but not loosely, within the tube. It has a nail or screw (*i*) fixed axially in one end, and then filed to a blunt point pro-

jecting ¼ in. from the wood. Now, if this plug is dropped into the top of the tube, the point (*i*) will rest on the cap (*x*). The other end of the plug (*k*) will still project ⅜ in. from the top of the tube, and a blow on it will explode the cap.

4. *Safety Pin.*—To prevent this happening accidentally, the point of the striker (*i*) is raised ⅛ in. above the cap and held there by means of the "safety pin" (*f*).

This is a piece of stiff iron wire (say, telegraph wire 75 lbs. to the mile, or a 2-in. wire nail) which passes through the two holes in the tin tube, and also through a hole across the plug (*k*), thus locking it to the tube. This pin can be withdrawn at will.

5. *Retaining Wire.*—If the safety pin were thus withdrawn, and the grenade inverted, the plug (*k*) would fall out. To prevent this, it is secured to the tube by the "Retaining Wire" (*e*, *Fig.* 1). A tack is driven into the top of the plug (*k*), a turn of the wire taken round this, and the two ends then similarly made fast to any two opposite screws *mm*. Any thin wire, or string, will do.

This arrangement prevents the striker plug (*k*) leaving the grenade accidentally after the safety pin is withdrawn, but still permits it (under a blow) to descend on the cap (*x*) and explode it.*

6. *Explosive Charge.*—Below the cartridge plug (*h*) comes the charge (*ss*), composed of two 1-oz. gun-cotton† primers.‡ That next the cartridge plug has a Nobel's octuple detonator (*y*) fixed in it, the shank projecting up as far as it will go into the cartridge case. As a 303 case is longer than the cartridge plug, it must be cut down with a file to the necessary length (¾ in.). A ·450 revolver case can equally well be used, and requires no cutting. The whole of the cordite, or other explosive, should be removed from the case, the cap alone being sufficient for the ignition of the detonator.

The detonator being a good deal longer than a single primer, it will project both upwards into the case, and downwards for a certain distance into the lower of the two primers, thus skewering them together. To prevent the detonator from shifting downwards under the shock of discharge, the remainder of the central hole of the lower primer should be closed with the wooden "filler" (*d*, *Fig.* 5).

* NOTE.—To prevent this happening prematurely at the moment of discharge, there is a further safety arrangement. This, however, it will be more convenient to describe later, *vide* para. II., 11 and 12.

† NOTE.—It will be noted that the O.P. *cylindrical* 1-oz. gun-cotton primer is shown in *Plate* as this is still issued in India. There is no difficulty, however, in adapting the N.P. *conical* primer to the same use.

‡ NOTE.—Dynamite can also be used. First a tin or paper cylinder is made of the same size as the two primers, *i.e.*, 2½ in. long by 1¼-in. diameter. Dynamite is warmed till plastic and pressed into this cylinder, which will hold about 3 ozs. A hole is made for the detonator in the usual way, and this cartridge used in lieu of the two primers.

7. *Projectile.*—To increase the man-killing powers of the grenade, a segment projectile (*nn*) is added. This consists of 22 segment bars (*n*), each 2½ in. long (*i.e.*, the same length as the two primers), made of $\frac{5}{16}$-in. square iron rod. To assist these bars in breaking up into uniform segments on explosion, each is notched in two places with a cold chisel, thus giving 66 segments, running about eight to the ounce. These segment bars are inserted between the primers and the tin tube, so as to surround the former completely (*vide Fig.* 6).

8. *Bottom Plug.*—The lower end of the tube is closed, and the whole contents kept snug, by a third plug of hard wood (*r*), 1 in. long and of the same diameter as the cartridge plug (*h*). This is faced on the upper surface with three tin discs (*c*), secured to it with a couple of tacks (*uu*).* The plug is thrust into the tube from the lower end, and should grip the charge tightly between itself and the plug (*h*). It is secured in this position with four $\frac{5}{8}$-in. screws (MM) distributed evenly round its circumference. Through the axis of the plug is bored a ¼-in. hole, and round it, as centre, in the upper surface of the plug is countersunk a recess ½ in. square and $\frac{3}{16}$-in. deep. This hole and recess are for the attachment to the grenade of the "Tail Rod" (*a*). A tin clip (FS, *Fig.* 8) is secured to the bottom surface of this plug with a tack (U) and the "Tail Rod" (*a*) which passes through it.†

9. *Tail Rod.*—This is a round mild steel rod, ¼ in.‡ in diameter and 18 in. long. It is threaded for 1¼ in. at the top end to take a square iron nut of ½-in. side. Two such nuts are required. One the "Bottom Nut" (T) is screwed down the rod till only 1 in. of the threaded end protrudes from it. The other, the "Top Nut" (*t*), is placed in the recess in the upper surface of the plug. The threaded end of the rod is then inserted into the hole in the plug and screwed through it into the top nut (*t*), till its upper end is flush with the upper surface of plug and nut. The bottom nut (T) is then screwed up till the plug (*r*) is gripped rigidly between the two nuts. The lower end of the tail rod (*a*) is filed to a neck (*vide Fig.* 5) to fit into the "Gas Check" (*g*).

10. *Gas Check.*—This is the front portion of a hard-nosed ·303 bullet, cut off about $\frac{5}{8}$ in. above the base (*g*, *Fig.* 5). If cut off at the proper point it will just go down the barrel of a rifle from the muzzle. This gas check is fixed to the lower end of the tail rod (*a*) by drilling a hole in the nose of the bullet, inserting the end of the tail rod (which should be coned as shown), and securing in position with a drop of solder. A small tin disc (*v*), soldered to the base of

* NOTE.—These tin discs act as a wad between the end of the tail rod (*a*) and the charge. They prevent the former being driven into the latter, should the threads of the nut (T) strip when the rifle is fired.

† NOTE.—For the object of this clip, *vide* para. II., 11.

‡ NOTE.—This is the nearest commercial size to ·303 calibre.

the gas check, is useful in protecting the lead at the moment of discharge. It tends to produce more regular results, but it is not indispensable.*

11. *Safety Spring and Plate.*—Now, if the grenade has its tail rod inserted into the barrel of a rifle, and is propelled from it so that it may land on its head, explosion should result, if the safety pin has been duly removed. But, as by the removal of the latter the striker point would, at the moment of discharge, be free to impinge on the cap (*x*), the inertia of the plug (*k*) would tend to make it do so, and produce a premature explosion at the muzzle. The following device has accordingly been adopted to protect the cap from the striker point until the inertia of the plug (*k*) shall have spent itself.

A 8½-in. length of untempered steel wire, say, S.W.G. 20, (VWXYZ in *Figs.* 1, 3, 4, 5, 8 and 9, and " w " in *Figs.* 6 and 7), is bent at right angles at X, 2½-in. from one end. The long end of the wire is passed down the whole length of the interior of the grenade, being confined between the plugs (*h*) and (*r*) and the side of the tube by being housed in a slight notch made in each of the former. On emerging from the bottom plug at Y, it is again bent at right angles in the same plane, as shown in *Fig.* 5. The shorter end, XWY, now lies along the top surface of the cartridge plug. It is next bent at right angles in this plane at W, 1 in. from X and the tin " Safety Plate "† (*j*) soldered across this angle as shown (*Figs.* 3 and 4). Finally the end V is bent into the shape of a hook, and adjusted so that it will project slightly through the safety port (*b*) when the plate (*j*) is over the cap (*vide Fig.* 3).

Now taking the length of wire XY within the tube as an axis, the portion YZ can be rotated round this axis, either to left or to right (*vide Fig.* 8), till the end Z will approach the tail rod (*a*) on one side or the other. This end YZ can then be secured in either position by being hitched beneath either the small lug " S " or the large lug " F " of the tin clip FS, which is provided for this purpose.

The short end VWX of this same wire, which carries the plate (*j*), would naturally strive to conform to this movement of the end YZ. If it is restrained from so doing, the portion XY is placed in torsion. The wire being steel, as soon as the restraint is removed, the end VWX will conform as far as it can. It can only move within the limits of the tube, but it can still move far enough to assume either of the positions shown in *Fig.* 3 or 4. When it is in the former, the

* NOTE.—This gas check causes no damage to the rifle barrel. Over 200 grenades have been fired from one rifle at Bangalore without any ill-effects.

† NOTE.—Two thicknesses of block tin, soldered together, with the wire between them. With this plate between striker and cap, the grenade can be dropped on its head over 15 ft. on a hard surface without exploding.

plate (*j*) protects the cap (*x*) from the striker. When it is in its *Fig.* 4 position, however, the cap is exposed.

This length of wire, VWXYZ, is called the "Safety Spring," and the end VWX is restrained when necessary in the *Fig.* 3 position by means of the "stop" (*p*).

12. *The Stop* (*p*).—The stop (*p*) is an 18-in. length of the same wire, bent in the middle to hairpin shape. It, too, runs along the inside surface of the tube, being similarly confined in a shallow notch made in each of the three plugs (*vide Plate*). It is so arranged as to cross the centre of the safety port (*b*) on the inside, and so engage the hooked end V of the safety spring, thus locking the latter in the position shown in *Fig.* 3. The withdrawal of this stop in a downward direction will obviously release this end V. Such withdrawal, however, is impossible as long as the safety pin (*f*) is in position, as this pin passes through the bend of the "hairpin," and so secures it in the grenade.

The two free ends of the "hairpin" stop are connected together below the grenade by the "Clutch" (*q*) (*vide Figs.* 1 and 9). This is a piece of tin 1 in. square, slightly bent across the middle, with two holes punched in it large enough to receive the two ends of wire side by side. The object of this form of connection is described in para. V., 6.

Now, when the end YZ of the safety spring is turned round and hitched beneath the small lug "S" (*Fig.* 8), the spring is in its "*Safe*" position. The torsion of the wire XY keeps the hooked end V in the safety port (*b*), and the plate (*j*) accordingly above the cap (*x*). The stop (*p*) passes through the hooked end V, but is doing no work, as this end has at present no tendency to leave the hole (*b*). If, however, the end YZ be turned round the reverse way and hitched beneath the large lug "F," the torsion of the wire XY is in the opposite direction, and tends to make the portion VWX assume its *Fig.* 4 position. It cannot do so, however, as the hooked end V is now held by the stop (*p*). The safety spring is now in its "*Fire*" position.

Should, however, the stop (*p*) be withdrawn downwards (the safety pin (*f*) having first been removed) the end VWX will at once fly across to its *Fig.* 4 position, and uncover the cap.

The effect of this safety device is described in para. V., 2.

13. *Weight and Length.*—The total length of the grenade, including tail rod, is $23\frac{3}{16}$ in. Its weight (loaded with gun cotton, and made of block tin and teak wood) is 1 lb. 5 oz., composed as follows:—

Charge (gun cotton, detonator, cartridge case) ..	$2\frac{1}{2}$ oz.
Projectile	$8\frac{1}{2}$,,
Tube, tail rod, blocks, etc.	10 ,,
Total	1 lb. 5 oz.

III. Preparing for Use.

(1). The lower end of the safety spring YZ is unhitched from beneath the small lug "S" (the grenade is carried in its "*Safe*" position), turned round the axis XY in three-fourths of a circle, and hitched beneath the large lug "F," in its "*Fire*" position.

(2). The tail rod is introduced into the rifle muzzle and the grenade pressed down till the lower surface of the bottom plug rests on the "boss for ring of bayonet" of the rifle (o, *vide Fig.* 9).

The grenade will not go fully down unless the instructions of para. (1) above have been obeyed, as otherwise the rolled end, Z, of the spring interposes between the boss and the bottom plug. This prevents the grenade being fired with safety spring at "*Safe.*"

(3). The two returns of the stop (*p*), projecting below the grenade, are slightly separated and passed one each side of the right-hand horn of the foresight protector (*l*). The clutch (*q*) is now slid up the wires as far as possible, and straightened out between thumb and fingers to grip the wires tightly (*vide* V., 6, and *Figs.* 1 and 9).

(4). The propelling cartridge is now inserted into the chamber of the rifle. This is a service ·303 cartridge *with bullet extracted.*

(5). Last of all the safety pin (*f*) is removed, and the grenade is said to be "*Set.*" It is now ready to fire.

IV. Firing Positions.

Firing is best done from the sitting position, with the legs crossed and the butt resting on the ground between them. The left hand should grasp the rifle near the backsight, while the right holds the small of the butt, forefinger on trigger, *vide Photo.* The necessary elevation for any range is given in para. VI., and the means of obtaining it in para. VII. For deliberate work, such as siege operations, more accurate results can be obtained by using some sort of fixed rest, such as that also shown in the *Photo.*

V. Action.

(1). On explosion of the propelling cartridge, the gas check (*g*) sets up on the coned end of the tail rod (*a*), sealing the bore to the escape of gas. This would otherwise be considerable, as the diameter of the bore is ·303 in., while that of the rod is only ·25 in. The pressure thus obtained expels the rod, which drives the grenade before it and at the same time acts as a tail to keep it head first during flight.

(2). As the grenade begins to move away from the muzzle, the stop (*p*) is restrained from accompanying it by the clutch (*q*), which is held behind the right-hand horn of the foresight protector (*l*),

and has a frictional grip on the two wires of the stop. The latter is accordingly pulled out of the grenade. This sets free the end V of the safety spring, which is in strong tension towards its *Fig.* 4 position. It would at once assume the latter were not the striker point (*i*) at that moment bearing heavily down on the plate (*j*) under the inertia of the plug (*k*). *As long as any pressure is exerted by the striker towards the cap, the plate* (*j*) *is thus held in place above the cap and the grenade is safe.*

As soon, however, as the plug (*k*) has lost its initial inertia, this pressure relaxes, the wire VWX whips across to its *Fig.* 4 position, and the plate (*j*) no longer covers the cap. The grenade, therefore, starts "*Safe*" but becomes active during flight.

(3). On impact with the ground, the weight of the grenade drives it forward on to the striker plug (*k*). The point of the striker (*i*) penetrates the cap (*x*) and the explosion of the latter fires the detonator (*y*) and so the charge (*s*).

(4). If the grenade after being "*Set*" is not fired, it is again rendered safe for carriage as follows :—

(*a*). Re-insert the safety pin, being careful that it both locks the striker plug (*k*) to the tube, and passes under the bend of the "hair-pin" end of the stop.

(*b*). Remove grenade from rifle and transfer the lower end of the safety spring from beneath the large lug "F" to beneath the small lug "S."

(5). It will be observed that, *as long as the safety pin is in position*, the stop (*p*) serves to attach the grenade to the rifle. This enables the grenadier to carry his rifle in any position without the grenade falling out.

(6). The object of the frictional connection of the two lower ends of the stop (*p*) by the clutch (*q*) is to avoid the danger of bursting the rifle, should the grenadier discharge it without first removing the safety pin. The abnormal pressure thus obtained overcomes the frictional grip of the clutch, and the stop (*p*) is released from the rifle by slipping through the former. The grenade, of course, falls blind, as the stop remains in it.

The frictional grip of the clutch is increased or reduced by straightening or bending the tin plate between the fingers. When straightened as much as possible by the aid of the naked fingers of one hand alone, the rifle can just be lifted by the grenade without the clutch beginning to slip, and this is the friction worked with at Bangalore.

VI. RANGE.

On a calm day, with the rifle elevated at 45 degrees, and the service cartridge (31½ grs. cordite), the grenade will fall about 230/250 yards from the muzzle. Shorter ranges down to about

130/140 yards can be obtained by continuing to elevate the rifle till 70 degrees is reached.

To get still shorter ranges it is necessary to use reduced charges. The service cartridge contains 60 strings of cordite. Half and three-quarter charges are easily made by removing 30 and 15 strings respectively, and replacing the wad. By the combined use of these reduced charges and elevations between 50 degrees and 70 degrees, any range down to 50 yards can be obtained, *vide* the following approximate range table :—

Rifle Grenade.				Hand Grenade.
Elevation.	Charge.			
Degrees.	Full.	¾	½	
30	180	—	—	Can be thrown up to 40 yards.
40	220	—	—	
45	240	—	—	
50	220	180	90	
60	180	140	70	
70	140	100	50	

N.B.—A fresh breeze will make a difference of quite 20 yards in any direction.

For ranges less than 50 yards the grenade must be thrown by hand, *vide* para. VIII.

Although the elevation 30 degrees is given above, the use of elevations of less than 40 degrees is not recommended, as the grenade possesses its maximum efficiency when dropped as nearly as possible vertically into the target.

On a calm day the maximum range is given by an elevation of 45 degrees. With a head wind, however, 40 degrees is found to produce the best results, while with a following wind an elevation of 50 degrees gives the longest shots. From this it is evident that ascertaining the "error of the day" is a necessary preliminary to accurate practice.

VII. Sighting Expedients.

(1). *For Direct Aiming.*—When the target is visible and on much the same level as the firer, the dial sight pointer of the rifle can be used as a rough sight. If the "index point of pointer" be adjusted to the ranges given in the following table, and *aim be taken along the*

arm of the pointer at the target, the rifle will be elevated approximately at the angles shown :—

Range on Dial Sight Plate.	Angle of Elevation of Rifle.
2,500 yards	30 degrees
2,550	40 ,,
2,600	50 ,,
2,650	60 ,,
2,700	70 ,,

(2). *For Indirect Aiming.*—A clinometer is improvised on the rifle as follows:—The dial sight pointer is placed at right angles to the axis of the barrel, with the "bead pointer" upwards. A piece of string about 6 in. long has one end tied to this bead, any small weight attached to the other, and allowed to hang vertically down. The rifle is now inclined successively at the various angles of elevation given in the range table (*vide* para. VI.), which is easily done by aid of the Abney's level carried in the equipment of a field company of S. & M. The wood of the fore-end of the rifle is then marked with a knife, or with paint, where the above improvised plumb-line crosses it at each elevation. Once this has been done, any required elevation is obtained by elevating the rifle till the plumb-line again touches the required mark. This is the most suitable arrangement if the rifle is to be fired from a fixed rest, *vide* para. IV. (*vide Photo*).

VIII. Use as a Hand Grenade.

It will be seen from para. VI. that for ranges of less than 50 yards, the grenade must be thrown by hand. When so thrown it can be used either with percussion or time fuze, certain modifications being necessary in either case.

(1). *Percussion Fuze Hand Grenade.*—To adapt the rifle grenade for this purpose it is necessary to remove and discard the bottom plug (*r*) with the tail rod (*a*), and substitute the "Handle" (*z*), *Fig.* 10. This is made of any light wood, and is quite sufficiently secured to the tube by two of the screws MM. Attached to this handle with tacks or twine is a calico "tail," 18 in. to 2 ft. long and 6 in. wide, which serves to keep the grenade head first during flight.

The stop (*p*) is also removed, and the safety spring VWXYZ either set permanently in its *Fig.* 4 position or (better) removed altogether.

To throw the grenade, the tail is balled up in the throwing hand, which grasps it and the handle together, and the grenade cast overhand at an angle of 30 or 40 degrees, just as a stone would be thrown. It can be thrown about 40 yards by the ordinary unpractised man, and 50 by an expert.

(2). *Time Fuze Hand Grenade.*—In this case the striker plug (*k*), the safety pin (*f*), the stop (*p*), and the cartridge (*x*), are discarded

altogether, while the safety spring VWXYZ is either set permanently open, or also removed. A piece of safety fuze of suitable length ($3\frac{1}{2}$ in. will burn for about 7 seconds) is fitted in the detonator (v), and the end led out through the hole in the plug (h) and the top of the tube.

All that now is necessary is the ignition of this end of fuze and the prompt hurling of the grenade. The handle (z) may be fitted as before, or the grenade may be thrown by the tail rod (a), as it is immaterial whether it falls on its head or not.

IX. Efficiency.

The weight of charge, and weight and nature of projectile given above are the outcome of a large number of experiments. As an example of the action of these grenades the following experiments may be quoted :—

A grenade was exploded in the centre of a circular paling of wood, whose sides were 6 ft. high, and made of planks 2 in. thick. Thirty-two holes were blown clean through the 2-in. teak by segments. In addition, there were 37 other hits by segments, or parts of segments, which did not amount to penetration, and 84 minor hits from pieces of tin, etc. Of the 63 planks on end which formed the paling, 10 alone were not touched.

X. Sensitiveness.

The following also are the result of experiments at Bangalore :—

1. *Rifle Grenade.*—A rifle grenade will explode on pitching in mud or water.

2. *Hand Grenade.*—After removal of the safety pin, a grenade will explode if dropped 2 ft. on its head on hard ground.

XI. Carriage in the Field.

The most convenient way of carrying the grenades in the field is in a "quiver" made of canvas, very much like a small golf bag, but with a flap over the mouth to retain the grenades and exclude the rain.

Six grenades are a suitable number for the quiver, whose dimensions are then as follows :—Length 2 ft., diameter at mouth 7 in., diameter at bottom 3 in. The bottom is closed with a piece of wood 3 in. in diameter and $1\frac{1}{2}$ in. thick, in whose upper surface is bored a hole 2 in. across and $1\frac{1}{4}$ in. deep. The six grenades stand head up in the quiver, and their six gas checks are placed in this hole, and so protected from accidental damage. There is room also in this quiver for the six handles (z) *vide* para. VIII., if required. The range

table (*vide* para. VI.), can be conveniently inscribed on the under side of the flap, for reference in the field.

The whole, which weighs about 9 lbs. full, is slung over the right shoulder with a strap, and rests between the left arm and side (*vide Photo*).

XII. TIME, COST, AND LABOUR.

Table A is the result of actual experiments at Bangalore. It will be seen that the time and labour consumed in the manufacture of one of these grenades amounts to 4·8 man-hours.

The materials necessary for the construction of any number of grenades can be ascertained from the same Table. It should be remembered, however, that the various materials were usually chosen rather because they happened to be on hand in the S. & M. Workshops at Bangalore, than from any special suitability. Many other materials could be used, the dimensions of the grenade being varied, *mutatis mutandis*. For instance, if $\frac{3}{16}$-in. square iron rod is not available for projectile, a very slight increase of diameter in the grenade will allow pieces of $\frac{1}{4}$-in. round steel rod, such as is required for the tail rod (*a*), to be used instead.

From the same Table the cost is seen to be approximately Rs.1/8/0 per grenade, including labour and all material and explosives. The price quoted for the actual "Hale's Rifle Grenade" varies from 10s. to 17s. according to pattern.

My thanks are due to Regtl.-Sergt.-Major King, R.E., of the 2nd (Q.V.O.) S. & M., who has given me the greatest assistance in the whole of the experiments connected with the above grenade.

TABLE A.—Details of Time and Cost of Manufacture of 24 Bangalore Improvised Grenades. Mark II. (Universal Pattern).

		Hours Work. 1 Man. 1st Rate.	No. or Quantity.	Rate. Rs.	Rate. A.	Rate. P.	Per.	Amount. Rs.	Amount. A.	Amount. P.
	1. *Tinsmiths' Work.*									
Labour.	Making Body Tubes and punching holes (*b*, M and *m*)	39	—	—	4	0	8 hours	1	4	0
	,, Wad Discs (*c*)									
	,, Safety Plates (*j*) and soldering to Safety Springs (VWXYZ)									
	,, Bottom Clips (FS)									
	,, Clutches (*q*) for Stops (*p*)									
	,, Gas-Check Discs (*v*) and Fixing to Gas Checks									
	Fixing Gas Checks (*g*) to Tail Rods (*a*)									
Material.	Tin sheet medium 20 in. × 14 in., for the above	—	4 sheets	—	6	3	sheet	1	9	0
	Solder do.	—	½ lb.	1	3	0	lb.	—	9	0
	Fluxite and charcoal do.	—	Inappreciable	—	—	—	say	—	4	0
	2. *Smiths' Work.*									
Labour.	Cutting and Notching Segment Bars (*n*)...	27	—	—	4	0	8 hours	—	14	0
	,, Tail Rods (*a*); screwing for Nuts (T and *t*) and coning for Gas Checks (*g*)									
	,, Gas Checks from bullets and drilling for Tail Rods ...									
Material.	Iron Rod $\frac{3}{8}$ in. × $\frac{3}{8}$ in. for 528 Segment Bars (*n*)...	—	16½ lbs.	8	8	0	cwt.	1	3	6
	Steel Rod ¼ in. round for 24 Tail Rods (*a*)	—	7 lbs.	42	0	0	,,	2	10	0
	Nuts, iron, square, ½-in. side, for ¼-in. bolt (T and *t*)	—	48	—	4	0	doz.	1	0	0
	(For Bullets for Gas Checks, see § 4 infra).									
	3. *Carpenters' Work.*									
Labour.	Making Plug Striker (*k*)	42	—	—	4	0	8 hours	1	6	0
	,, ,, Cartridge (*h*)									
	,, ,, Bottom (*r*)									
	Fixing Strikers (*i*) in Striker Plug (*k*)									
	,, Tail Rods (*a*), Bottom Clips (FS) and Wad Discs (*c*) to Bottom Plugs (*r*)									
	Assembling grenades and adjusting Safety Spring (VWXYZ), Stops (*p*), Retaining Wires (*e*) and Safety Pins (*f*)									

TABLE A.—*Continued.*

		Hours Work. 1 Man. 1st Rate.	No. or Quantity.	Rate. Rs.	A.	P.	Per.	Amount. Rs.	A.	P.
	3. *Carpenters' Work—Continued.*									
Material.	Teak wood, for Plugs (*k*), (*h*) and (*r*)	—	¼ cubic foot	3	8	0	c. ft.	—	14	0
	Wire, Steel, S.W.G. 20 for Safety Spring (VWXYZ) and Stop (*p*) ...	—	¼ lb.	1	4	0	lb.	—	5	0
	,, Iron, Telegraph, 75 lbs. for Safety Pin (*f*)	—	Inappreciable	—	—	—	say	—	1	0
	,, Brass or Copper, S.W.G. 20, for retaining Wires, 8 in. long each									
	Screws, Iron, ⅜ in. (Size No. 4) 192, for fixing Plugs (*h* and *r*) to Tube	—	1½ gross	—	6	6	gross	—	9	9
	,, ,, ⅝ in. (Size No. 7) 24, for Striker Points (*i*)... ...									
	4. *Loading.*									
	(Should be done by an officer, or other responsible person).									
Labour.	Inserting Cartridge Cases, (*x*) in Plugs (*h*)	2	—	—	—	—	—	—	—	—
	,, Detonators (*y*) in Primers (*s*)									
	,, Filler (*d*) ,, ,, ,, ...									
	,, Primers and Segments (*n*) in Tube									
	Fixing Bottom Plugs (*r*) in Tubes									
Material.	Cartridges, L.M. ·303 (*x*)	—	24	55	0	0	per 1,000	1	5	2
	[Bullets of these Cartridges make the Gas Checks (*g*)].									
	Detonators, Nobel's No. 8 (*y*)	—	24	9	0	6	per 100	2	2	8
	G.C. Dry Primers 1 oz. (*ss*)	—	48	—	6	0	each	18	0	0
	5. *Additional Fittings for Use as Hand Grenade.*									
	Carpenters' Work.									
Labour.	Making 24 wood handles (*z*)	6	—	—	4	0	8 hours	—	3	0
	Attaching calico tails									
Material.	Dealwood for Handles (*z*)	—	¾ cubic foot	3	0	0	c. ft.	—	12	0
	Calico 1 yard wide, for tails (18 in. long each and 6 in. wide) ...	—	2 yards	—	6	0	yard	—	12	0
	String, for attaching tails to Handles	—	Inappreciable	—	—	—	say	—	0	3
	Total for 24 Grenades ...	116 hours	... ...				... Rs.	35	12	4

Therefore a single grenade costs approximately Rs. 1/8/0, to make, including labour and explosives, and its manufacture takes 4·8 man-hours.

NOTE.—The above Table is for the manufacture of the *Universal* grenade, convertible for use either as *Rifle* grenade or *Hand* grenade. Should the former only be required, then the operations of §5 would be entirely omitted. If the latter only, then the manufacture of the following parts would be altogether dispensed with:—(*a*), (*b*), (*c*), (*g*), (*j*), (*p*), (*r*), (*u*), (*v*), (T & *t*), (FS), (VWXYZ), and half the Screws (M & *m*)—to the considerable economy of time and material.

BANGALORE IMPROVISED GRENADE, MARK II. UNIVERSAL PATTERN.

Figs. 1—9, Rifle Grenade. Fig. 10, Hand Grenade.
THREE-QUARTER SIZE.

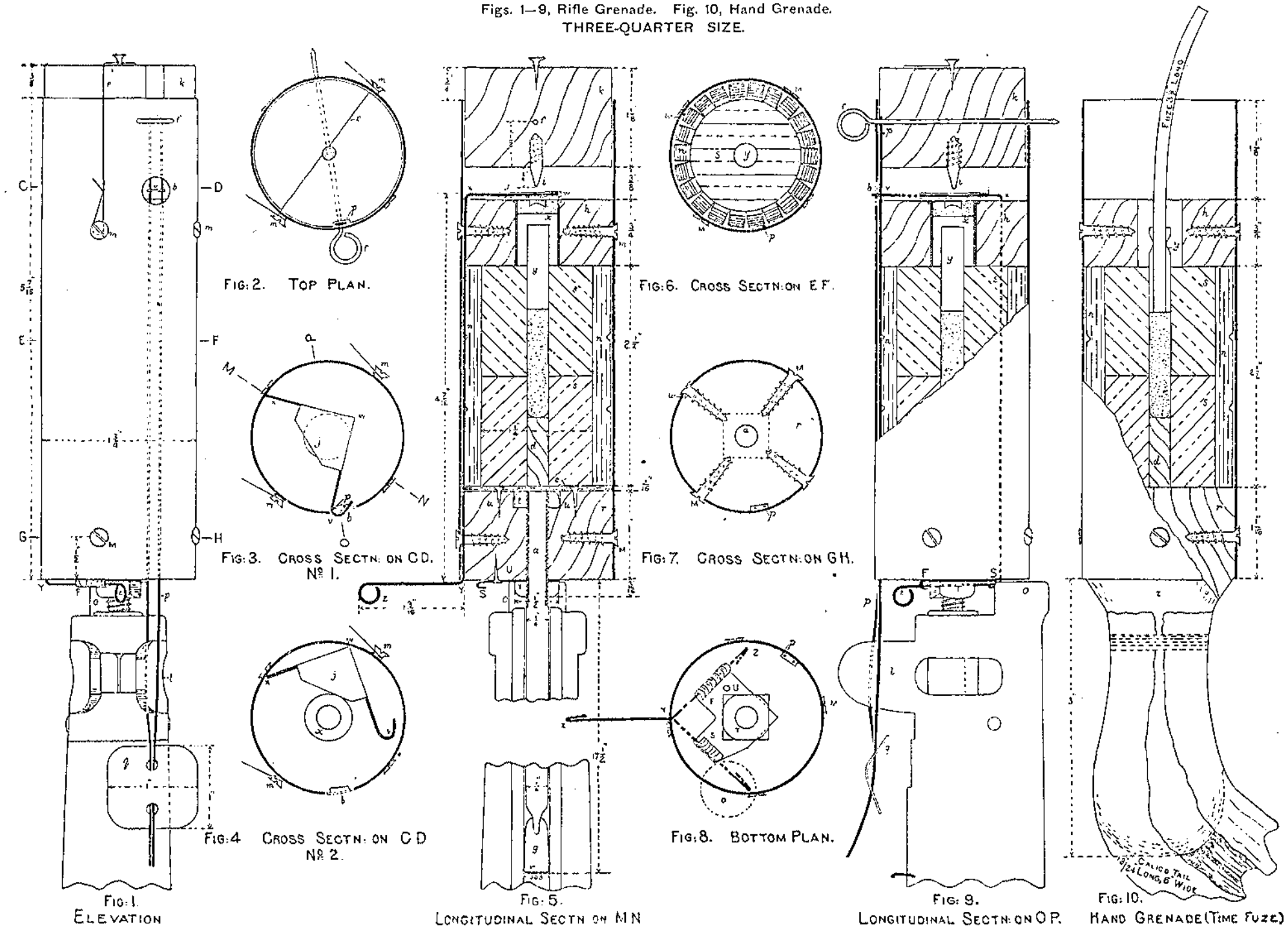


FIG: 1. ELEVATION

FIG: 2. TOP PLAN.

FIG: 3. CROSS SECTN: ON C D. № 1.

FIG: 4 CROSS SECTN: ON C D № 2.

FIG: 5. LONGITUDINAL SECTN ON M N

FIG: 6. CROSS SECTN: ON E F.

FIG: 7. CROSS SECTN: ON G H.

FIG: 8. BOTTOM PLAN.

FIG: 9. LONGITUDINAL SECTN: ON O P.

FIG: 10. HAND GRENADE (TIME FUZE)

a Tail Rod.
b Safety Port.
c Tin Wad Discs.
d Wooden Filler.
e Retaining Wire.
f Safety Pin.
g Gas Check.
h Cartridge Plug.
i Striker.
j Safety Plate.
k Striker Plug.
l Foresight Protector (on rifle).
mm ½-in. Screws, Cartridge Plug.
MM " " Bottom Plug.
nn Segment Bars.
o Boss for Ring of Bayonet (on rifle).
p Stop.
q Clutch.
r Bottom Plug.
ss 1-oz. G.C. Primer.
t Top Nut.
T Bottom Nut.
uu Tacks securing Tin Wad Discs.
U " " " Tin Clip FS.
v Gas Check Disc.
w Safety Spring (in section).
VWXYZ " in elevation, and plan.
x Cartridge Case.
y Detonator.
z Handle.
FS Lugs on Tin Clip.

SIEGES AND THE DEFENCE OF FORTIFIED PLACES BY THE BRITISH AND INDIAN ARMIES IN THE XIXth CENTURY.

(*Continued*).

By COLONEL SIR EDWARD T. THACKERAY, V.C., K.C.B. (LATE R.E.).

THE GREAT SIEGE OF SEBASTOPOL, 1854–55.

When the Allies in Bulgaria finally determined upon the western and not the southern coast of the Crimea as the place of their landing, it was taken for granted, though not perhaps committed to writing, that this resolve carried with it the ulterior design of moving southward along the coast, and operating against the northern defences of Sebastopol. The assumption was a natural one; since Sebastopol Bay made it impossible for an invader established on the western side to attempt an attack, except from the north.

Long before, and prior indeed to the actual commencement of the war, Capt. Drummond, of the *Retribution*, had ventured to give firm counsel upon this subject; and the knowledge which he had acquired while lying at anchor in the roadstead of Sebastopol enabled him to speak with great weight. Both Capt. Drummond and Capt. Willes (who was acting with him at the time of the survey) conceived themselves able to report decisively in favour of an attack upon the Star Fort as a means of achieving the great object of the Allies. If, even before the invasion they were warranted in fixing upon the Severnaya or "North Side" as the true point of attack, much more was it now, September, 1854, to be concluded in favour of such a choice, since the Allies by their successful landing, followed up by the result of the battle of the Alma, had fastened already on that very part of the coast from which they could conveniently assail the Star Fort; and moreover it was fairly to be reckoned, that if the Allies should go straight to their end, without turning aside or interposing fresh marches between themselves and the enemy, the momentum they had gathered from their victory might carry them through the defences without necessitating a siege.

Bivouacking now on the Belbec, the Allies were at last within gunshot of the fortress they had come over sea to confront; and

the period during which it had been possible to keep the question open being close to its end, they were called upon to determine whether they would at once prepare to deliver the attack, or give up their old plan of campaign.

On the northern side of Sebastopol Bay, and facing the sea forts which covered the town and harbour, there were not only other sea forts of great size and power but also some barracks, some magazines, and a factory worked by the Government. This aggregate of buildings, or the quarter on which they stood, was known amongst Russians by the name of the Severnaya and by the English as the "North Side."

The sea forts were not so constructed as to be the means of defence against an invader coming down upon them by land from the north; but on the high ground above, though still at a distance of only a few hundred yards from the bay, there was a dilapidated work, called by the English the Star Fort, which had been constructed in 1818. It was of octagonal shape with sides from 190 to 230 yards long; and of its eight angles, every other one was supplied with a little bastion or caponière having an earthen parapet, whilst three out of the four remaining angles of the octagon were furnished with small bonnettes or barbettes, each taking three guns. The profiles of the bastion were 14 ft. high and 10 ft. thick. The bastion which looked towards the roadstead was retrenched at its gorge by a cavalier. The fort was surrounded by a ditch 12 ft. deep and 18 ft. broad with revetment in masonry and a glacis.

Of the 47 guns with which the work was armed only 12 could be of service in the expected attack from the north. The fort was commanded and even looked into from the heights towards the north. In and near this work, from the day of the landing on the 14th of September, down to the evening of the 24th, the Russians had toiled night and day, at one time with a force of 1,500 workmen. Their object was not only to repair and strengthen the Star Fort itself, but also to provide generally for the defence of the plateau against an enemy advancing from the Belbec. By those who knew that these hurried works went on under the direction of Colonel Todleben it will be easily inferred that they were planned with a consummate skill; but what even he found means to achieve in ten days could not but fall very short of what was needed. One of Todleben's objects was to throw up works which might prevent the enemy from turning the Star Fort on the eastern flank, but for the execution of this part of his plan there was no time.

By the morning of the 25th there were altogether twenty-nine guns in battery and available for the defence against the expected attack from the north. The two north-western batteries were however liable to be destroyed by the guns of the Anglo-French

fleet ; * and the trench connecting one of them with the fort could be enfiladed and taken in rear by the fire from the same quarter.† Indeed the position of the ground and of the Russian works was such that in every stage of an attack undertaken against the Star Fort, the seamen and the ships of the Allies would be able to take a great part.‡

In order to cover the retreat of the Russians, some of their ships were placed in such positions as to be able to sweep with their broadsides the slopes on the north of the roadstead. The form of the ravines descending from the Star Fort was such that upon two if not upon three, of the approaches from the side of the Belbec, the assailants might come up to the ditch without first incurring a cannonade of any great force or duration.

With regard to the forces available for the defence, it may be said that if the Allies had advanced against the Star Fort on the morning of the 25th they would have encountered there and on the ground adjoining a battalion of militiamen, a company of sappers and so large a body of sailors—withdrawn for that purpose from the ships and from the defence of the South Side—as would bring up the whole number to 11,000.§ The sailors were for the most part, badly armed, some of them having old flint and steel muskets, and others, it seems, only pikes and cutlasses. This was the force which extended along a front of a mile, was to defend the fort and the plateau against a victorious army of from 50,000 to 60,000 men, supported and actively aided by their fleets. The defenders were, however, commanded by one whose name will be long illustrious in the annals of Russia. For the present it suffices to say of Admiral Korniloff that he was a chivalrous, resolute and devoted seaman who, with hardly any hope of any better success than that of an honourable death, had determined to defend the plateau and the fort to the last extremity.

The officer who planned and directed the works of defence was Colonel Todleben and he was of opinion that the plateau and the fort could not have been successfully defended against the attack which the Allies had the means of making. The situation of the defenders, he says, notwithstanding all they had done, and notwithstanding their heroic resolves was nothing less than desperate ;‖ and he declared that the complete success of the expected attack by the Allies would have been inevitable. Lord Raglan and Sir Edmund Lyons came in fact to the same conclusion as Colonel Todleben, and it is not possible in this short account of the

* Todleben, *Defense de Sebastopol*, Vol. I., p. 233.
† Ibid.
‡ Ibid.
§ Todleben 11,350.—*Defense de Sebastopol*, Vol. I., p. 227.
‖ *Defense de Sebastopol*, Vol. I., p. 230–33.

memorable siege to discuss the reasons for the Allies relinquishing the proposed attack on the North Side.

The Allies were not ignorant that the possession of the North Side would at once enable them to cannonade the enemy's shipping. Nor again did they fall into the error of supposing the Star Fort of itself to be a formidable work. By far the gravest of the obstacles to the plan of assailing the North Side was the want of a safe harbour on that part of the neighbouring coast which was north of the Sebastopol Bay. It was said that the attack might take time, and that pending the operations, the fleets might be so driven from the coast by stress of weather as to put the Allies in peril for their supplies.

So inextricably were the Allies engaged in the expedition, and so deeply were they committed in the face of Europe to the duty of achieving their end, that whatever might have been their wisdom originally in resolving to touch the Crimea, ordinary prudence now seemed to command that they should follow up the victory with swiftness, and always in that venturesome temper which was the only one fitted for their enterprise. For refuge as well as for glory they needed the port of Sebastopol. But if the relinquishment of the North Side was not to be justified on military grounds, there was still this to be said for the measure; it was a way out of the trouble.

On the day after the battle of the Alma Lord Raglan proposed to Marshal St. Arnaud, the Commander-in-Chief of the French Army, "at once to advance to the Belbec, cross that river, and then assault the forts." The Marshal answered that "his troops were tired and that it could not be done."* It must also be added that the further efforts of Sir Edmund Lyons to induce the Marshal to agree to an attack on the position of the Star Fort met with no success.

Notwithstanding the failure of these efforts, Lord Raglan was thoroughly qualified to deal with the emergency in which the Allies would find themselves placed if the French should persist, as they did, in their unwillingness to assail the Star Fort.

At the time of the earliest deliberations on the subject, Lord Raglan had been disposed to think that Sebastopol ought to be attacked on the south; and although he had ceased to dwell upon the idea from the time when the west coast was chosen for the place of landing, it recurred to him on the morrow of the Battle of the Alma when he found himself encountered at the French head-quarters by a refusal to attack the Star Fort. He then conceived that if the French should persist to the last in their refusal, he at least might avert that utter cessation and collapse of the whole enterprise which their determination threatened to produce by

* Statement of Sir E. Lyons.

persuading them (as a substitute for the old plan which they were then abandoning) to join with him in marching across the country to the south coast, and there establishing a new base of operations, from which to attack Sebastopol on its south side.

The unwillingness of the French to attack the north side of Sebastopol had brought the Allies into straits so hard, that with all its rashness the plan of defiling round the east of Sebastopol might be regarded as the least of the evils from which a choice could be made. Rightly looked at " the flank march," for so the movement is called, was a perilous, a desperate expedient, by which Lord Raglan sought to find an alternative for the enterprise declined by the French and avert a collapse of the whole undertaking.

From causes which will be spoken of later, the French Army, without any fault of its own was, for the moment, paralyzed ; and the English Army, on the other hand, being ready for action and under a General resolved to force on the enterprise, there was a great temptation to clutch at a plan which would relieve the French Army from all immediate demands on its energies, and cast the load on the English. The plan of the flank march fulfilled these conditions ; for it spared the French from the task which seemed to await them on their right front, and invested the English General with the leadership, and the virtual control of the proposed operation.

But although it was as an escape from a dilemma that the flank march is best to be justified, it is not believed that Lord Raglan himself thought ill of the measure. Without ever wavering in his opinion that the victory on the Alma should be followed up by pursuing the old plan, and attacking the Severnaya or north fort, he yet thought that he saw such good features in the alternative plan as to be able to fall back upon it with contentment. Apparently he was not much impressed with the hazardous character of the flank march ; and on the other hand he certainly thought that, if once the Allies should be established on the south coast, they would then be on the best ground for attacking Sebastopol.

For the purpose of informing himself upon any question of military engineering, Lord Raglan had at his side an accomplished and gifted adviser. Sir John Burgoyne was a general of Engineers now serving on the Staff of the Army which Lord Raglan commanded. His experience of war was very great. It began with the first year of the century at Malta. In 1806 he was serving in Sicily. He was Commanding Engineer with General Fraser's expedition to Egypt, and was at the assault on the lines of Alexandria, and the Siege of Rosetta. He was with Sir John Moore at Messina and in Sweden in 1808, and was with him the same year in the Peninsular. He was at Corunna. He blew up the bridge of Benevente in the presence

of the enemy. He was with Sir Arthur Wellesley in 1809, and at the passage of the Douro. He served in the lines of Torres Vedras. He blew up Fort Conception in presence of the enemy. He was at Busaco, at the first siege of Badajoz, at Elboden, and at the siege and capture of Ciudad Rodrigo. He was at the second siege and capture of Badajoz, and was present at the assault and escalade of the castle. He was Commanding Engineer at the siege and capture of the Forts of Salamanca and at the battle. He was Commanding Engineer at the capture of Madrid, and the Retiro, and also at the siege of Burgos where he was wounded. At Vittoria he had a horse shot under him. He was wounded at the assault of San Sebastian where he conducted the siege as Commanding Engineer. He was also at New Orleans. He had therefore a vast experience, connecting his name with a glorious period of English history; and the value of this advantage was not, as often happens in the least counteracted by failure of energy. As might be expected he was a master of military engineering science; but his mind ranging freely beyond his own branch of the service, had become stored with the many kinds of knowledge which concern the whole business of war. Of course it might have been thought that the judgment of a man deeply versed in the business of sieges should be more or less warped by his science; but Sir John Burgoyne had so much breadth of view, and so general a knowledge of war that he was little likely to err in that direction.

Sir John Burgoyne held strongly that the project of an attack upon the south side of Sebastopol had many and great advantages, and also that the Star Fort was far too strong to be carried by a *coup de main*.

Before the battle of the Alma, Lord Raglan requested Sir John to put his opinion in writing; and, in the course of the same day, the English Commander was furnished with this memorandum:—

"CAMP ON THE ALMA, 21ST *September*, 1854.

"I would submit that unless some impending circumstances occur which cannot now be foreseen, the combined armies should at once move round to the south side of Sebastopol, instead of attacking Fort Constantine; by which the following advantages may be anticipated:—

"1. That instead of attacking a position naturally strong and of limited extent to which a powerful support will be given by Fort Constantine, which is a permanent fortification, though by no means formidable if, insulated, the enemy would have to defend a very extensive line, divided by valleys, and, from every information, very imperfectly, if at all entrenched, and which would probably be forced rapidly.

"2. As the advance is from the north, our attack will rather be expected on that side, and not on the south.

"3. Even supposing Fort Constantine* to be taken, although it will open the shipping, dockyard, etc., to cannonading, it will not ensure entire possession of the important establishments until after a second operation, which may still require to move round to the south, while the enemy will retain free and open communication to the place.

"4. There is every reason to believe from the appearance of the maps, and what may be expected to be the formation of the ground, that there is a very strong position between the sea at Balaclava, and along the valley of the Tchernaya, that would most efficiently cover the Allied Armies during the operation, but which is too extensive to be taken up by the garrison.

"5. That the communication with the fleet, which is, in fact, our base of operations, would be much more secure and commodious by the small harbour of Balaclava, and the bays near Chersonese, than on the open coast to the north, and with the advantage of a good road to the attacks, and a very flat country to pass to them from the bays near Chersonese.

"6. Under ordinary circumstances such a movement would have the effect of exposing the communication of the army to be cut off; but in this case the idea is to abandon the communication from the north altogether, and establish a new one to the shipping in the south which would be moved round for that purpose.

"J. F. BURGOYNE, *Lieut.-General.*"

Sir John Burgoyne, by Lord Raglan's direction, then propounded the flank march to Marshal St. Arnaud, and Lord Raglan himself held a conference with the Marshal on the evening of the 24th; Marshal St. Arnaud it seems, though not without some hesitation, had already made up his mind to accept it. On this subject, therefore, neither one nor the other of the two commanders had need to use words of persuasion. They agreed to attempt the flank march.

At the time of this conference, Marshal St. Arnaud was in a dying state although he forced himself to sit rigidly up in an armchair, and on the night between the 26th and 27th September he ceased to hold his command and made over his trying and important duties to General Canrobert, a general with a brilliant reputation established in African warfare.

On this night the Marshal had thrown off the cholera, but other ailments still caused from time to time cruel suffering alternating with periods of prostration. From the moment he resigned the command he longed with great intensity to leave the Crimea, but before he embarked Lord Raglan went to his bedside to bid him adieu.

Almost the last of the Marshal's acts whilst on shore gave proof

* By Fort Constantine Sir John Burgoyne probably meant the Star Fort. Fort Constantine was one of the sea forts, but at this period of the invasion the name was often applied by mistake to the Star Fort.

of that freedom from vindictiveness which was one of the features of his character. Before he embarked he offered a present—his Russian carriage and horses—to General Bosquet, an officer of great repute in the French Army who even at that parting moment was regarded by the Marshal as his enemy. Covered by a tricolour flag, he was carried on board ship by the seamen of the *Berthollet* on the 29th September, and placed in the cabin prepared for him. This was in the morning, and although he no longer suffered pain, between noon and sunset he died.

During the seven days after the Battle of the Alma which were passed by the Allies in caring for their wounded and in marching to the southern coast of the peninsular, men faithful to their Czar and their country, and so endued with courage as to be able to exert their whole power of mind and body under a weight of disasters which seemed hardly short of mere ruin, were entering upon a task of great moment, and destined to be famous in history. Expecting the attack of a victorious host, and abandoned by their own defeated army, an admiral* with some thousands of sailors and workmen, all guided by the skilled engineer† whose achievement has made him illustrious, were preparing the defence of Sebastopol.

Towards the south-western extremity of the Crimea there is an arm of the sea, with a breadth of from 1,000 to 1,500 yards which stretches in from the west to a distance of $3\frac{1}{2}$ miles. This deep narrow bay is the roadstead of Sebastopol. On the north the roadstead is bounded by the slopes and ledges on which stand the forts and buildings constituting the Severnaya or "North Side of Sebastopol." There was reason for believing that even so late as the 25th September, though much had been done since the day of the landing, the Star Fort, the key of the North Side, could not have been successfully defended against a resolute attack by the Allies.

The plateau on the south and south-west of the bay is heart-shaped and is called the Chersonese. Its eastern end is much higher than the western and on this—the landward—side, it is abruptly divided from the plain by an acclivity rising from a height of from 500 ft. to about 700 ft., and extending for a distance of about 8 miles from north to south (in a straight line) so as to form a continuous buttress to the plain. This acclivity as well as the easternmost crest of the table-land or plateau at its top, is called Mount Sapounè.

The only great break in the steepness thus dividing the table-land of the Chersonese from the plain is at the point some 3 miles from the southern coast called the "Col de Balaklava." Along a distance of about 4 miles in a straight line, beginning from its north-easterly angle near the Inkerman bridge and going thence westerly, the

* Admiral Korniloff.
† General de Todleben.

plateau is washed for the first half-mile by the Tchernaya, and lower down by the waters of the Sebastopol bay; but the rest of the water boundary is the open sea. The side of the Chersonese which lies towards the north is deeply jagged by creeks or bays throughout its whole length, from the Inkerman bridge on the east to Cape Chersonese on the west; but on the south and south-western side of the plateau its shore line has a different character and it is only after passing the plateau that an inlet can be found. This inlet is called the Port of Balaklava. The length of the plateau from its easternmost side to Cape Chersonese is about 10 miles.

Throughout its extent the plateau is scarred by ravines. Some of these are deep and precipitous. They run, for the most part in a direction from the south-east to the north-west, and several of them are prolongations of the openings which form the many creeks and bays indenting the north and north-west of the plateau.

Of these creeks there is one which stretching deep in from the roadstead from north to south had become the port of Sebastopol or as the English used to call it the "Man-of-War Harbour." In this port mighty fleets could be sheltered.

Including the eastern suburb which is called the Karabel Faubourg, Sebastopol may be regarded as standing upon a semi-circular tract of ground, subtended by the great bay or roadstead, and split into two segments by the "Man-of-War Harbour" in such a manner that the western segment included Sebastopol proper, with the Admiralty, the public buildings, the arsenal, and town; whilst the eastern segment—that is the Karabel Faubourg—contained among other buildings, the docks, great Government storehouses, some barracks on a large scale, and a church.

The separation of the town from its faubourg was rendered more complete by the steepness and depth of the ravine which descended into the Man-of-War Harbour. The configuration of land and water which thus split off the faubourg from the main town was a great source of embarrassment to the defenders, and was not the only obstacle in the way of their lateral communications, for there was another ravine which subdivided the town, and another again which cut the suburb in two. These ravines as well as the ridges and knolls on which the place stood, sloped down with more or less abruptness to the water's edge. The long hill on which the main part of the town stood, is 200 ft. above the level of the sea.

Of the streets in the town two were spacious, and in these stood the principal buildings. The rest of the streets were narrow. On the highest spot in the town stood the Naval Library, and on the top of the building was an observatory.

In the times immediately preceding the invasion the numbers

collected within the town and its suburbs had been in general about 42,000, but 35,000 of these belonged to the fleet or the army.

At the time of the invasion, the entrances both north and south of the great bay or roadstead, and both its shores within, to a distance of more than 2 miles, were studded with fortified works. Of these, some indeed, were only great earthworks, but others, and those the chief ones, were huge casemated forts, having stone-work revetments. These sea forts and batteries were—On the north side, Fort Constantine and Fort Michael, both stoneworks, the work called "Number Four," the "Twelve Apostles" and "Paris"; and on the south side the Quarantine Sea Fort, Fort Alexander, the Artillery Fort, Fort Nicholas, and Fort Paul, and lastly the Sviatoslaw Battery. It was to cover Fort Constantine on its landward side, and to prevent the enemy's ships from approaching the shore, that after the breaking out of the war, the Volokhoff Tower (surnamed by our people the "Wasp") and the Telegraph Battery were erected on the high ground between the Star Fort and the open sea. In all these forts and batteries, without including the Star Fort, there were mounted at the time of the landing 611 guns for the most part of heavy calibre.

The Black Sea Fleet, which lay in the harbour or in the roadstead, consisted of 14 line-of-battle ships, 7 frigates, 1 corvette, 2 brigs, and 11 war steamers besides some other vessels. It carried 1,908 guns, and was manned by 18,500 seamen. There was a boom across the roadstead, at some distance from its entrance. Before the day of the Alma, it was believed by the Russians that these defences alone were quite sufficient to secure the roadstead against an attack from the sea; and after the sinking of the ships at the mouth of the bay, the Allies acquiesced in this judgment, abstaining throughout the war from any attempt to break in with their fleets. On the eastern side also the Karabel suburb was so bounded by the Careening Bay, and the deep ravine at its head, that in that quarter also, the dominion of the water by the Russians was an obstacle to any attack. Thus relieved from apprehension of attack from the side of the water, the garrison would be able to bring almost their whole strength to bear upon the land defences. On the western side of Sebastopol there was a wide and deep ravine, running parallel with the boundary of the place which could not but be a grave obstacle to besiegers; and upon the whole the configuration of the ground was such that works on a moderate scale might suffice to prevent an enemy from choosing his point of attack in that direction.

It was towards the south and south-east that the defenders were least helped by nature. Even in these quarters, however, the configuration of the ground was in some respects favourable to the defence; for the ravines descended into the place in a way which

laid them open to the fire of the garrison, especially to fire from the ships; and everyone of the intervening ridges along which the assailants could best push their attacks was so formed by nature as to offer the defenders an advantageous position for the erection of a fortified work.

Other sources of embarrassment existed which, however—though not in an equal degree—were common to the attack and the defence. Besiegers and besieged alike were sure to be put to great stress by the depth of the ravines, which would more or less split their strength by hampering all lateral movements; and in event of the conflict taking a form which should make it depend much upon earthworks, both the garrison and their assailants would have to encounter the difficulty of trying to gain cover from ground which was simply hard rock, coated over, where coated at all, with a very thin layer of clay.

The length of the semi-circular line which had to be defended throughout was 4 miles; and of the defensive posts which might be most advantageously established along this extended line, there were three at the least, so circumstanced that the loss of any one of them would be likely to carry with it the fall of the place.*

Although in the beginning of February, 1854, the works planned for the defence of the west side of the town had been begun, the whole of the Karabel suburb, and even the approach from the south leading into the heart of the place, remained untouched by the spade. After that period, however some works sprang up; and on the day when the Allies effected their landing, the state of the land defences was as follows:—At intervals along a curved line beginning from the Artillery Fort, and ending at the ground overhanging the Man-of-War Harbour, there now stood this chain of works: the Artillery Fort, the Land Quarantine Bastion, the Central Bastion, the Schwartz Redoubt, and the Flagstaff Bastion.

With the exception of the Central Bastion, which was still in course of construction, these works had been completed, and were connected with one another by a loopholed wall, which passed, with but little interruption, along the whole of the curved line from the Artillery Fort to the head of the Man-of-War Harbour. Besides these works, the isolated sea fort near Quarantine Bay, and also the Artillery Fort, had been so closed by earthworks at their gorges as to be turned into redoubts, now defended on the land side as well as on the side of the water.

In the Karabel suburb less had been done; but there also, along a curved line extending from the head of the Man-of-War Harbour

* The position subsequently occupied by the Malakoff, the Redan, and the Flagstaff Bastion. Todleben even says that the loss of the "Central," or of the "Land Quarantine" Bastion would also have been fatal.

to the mouth of the Careening Bay, were already the Redan, the Malakoff Tower, the Little Redan, and finally a single-faced battery for four guns in connection with the stone building in the form of a cross, which stood near the Careening Bay. The works thus defending the Karabel Faubourg were not as yet connected by any intermediate entrenchment; and the Malakoff, afterwards so formidable, was at this time only a naked horseshoe-shaped tower having five guns at the top, but without the glacis, which were soon afterwards added. At this time the number of guns for the defence of the south side of Sebastopol on its land side amounted to 151. Of these 128 pieces were applied to the defence of Sebastopol proper, and only 23 to that of the Karabel suburb.

The strength of the Czar's forces in the Crimea, according to General de Todleben on the day when the great armada of the Allies was seen to be approaching the coast, may be taken to stand as follows :— The land forces then occupying the peninsular were 54,000 strong.* Of this force, some small portions consisting of about 1,000 men, were local troops; and another portion to the number of 2,700, was a body of artillerymen permanently stationed at the batteries of the coast defences; but the rest, amounting in numbers to more than 50,500, were troops belonging to what the Russians called their "active army" and were available for operations in the field wherever their services might be needed. Of these Prince Mentschikoff had under his immediate personal command a force of 38,500 men. These lay posted partly in Sebastopol and partly at other places, but all were so nearly in hand as to be capable of being assembled in time for the battle. The rest of the regular land forces in the Crimea amounted in number to about 12,000 and were stationed under the command of General Khoumatoff in the south-eastern part of the peninsular; but even these most distant troops were not so far beyond reach as to make it impossible to call them in to headquarters before the critical moment.†

Besides these bodies of men, which were all land forces proper, there were some bodies of marines which had been permanently stationed partly at the several sections into which the land defences had been divided, and partly in furnishing guards for the Admiralty and the hospital. They amounted in number to 2,600. There were besides four "landing battalions" amounting in number to 1,800 men who were posted along the lines of defence.

* 54,208 thus made up :—

Strength of the army (Todleben)	.. ..	51,500
Artillery appropriated to the coast defences	..	2,708
		54,208

† This was proved by the forced march of the Moscow Regiment which having been ordered up soon after the appearance of the Allies on the coast was on the field of the Alma on the morning of the battle.

The seamen of the Black Sea Fleet lying in the harbour numbered 18,500 men. Prince Mentschikoff, as High Admiral was in command of the fleet as well as the army, and in the absence of the Prince, Vice-Admiral Korniloff commanded the naval forces and the roadstead, and the harbour of Sebastopol. The number of workmen whose services could be obtained for the defence of the place amounted to 5,000. Including these the force which Prince Mentschikoff had in the Crimea at the time of the landing therefore was 76,000 men.*

There were thousands of guns of heavy calibre in the arsenal but it was stated that owing to age and other causes, a large proportion of these were useless. Cranes, guns, and engines of all kinds were at the disposal of the defenders, and a body of men, 26,000 in number, who had long been accustomed to work them. There was an abundance of ammunition for all the early necessities of the defence and fresh supplies could always be poured in owing to it not being possible for the Allies to invest the place. At the early period of the siege the Russians squandered their ammunition.

At this time the five thousand workmen at the command of Prince Mentschikoff were busily employed, and the works on the north side especially were pushed on with ceaseless energy; but it was not until a week after the landing that these approached completion. On the south side the defenders were busied with a fieldwork connecting the Flag Staff and the Central Bastions. Means were also taken for perfecting the telegraphic communication between Sebastopol and the covering army.

When Prince Mentschikoff had advanced to the heights on the Alma with the whole of the forces which afterwards opposed our landing the number of men still forming the garrison of Sebastopol or aiding in its labours amounted to some 32,000. Of these, however, only the gunners at the coast defences, and the militia could be said to form part of the army.

Such was the condition of things at Sebastopol when on the 20th September, the telegraph announced to the garrison that the Allies were advancing to assail Prince Mentschikoff in his position on the Alma Heights.

The result of this great battle and the victory of the Allies is well known, and as we are only dealing with condensed accounts of sieges proper no attempt has been made to describe the great battles of

* 76,375 thus made up:—

The Army	51,500
Local companies	1,000
Stationed Marines	2,666
Seamen of the Black Sea Fleet	18,501
Artillerymen appropriated to the coast defences ..	2,708
	76,375

Alma, Balaklava, and Inkerman. For full and detailed descriptions of these battles the reader is referred to the grand classical work, *The Invasion of the Crimea*, Vols. II., III., IV., and V., by the great military historian, A. W. Kinglake, from which work a large portion of this chapter has, by the kind permission of Messrs. Blackwood & Son, been taken.

Admiral Korniloff who was riding with Colonel Todleben towards the sound of the guns, was forced to apprehend, and then to see only too plainly the result of the encounter. "As I approached," he says, "the firing grew slacker, and I soon perceived that our army was retreating, but retreating in order. A sad picture it certainly was but the will of the Lord is inscrutable to us."

The next morning, Korniloff assembled a council of admirals and captains to determine what should be done in the straits to which things were brought by the loss of the battle. Prince Mentschikoff was not present at this council. Korniloff addressed the assembled admirals and captains. "Our army," he said, "is falling back on Sebastopol, and therefore the enemy will easily occupy the heights on the south of the Belbec. He will extend his forces as far as Inkerman* and Holland†, and commanding from those heights the ships of Nachimoff's squadron, he will force the fleet to leave its present position. By thus altering our order of battle for the fleet, he will make it feasible to force the entrance to the roadstead; and if at the same time his land forces should take the Star Fort, no resistance on our part, however heroic, will save the Black Sea Fleet from ruin and disgraceful capture. I therefore propose to put to sea and attack the enemy, crowded as he is off Cape Loukoul. I think that, fortune favouring us, we might disperse the enemy's armada, and thus deprive the Allied Armies of supplies and reinforcements. In the event of failure, we shall be able to avoid a disgraceful capture; for supposing we do not succeed in boarding the enemy's ships, we can at all events blow them up when close alongside, together with our own. Without the co-operation of the fleet, the Allied Armies could not capture the town, if fortified and defended by our troops, until the arrival of a fresh army from Russia, and then with united exertions we might crush the enemy."

The assembled admirals and captains received the proposal of Korniloff in blank silence, and although there were some who assented, the rest disapproved of it. All probably knew beforehand that the other measure was to be proposed, and that it had the sanction of Prince Mentschikoff, the Commander-in-Chief.

The rejection of Korniloff's measure was followed by the open

* This does not mean the ground where the Battle of Inkerman was fought but the eastern heights overhanging the head of the roadstead.

† The ground thus designated was between the Star Fort and the head of the roadstead.

proposal of that other and very different line of action which was already engaging the thoughts of the council.

That which Capt. Zorin proposed was this: to sink some of the oldest ships across the mouth of the roadstead, and employ the crews of the sunken ships, as well as those of the rest of the fleet in reinforcing the garrison.

Korniloff expressed his dissent from the counter-proposal, but perceiving that the majority of the officers present approved it, and still holding to his own opinion, he dismissed the council, and with these words "Prepare for putting to sea. A signal will be given pointing out what everyone has to do."

But he spoke, the narrator said, with a heavy heart, for he had little hope that the Commander-in-Chief would change the resolve he had imparted to him the evening before. Korniloff however went to Prince Mentschikoff, and declared his intention of putting to sea. To this the Prince peremptorily objected, and he reiterated the order he had given to Korniloff the evening before—the order to close the roadstead by sinking some of the ships. Korniloff when told that he might return to his post at Nicolayaff, however said "It is suicide what you are compelling me to; but now—to leave Sebastopol surrounded by the enemy is impossible. I am ready to obey you."

Prince Mentschikoff was at this time very secret in regard to his ulterior plan for the disposition of the army; but for the present he allowed his troops to continue the movement which divided them from the field of the Alma, and retreat fairly into Sebastopol.

In a weakened and tired condition of body, but not, it is said, in a state of dejection, the troops in the course of the 21st September were all brought over the water, and into the town. Thence they were moved to a piece of ground outside which was called the Koolikoff Field. There they bivouacked. At 4 o'clock in the afternoon, the ships of the fleet including those that were doomed, began to move into their places, and at half-past ten at night all were in their ordered places. In the night the orders for the scuttling of the ships were obeyed, and at the dawn of the morning of the 23rd there were only to be seen some bare masts in the places where the *Sirópol*, the *Varna*, and the *Silistria* had been lying the day before. Soon afterwards the *Oorgil* and the *Selaftroil* went down, and at 8 o'clock the *Flora* also disappeared, but the *Three Holy Fathers*, a 130-gun ship, was still erect. The commander of the steam frigate the *Thunder-Bearer* was commanded to fire into her sides, in order to "shorten her agony." At a quarter before one the sacred man-of-war reeled. For a moment—so pious men thought—the waves fell away recoiling, then closed, and bore the ship down.

But it must be acknowledged that the sinking of the ships was a

wise measure. It fulfilled two great purposes. It not only closed the entrance of the roadstead against the Allies, but also, by putting a sure and visible end to the career of the fleet at sea, it brought to bear upon the land defences, that strength of 18,000 fit men, and those almost boundless resources in the way of materials which the Navy was able to furnish; Prince Mentschikoff's idea of at once shutting out the invading fleets, and turning his own navy into a town garrison by the short expedient of sinking some ships, was a conception boldly and ruthlessly formed, and one well adapted for its twofold end.

Of the celebrated flank march made by the Allied Armies in September it is not necessary to refer, as only the siege operations are being dealt with. It is sufficient to say that the march was successfully carried out without hindrance by the Russians, and that the town and port of Balaklava was seized and held.

In the course of the 25th Prince Mentschikoff with the whole of his force took up a position in the neighbourhood of Otarkoi; and the next day after leaving a detachment* in the country of the Upper Belbec, he yet further withdrew the main army, and completed his retreat to the Katcha.

There, day after day, he remained with his army, concerting no measures with the people he had left in Sebastopol for the defence or relief of the place, and suffering the garrison to live on for a time in ignorance of the region where he and his troops were reposing. So far from threatening or even observing the invaders, not only did he not know on which coast of the Crimea (the west or the south) they were operating, but when at last he once more put himself in communication with the garrison, it was to them that he looked for his tidings.

* A force of cavalry and infantry under Jabrokritzky amounting altogether to 13,000 men.

(To be continued).

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Technical Terms Committee.

By the courtesy of the Aeronautical Society we are enabled to publish the following :—

The need having become pressing for an extension of the preliminary list of Technical Terms published by the Society in 1910, a representative Committee, upon which the Air Departments of the Admiralty and the War Office are officially represented, has been appointed to deal with the matter. It has been decided to publish as an instalment the list of terms annexed hereto. The absence of terms dealing with Stability in the present list is due to the fact that a comprehensive set of such terms, together with others, is under consideration and will be published in due course.

WORD.	DEFINITION.
A	
Aerofoil.	—A structure, analogous to the wing or tail of a bird, designed to obtain a reaction from the air approximately at right angles to the direction of its motion.
Airscrew.	—Used as a generic term to include both a propeller and a tractor screw. See "Screw."
Aileron.	—See "Balancing Flap."
Alighting Carriage.	—See "Carriage."
Angle, Dihedral.	—In geometry the angle between two planes. The wings of an aeroplane are said to be at a dihedral angle when both right and left wings are upwardly or downwardly inclined to a horizontal transverse line. The angle is measured by the inclination of each wing to the horizontal. If the inclination is upward the angle is said to be positive, if downward, negative.
Angle, Gliding.	—The angle between the horizontal and the path along which an aeroplane, in ordinary flying attitude, but not under engine power, descends in still air.
Angle of Incidence or Angle of Attack.	—The angle a wing makes with the direction of its motion relative to the air. The angle is usually measured between the chord of the wing and the direction of motion.
Attitude.	—An aeroplane's or wing's position relative to the direction of motion through the air.

B

BACK, To.—Of the wind, to change direction counter-sunwise (counter-clockwise).

BALANCING FLAPS.—Aerofoils used for causing an aeroplane to roll about its longitudinal axis for the purpose of balancing.

BALLONET.—A word taken from the French meaning "a little balloon" and exclusively limited to an interior bag containing air, within the envelope of an airship.

BANK, To.—To heel for the purpose of turning.

BODY.—Of an aeroplane—that part which usually contains the engine, crew, tanks, etc., and to which the wings, carriage, and other organs are attached.

BRACING.—A system of struts and ties to transfer a force from one point to another.

C

CABANE.—A French word to denote the mast structure projecting above the body to which the top load wires of a monoplane are attached.

CABRÉ.—Tail-down.

CAMBER (of a wing section).—The convexity of a wing section. The camber is usually measured (as a fraction of the chord) by the maximum height above the chord.

CANT, To.—To tilt; to take any inclined position.

CARRIAGE.—That part of the aircraft beneath the body intended for its support on land or water and to absorb the shock of alighting.

CHASSIS.—See "Carriage."

CHORD.—The straight line (taken conventionally fore and aft unless otherwise specified) touching the under surface of an aerofoil at or near the leading and training edges. The length of the chord is the projected length of the section on the chord.

CLINOMETER.—See "Inclinometer."

CONTROL LEVER.—On an aeroplane, a lever by means of which the principal controls are worked. It usually controls pitching and rolling.

CROSS SECTION (of an Aerofoil).—The section cut by a fore and aft plane normal to the surface (commonly the under surface).

D

DIHEDRAL ANGLE.—See under "Angle."

DIVE.—To descend steeply with the nose of the aircraft down.

DOPE, To.—Of fabrics—to paint a fabric with a fluid substance for the purpose of tightening and protecting it.

DRAG.—The resistance along the line of flight; the head resistance. Compare "Drift."

DRIFT, TO.—To be carried by a current of air or water; to make leeway.

DRIFT.—The distance drifted. The speed of drifting. The word "drift" having a well-accepted nautical significance should be avoided as far as possible in the sense of "head resistance" or "drag."

E

ELEVATOR.—An aerofoil set in a more or less horizontal plane and hinged on an athwartships or transverse line. It is used for controlling the angle of incidence of the aeroplane.

ENTERING EDGE.—See "Leading Edge."

F

FAIRING.—A piece added to any structure to reduce its head resistance or drag.

FINS.—Subsidiary aerofoils set parallel to the normal direction of motion of an aircraft.

FLAPS, BALANCING.—See under "Balancing."

FLAPS, WING.—See under "Balancing."

FUSELAGE.—See under "Body."

G

GAP.—The distance between the upper and lower wings of a biplane. For specific purposes the points between which it is measured should be indicated.

GLIDE, TO.—To fly, usually on a descending path, when the aircraft is not under engine power.

GLIDING ANGLE.—See under "Angle."

I

INCIDENCE, ANGLE OF.—See under "Angle."

INCLINOMETER.—An instrument for measuring the angle of slope of an aircraft, referred to the horizontal.

L

LEADING EDGE.—Of a wing—the forward edge.

LEEWARD.—Away from the wind.

LEEWAY.—Lateral drift to leeward.

LIFT.—The force exerted by the air on an aerofoil in a direction perpendicularly or nearly so to the motion. Usually upwards in ordinary flight.

LONGITUDINALS.—Of an aeroplane, the long fore and aft spars connecting the main with the subsidiary supporting or controlling surfaces.

LONGERON.—See "Longitudinal."

P

PANCAKE, TO.—To descend steeply, with the wings at a very large angle of incidence, like a parachute. Contrast "Dive."

PITCH, TO.—To plunge in the fore and aft direction (nose up or nose down). Contrast this with "Roll."

PITOT TUBE.—A tube with open end facing the wind, which, combined with a static pressure or suction tube, is used in conjunction with a gauge to measure fluid pressure or velocities.

PRESSURE HEAD.—A combination of pitot tube and static pressure or suction tube, which, in conjunction with a gauge, is used to measure fluid pressures or velocities.

PRESSURE TUBE, STATIC.—A tube (usually with holes in its side past which the fluid flows) so designed that the pressure inside it equals the pressure exerted by the fluid on any body at rest in the fluid. Used as part of a pressure head.

PROPELLER.—An air-screw behind the main supporting surfaces. Compare "Tractor."

PYLON.—A mast or post.

R

RIB.—Of a wing, a light fore and aft member which carries the fabric for the purpose of giving the desired cross section to the wing.

RIB, COMPRESSION.—A rib designed to act as a strut between front and rear spars of a wing.

ROLL, TO.—To turn about the fore and aft axis.

RUDDER POST.—The main post of a rudder.

RUDDER.—A subsidiary aerofoil (in an aeroplane more or less perpendicular to the main supporting surfaces) by means of which an aircraft is turned to right or left.

RUDDER BAR.—The foot-bar, by means of which the rudder of an aeroplane is worked.

S

SCREW, AIR.—An aerofoil so shaped that its rotation about an axis produces a force along that axis for driving an aircraft.

SIDE DRIFT.—See "Drift."

SIDE SLIP, TO.—In an aircraft, to move more or less broadside on relatively to the air.

SKID.—A part of the alighting gear of an aircraft arranged to slide along the ground.

SPAN, OF WINGS.—The distance from wing tip to wing tip.

SPAN, OF AEROPLANES.—The maximum transverse dimension.

SPAR.—A long piece of timber or other material. In a wing, either of the beams which run transversely to the aircraft, and transfer the lift from the ribs to the frame and bracing.

STAGGER.—Of wings. When the wings of a biplane are set with the upper one slightly ahead of, or abaft of the other, they are said to be staggered. The stagger is measured by the angle made by the line joining the leading edges with the normal to the fore and aft axis of the aeroplane. It is convenient to call the stagger positive if the upper wing is ahead of the lower.

STATIC PRESSURE TUBE.—See under "Pressure."

STATOSCOPE.—An instrument to detect the existence of a small rate of ascent or descent.

STRAINER.—An appliance bearing a suitable mesh for straining impurities from petrol and other fluids. Also compare "turnbuckle."

STREAM-LINE.—The path of a small portion of a fluid, supposed continuous, moving relatively to a solid body. The term is commonly used only of such paths as are not eddying, but the distinction should be made clear by the context.

STRUT.—A structural member intended to resist compression in the direction of its length.

T

TAIL.—The after part of an aircraft, usually carrying certain controlling organs.

TIE.—A structural member intended to resist tension.

TOP SURFACE CAMBER.—See under "Camber."

TOP LOAD WIRES.—See under "Wires."

TOP WARP WIRES.—See under "Wires."

TRACTOR.—An air-screw mounted in front of the main supporting surfaces.

TRACTOR MACHINE.—An aeroplane with air-screw mounted in front of the main supporting surfaces.

TRAILING EDGE, OF A WING.—The after edge.

TURNBUCKLE.—A form of wire tightener.

U

UNDER-CARRIAGE.—See "Carriage."

UNDER-SURFACE-CAMBER.—See "Camber."

V

VEER, OF THE WIND.—To change direction sunwise (clockwise).

VELOCITY OF SIDESLIP.—The speed with which the craft moves broadside on with respect to the air. Distinguish from "drift," q.v.

W

WARP, TO.—Of a wing, to bend so that the outer end of the back spar moves up or down. It is convenient to call the warp positive when the movement is downwards.

WING FLAPS.—See "Balancing Flaps."

WINGS.—The main supporting organs of an aeroplane. A monoplane has two wings, a biplane four.

WIRES, LIFT.—Wires, the principal function of which is to transfer the lift of the wings to the body or other part of the aeroplane structure.

WIRES, WARP.—Lift wires connected to the back spar and controlled so as to move its outer end down for the purpose of warping the wing.

WIRES, TOP LOAD.—Wires intended mainly to resist forces in the opposite direction to the lift.

WIRES, TOP WARP.—Top load wires connected to the back spar and passing from wing to wing to allow the wings to warp.

WIRES, DRAG.—Wires, the principal function of which is to transfer the drag of the wings to the body or other part of the aeroplane structure. Wires intended mainly to resist forces in the opposite direction to the drag are sometimes called "anti-drag wires."

WIRES, DRIFT.—See "Wires, Drag."

WIRE-STRAINER.—See "Turnbuckle."

Y

YAW, TO.—An aircraft is said to yaw when its fore and aft axis turns to right or left out of the line of flight. The angle of yaw is the angle between the fore and aft axis of the aircraft and the instantaneous line of flight.

TRANSCRIPT.

HISTORY OF UNDERGROUND WARFARE.

(Continued).

Fourth Period.

Under Louis XV., Marshal Vallières and his son did much to improve the artillery, but it is to Gribeanval that we owe the mobile and powerful weapons in vogue during the revolutionary campaigns. These were wars of manœuvre and movement, hence sieges were exceptional, and even at sieges long range weapons placed beyond the glacis were able to breach the parapets. The continuous enceinte was superseded by detached forts, which, as ranges increased, were placed further and further from the point to be defended. These circumstances limited the use of mines, which were little employed except during the Peninsula War. A few other cases may be mentioned, such as the Siege of Valenciennes in 1793, where the Allied Army under the Duke of York succeeded after a month's labour in laying three mines each containing 4,500 lbs. of powder. Owing to delay caused by want of information, countermining was tried too late, the mines were fired and an assault delivered. It failed at the time, but the town was surrendered three days later.

At the Siege of Acre in 1799 the salient of the counterscarp was blown in by a mine, but two assaults following it were repulsed mostly owing to flanking fire from a high tower on the walls. A deep mine, to blow in the tower, was then commenced. The Turks countermined, but too high. Three mines were fired under the tower, and one under the glacis to fill the ditch. The tower was not greatly damaged, an assault failed and artillery had to be brought up to complete the destruction. Another assault failed and the siege was raised.

During the Siege of Saragossa in 1809 the French had only captured a small part of the town after 30 days' operations. The Spaniards had collected the inhabitants into separate blocks of houses divided from each other by wide streets or public places, each block forming a separate fortress with some large building in it constituting a keep. The houses were barricaded and loopholed. Frontal attacks were out of the question, and mining had to be employed. The defenders tried to countermine, sometimes effectually, and it was not till 20 days later that the town capitulated.

Mont Jouy de Girone in 1809, and Valence in 1812, where the galleries had to be driven under a wet ditch, were captured by the French owing to the use of mines. In 1812 the English employed them against the Castle of Burgos. There were no engineers, the first explosion only demolished the wall of the escarp, and left the parapet above almost

intact, a second charge was better placed, and made a practicable breach which was crowned, but all efforts to advance further failed. The work was carried out by infantry, was very slow, and very trying to untrained and inexperienced men.

At the third Siege of Badajoz the fronts facing the Guadiana were the weakest, and the French had strengthened them by an improvised system of countermines. Wellington knew this, and having no engineers could not hope to succeed in a limited space of time in an attack upon this front. He was compelled to try elsewhere, where not only were the fortifications stronger but an inundation gave additional protection. Numerous and practicable breaches were made by gun fire, but the defenders closed them with sandbag parapets, placed chevaux de frise in front, arranged loops of bombs attached to powder hose, and large barrels filled with tarred straw, grenades, and shells, and posted men to set fire to these and roll them down on the assaulting columns. The counterscarp had not been breached, at the foot of it the defenders fixed another series of bombs under a few inches of earth, and connected together by powder hose covered with gutter tiles. These were fired as the English jumped into the ditch, but did not check the assault. Many men were drowned in a deep trench in the ditch. The remainder were checked by the burning barrels. However a party had managed to scale the St. Vincent Bastion and attacked in rear the defenders of the breach, with the result that a capitulation followed.

The mine defence of the Castle of Mouzon is of interest. The castle was held by 100 French gendarmes against 3,000 Spaniards. All the countermines were planned and superintended by a mine watchman named Saint Jacques who had been at the Siege of Saragossa. The only tools at first available were four pickaxes, three spades, three axes, two hammers and two saws. There were no candles or baskets. Powder was procured from cartridges, candles from melted bullocks' fat, and more tools were captured from the Spanish mine galleries. The place held out from the 27th of September, 1813, to the 18th of February, 1814, when the captain in command ascertained that the French were everywhere in retreat, and capitulated. On no single occasion did the Spaniards fire a mine, Saint Jacques and his men were too quick for them, or the mines were destroyed by sorties.

At the time of the Revolution the globe of compression had given birth to several countermine systems, the general characteristics of which were the omission of the envelope gallery at some distance in front of the counterscarp, and the use of listening galleries disposed as antennæ, whether connected together or not by a transverse gallery some distance in rear of the listeners. General Marescot, the first Inspector-General of Engineers, initiated in 1802 a competition for a treatise on mining. This produced the classic works of Mouzé, Gillot, Gumpertz and Lebrun, which obtained first and second prizes, and honourable mention respectively.

Mouzé's system of attack was based (1) on Belidor's idea that it was easy to invade the countermines after exposing them by an explosion, (2) on the utilization of Boule's shafts, and (3) on experiments made by himself with regard to the omission of tamping. Mouzé sited his

last parallel 52 yards from the nearest listeners, thus assuming *a priori* that the plan of the countermines was known, and from it made a series of attacks by mining without explosives, whilst he pushed on by flying saps over the ends of the listening galleries. There he sank Boule's shafts, which he estimated would take three hours each, placed in each 1,650 lbs. powder, or almost enough to fill it, laid a cover on the top and fired it. Eight miners then excavated in each crater to find the broken gallery, which Mouzé estimated would take an hour, and each gallery was invaded by a party of grenadiers and workmen. They barricaded themselves in the envelope, and thence pushed on to the counterscarp gallery.

Gillot was bolder, proposing to advance by zigzags from the third parallel, and to sink his shafts over, and blow in each listener with 300 or 400 lbs. powder. If the positions of the listeners were unknown, a row of mines at 20-ft. intervals could not fail to find them. Here the fourth parallel was sited, whence the salient place of arms and counterscarp gallery were attacked by shafts. Thus, whatever the countermine system, Gillot in three nights rendered it useless, and reached the counterscarp.

Gumpertz and Lebrun, inspired by Lefevre's advance at Schweidnitz, drove inclined galleries from the last parallel for 35 yards and fired three mines 44 yards apart with as large a L.L.R. as possible. He considered that at 9 yards depth in compact earth, 6,000 lbs. powder should produce craters of which the radius was double the L.L.R. From these craters the attack again advanced, and it was estimated that the counterscarp would be reached and demolished after 45 days' mining, assuming that the attack made no mistake and that the defenders confined themselves to looking on.

From 1815 to 1823 Lebrun was writing a work on countermines. He proposed to build one tier of galleries in earth up to 16 or 26 ft. deep, and if the earth were deeper, two tiers of galleries, the upper to attack the enemy's earthworks, the lower, his mines.

The most striking feature of Mouzé's and Gillot's methods is their overwhelming impetuosity; this probably reflects the military spirit of the times. The garrison would have to be deprived of all energy which could not put a stop to the sinking of the shafts; even if too weak to make a sortie it could considerably delay the work by plunging fire from the ramparts. The firing of even one countermine would send the workmen back to their parallel, and it would be difficult to induce them to face the work again.

This bold method of attack by shafts, however, produced modifications in the design of countermines, and in 1820 Colonel Rohault de Fleury invented a system of "countershafts," *i.e.* mines placed over the ends of the listeners just underground, so that their craters would give no cover to the assailants, and so far above the gallery roofs that a charge capable of damaging the enemy's galleries, would leave the protected gallery unharmed. This system was only introduced slowly, owing to its practical difficulties. At first excavations were made down to the roofs of the listeners, which were protected by shields, but in 1828 Colonel Thuillier invented the first camouflet machine, which enabled the deep excavation, and consequent disturbance of the soil over the

gallery, to be omitted. It also permitted of placing the mine from the gallery, and loading it by cartridge. These mines were then called "countershaft camouflets." The *attaque brusquée* was thus put a stop to.

Following on improvements in ventilating and firing apparatus, countermine systems were simplified. In the same gallery charges were laid in pairs, that furthest in front was first fired, that in rear, placed in the tamping of the former, exploded into the first crater. The new fuze gave so little smoke, and the renewal of air was so rapid, that it was even found possible to fire the first charge before tamping and firing the second.

Shortly afterwards it became customary to place a charge in position after the tamping was finished, the use of bored mines facilitated this procedure. The idea was not a new one, as a modified form of bored mine had been used at Candia, but now assumed fresh importance owing to the introduction of improved boring apparatus. For a time it was considered that the attack had acquired such a valuable weapon that the countermine was doomed, but practical experience proved that this opinion was not justified. The drill was frequently stopped by stones, or the ground was so hard that large numbers of men were required to work it. The Siege of Sebastopol finally burst the bubble of the bored mine, principally because it was found impossible to expose more than two or three men at a time under curved fire. Boring however still had its uses as a method of underground reconnaissance.

Major Laloy tried at Arras in 1854 an improved method of procedure analagous to that of Lefevre at Schweidnitz, but gave the miner some protection against the countermines of the defence, and considerably shortened the interval of time between each explosion. To fulfil the first condition 5 to 7 ft. of cases were erected and covered with earth in the first craters, which were to be opened by large mines at some little distance from the countermine system. Inclined galleries were then driven as far as verticals through the front edges of the first row of craters. The earth piled on the cases placed above ground in the craters, acted as additional tamping, and prevented the effect of the mine at the end of such a short gallery taking place backwards. If the defenders fired a countermine, part of its effect would only be to throw more earth into the crater and increase the L.L.R. In ordinary ground successive globes of 900 to 1,000 lbs. could be placed and fired at 12 to 15-hour intervals, securing an advance of about 13 ft. on each occasion. The mines were placed in rows close enough together to leave nothing untouched between them.

Thus at the opening of the 19th century the art of mining was held in great estimation, but countershafts, and charging after tamping were hardly applicable in actual warfare. The Siege of Sebastopol demonstrated that the most simple processes were the only practicable ones, but the attackers were confronted by worthy antagonists. The Russians were past masters in the art of underground warfare, and had acquired practical experience of it at Brailov and Varna during the Russo-Turkish War in 1828.

The fortifications of Brailov consisted of a semi-circle of small bastions

joined by long curtains, the ditch was dry, with revetment walls. The place contained a large garrison, and communication across the Danube was open. There were no countermine galleries. On the 11th night of the siege three covered saps were pushed from the third parallel, two towards No. 1 Bastion, and one towards No. 2. A large mine of 8,500 lbs. powder was placed against the counterscarp between the Danube and No. 1 Bastion, six of 800 to 1,000 lbs. each in a gallery behind the counterscarp on the attackers' left of No. 1 Bastion, and another of 8,500 lbs. under the foundations of the escarp. Two mines of 2,500 lbs. each were placed under the escarp of No. 2 Bastion, and four of 800 to 1,000 lbs. each along the counterscarp. These were to be fired simultaneously in three groups, (1) the large mine near the river, (2) the mines of No. 1 Bastion, (3) the mines of No. 2 Bastion, and an assault launched immediately. The signal to fire was to be three rockets. Unfortunately the officer in charge of No. 1 Group fired after the second rocket, and buried the junction box of No. 2 Group, consequently when the third rocket went up only No. 3 Group could be fired. Practicable breaches were formed by the mines which exploded, No. 1 having thrown a quantity of earth against the escarp opposite. The assault was delivered, but failed. partly owing to the stubborn resistance of the Turks, partly because the right column had to make a flank march, and lost heavily in doing so, and partly because the earth thrown by No. 1 Mine against the escarp slipped down under the feet of the attackers, and was soon too steep to climb over. The left assault reached No. 2 Bastion, but was there forced back, and 1,500 to 1,800 men were lost in a counter-attack. Next day the second group of mines was fired, all the craters crowned, and the ramparts heavily shelled by artillery. A sortie was repelled, and next day the place was surrendered after 24 days of open trenches.

In a report of the siege written by an artillery colonel it is stated that breaches might easily have been made by the guns more quickly than by mines, but the engineer corps dominated the siege, which was conducted by its first Inspector-General. The failure of the second group of mines shows how important it is in war to avoid complicated methods. It would have been better to fire each mine separately. In regard to this criticism it may be considered doubtful whether the artillery could have demolished the counterscarp walls, even if they had succeeded in making practicable breaches in the escarps. Certainly the absence of countermines contributed largely to the rapid success of the Russians.

The fortifications of Varna were much the same as those of Brailov. The Russian left rested on the Black Sea opposite No. 1 Bastion, which was separated from the sea by a ditch 170 ft. wide. The counterscarp was formed by a cofferdam cutting off the waters of the ditch from the sea. Between Nos. 1 and 2 Bastions, at right angles to the seashore, the ditch was 190 yards wide opposite the curtains. In the middle of the ditch was a stream which formed several pools. Trenches were opened on the 7th of August, 1828. The escarp of No. 1 Bastion was soon breached by gun fire, and opposite the breach five shafts, 56 ft. apart, were sunk, and 1,200 lbs. powder placed in each to blow down the counterscarp. These were fired about a month after the commencement

of the siege, but the earth thrown into the ditch was not nearly enough to fill it, and no assault could be attempted. The Russians then worked along the outside of the cofferdam, and also drove covered saps across the ditch. No. 2 Bastion was attacked similarly. Here the bed of the stream was very deep, but at length one mine of 5,000 lbs., and another of 2,000 lbs. were placed under the escarp. The quantity of powder would have been increased, but the Turks showed signs of countermining, and it was decided to hasten the explosion. No. 1 Bastion was breached on the 21st of September, and No. 2 on the 22nd. The Turks had prepared a retrenchment in rear, and an assault would have failed. It was decided to make new breaches in the curtain, but the town was surrendered on the 28th. Had the Turks known a little about countermining the Russian works would have been very much delayed.

SIEGE OF SEBASTOPOL.

Omitting any description of the surroundings and fortifications, the mining operations only will be touched on. Trenches had been opened on the 3rd of October, 1854, and by the 1st of November the third parallel was at 170 yards from the Flagstaff Bastion. The French commenced their galleries on the 20th, with the intention of breaching the bastion prior to an assault. Two shafts were sunk into the rock, when a bed of clay was found in which progress was rapid. It was not anticipated that the Russians had any countermines, and the first intimation of their existence was the blowing in, on the 3rd of February, 1855, of the head of the right gallery by a camouflet.

At the beginning of November the defenders thought they heard sounds of mining, and Colonel Todleben decided to organize a system of countermines. (On the 1st of January he received a plan of the French siege works which had been lithographed in Paris). His plan was to excavate an envelope gallery under the ditch of the bastion, with listeners at right angles to it. Twenty shafts were sunk into the same bed of clay which the French had discovered, but Todleben was not satisfied that his first scheme afforded sufficient protection, and relying on the motto that "the lower man has the upper hand," commenced a lower tier of galleries in a second layer of clay about 50 ft. below the surface. This lower tier comprised 480 yards of gallery, and was never used, but a mine of 9,000 lbs. of powder was discovered after the siege, at the end of one of the galleries. The lower tier had, however, a great moral value in relieving the miners in the upper galleries from the apprehension of being undermined.

Finding that they could not surprise the enemy, the French now determined to join up transversely their own principal galleries, to drive a series of galleries for mines the craters of which would intersect, to fire them simultaneously and so open a fourth parallel. After several mines had been fired on both sides the series of mines was charged by the 10th of April. There were twenty of them, varying from 1,200 to 4,200 lbs. each, up to a total of 57,000 lbs. After the explosion the craters were occupied and gave excellent cover, but a few mines had failed, and some craters had to be joined by sap. Owing, however, to the incessant fire and sorties of the garrison this parallel could only be occu-

pied at night. It was connected up to the third parallel by some mine craters joined by saps. The mines which had missed fire were untamped and fired by degrees, not without casualties to the French troops.

The action of the mines had not extended far, and the Russians were soon able to repair their galleries and advance again. The French therefore practically only held the rear slope and bases of the craters. However, they were able to put listeners on a banquette on the forward slope to give notice of attempts on the Russian side to mine under the parallel, and to drive them away by mines placed in hastily excavated shafts. In other words the attackers were reduced to defensive tactics.

Meanwhile the Allies had realized that the capture of the Green Mamelon, which commanded Fort Malakoff, would entail the fall of Sebastopol. The attack on the Flagstaff Bastion thus became of secondary importance, and was only continued to occupy the attention of a portion of the garrison, and as a defensive measure, to prevent their advance under the fourth parallel. A number of fougasses were fired from that parallel, as the bastion was within range, but besides annoying the Russians they did a considerable amount of damage to the French galleries in rear.

On the 2nd of May the French had armed a battery, No. 53, against the Central Bastion and the Schwartz Redoubt which covered its left flank. In the middle of May the Russians, in expectation of a possible subterranean attack in this quarter, opened countermine galleries of similar design to those at the Flagstaff Bastion. On the 14th of August, hearing the noise of a deep sap by which the French were connecting Battery 53 with a stone quarry on its left, they fired a mine in a hurry. It did no damage to the French, and was a lucky event for them, as a few days later the Russians would have been under the battery. A subterranean war now began in front of Battery 53. Several mines were fired, but neither side gained any particular advantage.

Countermining was commenced somewhat tardily from the Malakof, on the same principles as before. Fourteen listening galleries from an envelope gallery were driven at right angles to the counterscarp, and stepped shafts in the rock led down to another tier of countermines 50 ft. beneath the glacis. By the 8th of September the upper listeners had advanced 20 to 40 ft., and four lower listeners about 17 ft. When the French obtained knowledge of these works they sank twelve shafts, from which galleries ran towards the salient of the fort. On the 6th of September, the date of the assault of the Malakof, the only three mines which there had been time to charge were fired at eight in the morning. These mines would certainly have damaged any countermines within reach, but the main object in firing them was to prove to the troops of the assault that their own miners held the mastery of the subsoil. The capture of the Malakof ended the siege. It was rendered possible only by the delay of the Russians in countermining. The latter had been preoccupied by the defence of the town, but had the countermines of the Malakof been in a more forward state, the result might have been different.

On the French side the length of gallery and branches was about 1,200 yards in front of the Flagstaff Bastion, and 130 yards before the

Schwartz Redoubt. The Russians excavated 3,000 and 2,200 yards respectively, and 550 yards in front of the Malakof. Before the Flagstaff Bastion there were 125 explosions, and before the Schwartz Redoubt 11 only. The total weight of powder consumed in mines was 115,000 lbs., as compared with 6,600,000 lbs. expended by the artillery, but of 176 casualties amongst the French miners, including 17 killed, only 4 were killed in the galleries. This must be attributed in some measure to careful listening. The Russian miners incurred 191 casualties, including 54 killed; out of these 24 were killed and 32 wounded in the galleries.

The French mines established for opening the fourth parallel were each provided with two distinct means of firing, firstly, La Rivières fuze laid on the ground, each length starting from junction boxes filled with 4½ lbs. powder, and secondly, ordinary powder hose laid in troughs and starting from the same junction boxes as the respective lengths of fuze. There were six misfires, which may have been due to the different rates of burning of the fuze and powder hose. Symmetry in the means employed for the double transmission of fire is most necessary.

Several cases of suffocation occurred in the galleries. Very thorough ventilation is necessary, and apparatus should be at hand enabling foul mines to be entered with impunity.

The Russian countermines started very regularly, but once contact with the enemy underground was established all semblance of regularity was lost. Each miner seems to have worked independently, without reference to his neighbours. The drawbacks to following no definite plan are self-evident; not only might a great deal of the work done have been saved, but it must frequently have been impossible to distinguish sounds made by the enemy from those made by a neighbour, and no large mine could be fired without damaging adjacent galleries. The lower tier of galleries was almost useless for mines. The 9,000 lbs. mine found after the siege would only have been a huge camouflet, as there were 17 yards of rock above it. This criticism does not imply that a lower tier is in no case necessary, it gives confidence to those working above, but should not be commenced, when time presses, until the upper tier has been completed.

The Russian gallery cases were frequently fixed very carelessly. This may have been due to rapidity of execution, which in mine warfare is the first condition to be fulfilled. On the other hand the tamping, which consisted of sandbags strengthened by wooden frames, was finished most minutely, interstices being often closed with rags. Voltaic batteries seem to have been used for firing the mines, and it is probable that misfires were frequent.

In front of the Carenage Battery the Russians had placed a row of boxes each containing 15 to 20 lbs. powder, and destined to be fired by a liquid escaping from a glass tube, which would be broken by the steps of the assailants. These land mines were discovered before the attack.

(To be continued).

REVIEW.

MILITARY POLICY OF THE BRITISH EMPIRE.

In last month's *Supplement* we briefly called attention to the publication under the editorship of Colonel B. R. Ward, of the 5th edition of Sir Charles Pasley's *Military Policy of the British Empire.*

The first edition of this wonderful work appeared in 1810 when England was engaged in her great life and death struggle with Napoleon, and by a curious coincidence the present edition appears when we are again engaged in a similar struggle against Germany. Under these circumstances the book will be read with particular interest, and the eulogistic reviews which have appeared in the Press show how well worthy the book is of careful study.

Punch in "Our Booking Office" confesses that he has hitherto been among the number of civilian readers "to whom the name of Pasley conveyed nothing," but, he adds, "if you are at all concerned with the science and policy of arms (and who nowadays is not?) you will find this book of extreme interest."

The Spectator deals more fully with the essay and in a long and able review gives some idea of its sensational first appearance in 1810. "So great was the sensation," writes the reviewer, "caused by the work of the gallant 'Captain in the Corps of Royal Engineers' that edition after edition was called for, and women as well as men, indeed the whole of the reading and thinking public in the country, devoured the essay. For example, we find several references to it in Jane Austen's letters. She expresses her delight in her own inimitable fashion: 'I never sighed for a soldier before.'"

The following extracts are also taken from the same review:—

"Pasley's noble and far-seeing book was written in 1810, when Napoleon was at the very zenith of his power, and when most people in these islands had despaired of the republic, except on the sea, and considered that it was useless to attempt to interfere with Napoleon's domination on land. It was Pasley's glory that he bade his countrymen not to despair, but to look for the coming of the day of deliverance which he predicted was at hand. A second edition of his book appeared in the spring of 1811, and a third in the autumn of that year. A fourth was published in 1812, when Napoleon's army was in full retreat from Moscow. The publication of a fifth edition was contemplated in the winter of 1848, but Pasley's intention was never carried out.

"Pasley's main idea is that we cannot be safe unless we have military power as well as naval power, that we have the capacity for making

ourselves into a strong military Power, and that what we chiefly need is its adequate direction. He points out that our difficulty is not lack of soldiers—of these we possess enough—but the knowledge of how to use them, and also a clear understanding of what we want—*i.e.*, a true objective. If we have not got a well-defined military policy, we are sure to fail in our military operations. That, of course, is as true now as it was then. Here are Pasley's own reflections in his own words :—

"'I must observe, in the strongest manner, that no Great Power, in the critical situation in which Great Britain now stands, was ever saved by coalitions. *We must trust alone to our own arms. Wherever we display our standard, we must draw the sword with the spirit of principals, not of auxiliaries ;* and we must never cease to increase our own power by conquest, until we make ourselves the strongest Power in Europe, by land as well as by sea. If we neglect to use every exertion in our power to effect this purpose, it may prove of little use to us or our posterity should we, by any chance, escape being enslaved by France. *For if that Empire were to fall to pieces, new difficulties and dangers would gather around us. Germany might become so powerful as to act the same part in Europe which France now does.* Spain might, as she formerly did, threaten to reduce us to a province ; or, if we ever suffered ourselves to dwindle into a third Power, how could we promise to ourselves, that two of the neighbouring states might not coalesce, in order to divide our country between them.'

"Pasley, of course, wrote with Napoleon always before him, but it is a proof of the penetrating quality of his mind that he is able to look beyond the immediate struggle and see, as in one of the passages we have italicized, that the day may come when a German ruler will play the part of the great Corsican.

"In the fullest sense Pasley's essay is a great book by a great man. It shows on every page of it the authentic spirit of patriotism. If Pasley is often wrong in detail, in the highest sense he is always in the right. He has the true vision. He may be on occasion a little too emotional, but, on the other hand, he is never inhuman. He never anticipates Nietzsche or the 'ruthless, relentless, remorseless' war policy which now governs the minds of the ruling caste in Germany. Indeed, it is remarkable to note here the difference between Pasley's work and that of Clausewitz, the great metaphysician of war, from whom the soldiers and statesmen of Germany draw their inspiration in the matter of military policy. Clausewitz is a cold-blooded logician. Pasley insists always on the need of observing right and justice and fair play to other countries.

"We wish we could quote from the main portion of Pasley's essay, but space, unfortunately, fails us. We would advise our readers, however, most strongly to read the book for themselves. They will gain from it many useful lessons. Meanwhile, we may quote one or two of the maxims which the editor has drawn from the essay in order to illustrate Pasley's insistence on justice and fair play as factors in military policy :—

"'National ambition is only criminal or unjust when it passes the limits of necessity.'

"'It is an advantage in war to show moderation and justice, when these qualities are united to a martial spirit.'

"'A scrupulous adherence to the law of nations and an inflexible constancy in the cause of deserving allies is the only sound policy.'"

The essay called forth a passionate eulogy from the poet Wordsworth and portions of his letter to Pasley are reproduced in a later number of *The Spectator*. "Let me express," he writes, "my zealous thanks for the spirit and beauty with which you have pursued through all its details the course of martial policy which you recommend. Too much praise cannot be given to this, which is the great body of your work. I hope that it will not be lost upon your countrymen."

In fact it is not too much to say that Pasley's *Military Policy of the British Empire* played a considerable part in moulding the policy of the succeeding years of the great struggle in which we were engaged, and Colonel Ward deserves the thanks of the Corps for having again brought it to the notice of the British Public.

RECENT PUBLICATIONS OF MILITARY INTEREST.

REVIEW OF BOOKS.

[Reprinted from *The Army Review* by permission of the Controller of His Majesty's Stationery Office.]

* * * * * *

BIOGRAPHY AND HISTORY.

RUSSIAN OFFICIAL HISTORY OF THE RUSSO-JAPANESE WAR. Vol. IV., Parts I. and II.* THE BATTLES ON THE SHA HO. (Guerre Russo-Japonaise, 1904—1905. Historique rédigé à l'état-major général de l'armée russe). Part I., 625 pp. with 48 maps; Part II., 794 pp. with 28 maps. 8vo. Paris, 1912. Chapelot. £1 5s. each part.

Vol. IV. takes up the story from the arrival of the Russians at Mukden, after their retreat from Liao-yang, and deals with the fighting on the Sha ho and the Battle of San-de-pu. Part I. is occupied solely with the fighting on the Sha ho: Part II. with the Battle of San-de-pu and Mishchenko's raid.

The introductory note, repeated in every volume, should be read attentively; it explains certain peculiarities of the Russian organization, and gives a useful list of Russian terms which have been retained in this French text.

Part I. contains 13 chapters, 49 appendices, and 21 notes.† The chapter headings are as follows:—

Chapter I.—The situation in Manchuria between the retreat from Liao-yang and the commencement of the offensive on the Sha ho.
Chapter II.—The plan, organization and preparation for the offensive.
Chapter III.—The operations of October 5th and 6th, 1904.
Chapter IV.—Events of October 7th and 8th.
Chapter V.—Events of October 9th.
Chapter VI.—Events of October 10th.
Chapter VII.—Events of October 11th.
Chapter VIII.—Events of October 12th.
Chapter IX.—Events of October 13th.
Chapter X.—Events of October 14th.
Chapter XI.—Events of October 15th.
Chapter XII.—Operations of October 16th. The attack of Putilov and Novogorod Hills. The end of the operations.
Chapter XIII.—The organization of the Russian rear for the Battle of the Sha ho.
Appendices.—Notes to Vol. IV., Part I.

The maps are in a separate portfolio.

* Previous volumes have been reviewed in *The Army Review*: Vol. I., Part II., in July, 1911, p. 189; Vol. II., Part I., in April, 1913, p. 648; Vol. II., Part II., in April, 1914, p. 539; Vol. III., Parts I., II. and III. in July, 1914, p. 293.

† The notes are by the French General Staff; those contained in the Russian text have been in the main omitted.

Chapter I. first describes the situation about Mukden, and shows the cause which led General Kuropatkin to adopt the offensive after his retreat from Liao-yang.

By September 8th the Russian Army was established in prepared positions about Mukden, and was fast recovering in organization and in *moral* from the effects of its retreat from Liao-yang. It appears that General Kuropatkin had quite intended to fall back beyond Mukden if pressed; but when he found that his retreat was unmolested, he realized that the Japanese Army was probably exhausted and in a critical condition at Liao-yang. Mukden contained large stocks of supplies and the neighbourhood possessed valuable resources which ought to be denied to the enemy. It was possible and desirable to halt there, and at first General Kuropatkin's attitude was strictly defensive. But his thoughts turned to the possibility of taking the offensive; his troops were in good spirits and well equipped, the season was favourable for marching, his own reinforcements were coming in, while the Japanese were known to be striving to send out drafts. Port Arthur was calling for relief, and undoubtedly the enemy would now redouble their efforts to take it. The influence exerted by Port Arthur was considerable. Personally, Kuropatkin did not share in the apprehensions for the security of Port Arthur, and he objected to repeat Vafangou (Te-li-ssu) for all Stossel's appeals for succour; but the arrival of three fresh corps gave a new impulse to the idea. Kuropatkin decided to take the offensive, and prepared to do so; but as will be seen he was unable whole-heartedly to take the initiative, he made reservations, and would revert to the defensive if the enemy became active.

On September 16th and 17th Mishchenko and Rennenkampf reconnoitred the Japanese positions about Yentai and Pien-niu-lu-pu. The information gathered though not very positive, indicated that the Japanese were in strength on the east flank, it confirmed Kuropatkin's fears for his left and influenced his plan in making him deliver his principal attack from that side.

The story of the capture and execution of Ryabov, a Russian scout taken in disguise by the Japanese, gives an insight into the staunchness of the Russian peasant character, and the appreciation of it by the foe (p. 20).

Chapter II. deals with the preparation and issue of orders for the advance. The principal object of the offensive was "to defeat the enemy and relieve Port Arthur." The Army was divided into two main groups and a general reserve. The Eastern Force under General Stakelberg was one-third of the whole, its task was to seize Pien-niu-lu-pu, and envelop the right flank of the Japanese. The Western Force under General Bilderling comprised one quarter of the whole; it was to act on both sides of the railway, and contain the enemy. The general reserve of two corps was in the rear of the centre, and one corps* over which General Kuropatkin had only a limited control was arriving at Mukden.

In addition to the operation orders, special instructions were issued to the commanders of the two groups. It is these instructions which reveal how Kuropatkin was unable to dissociate from his mind the idea of acting defensively: "If the Japanese are encountered advancing, the Eastern (or Western) Force must take up a defensive position and hurriedly entrench." This anxiety to entrench cost the Russians dear, and largely contributed to the failure of the plan. General Kuropatkin also thought fit to issue to all commanding officers of units a pamphlet of "Guiding Principles" which indicated the tactics to be employed. In these, too, some emphasis was laid on the value of the defensive. Lastly, Kuropatkin addressed a special memorandum to commanding officers on the manner of executing the plan of advance. Many details in this document might have been left to lesser commanders to arrange: commanders and troops were over-instructed in regard to the impending operations.

The arrangements for intercommunication are interesting.† Two or more of the corps of each group had to construct telegraph lines to the Army Headquarters,

* VIth Siberian Corps. See p. 31.

† In the Russian Army the lesser unit must provide the means of communication to the greater.

and as an alternative means of communication, relays of despatch riders were provided parallel to the wires used by the commanders of the Eastern and Western Forces. In other cases the corps were required to arrange for relays to convey messages only until their telegraph line was in working order.

The latter part of the Chapter II. gives a full description of the theatre of operations. Generally described the eastern part was mountainous, sparsely populated, difficult for troops to traverse, and little known, the available maps being inaccurate; the western portion lay in the plains, and had fairly good roads, but the *kaoliang* hampered the movement of troops.

Chapter III. opens by describing the situation on October 5th prior to the Russian advance. Pp. 96 to 100 narrate the operations of the Eastern Force, whose three columns were directed concentrically on Pien-niu-lu-pu, and the outermost of which had to cover 30 miles on this day. The information obtained by Mishchenko's and Samsonov's reconnaissances on October 4th had showed that the enemy was strongly entrenched at and east of Yentai. As regards the Japanese right at Pien-niu-lu-pu, General Kuropatkin had informed Stakelberg that the Japanese were relatively weak there. This was true. Umezawa's brigade at this point was in a dangerous position, and Kuroki on his own responsibility gave orders for it to withdraw. Although the Eastern Force had come into touch with the enemy's right on October 6th, the scanty details available were not considered sufficient for offensive operations, the Russian maps were found to be quite unreliable, and Stakelberg ordered an extensive reconnaissance for October 7th; he proposed to prepare his troops on the 8th, and deliver his attack on October 9th. Such dilatory procedure could hardly be compatible with the vigorous offensive, but General Kuropatkin appears to have been satisfied with these proposals.

The narrative then turns to the operations of the Western Force. The Commander-in-Chief had cautioned General Bilderling to use the utmost prudence in his first moves, and in accordance with his instructions the latter chose alternative positions—north and south of the Sha ho respectively—to be occupied in case the enemy should become active. The Russian account says: "This was not considered to be in any way contrary to the offensive character of the intended operations."

The Western Force began to move on October 5th, and on October 6th, when General Bilderling found that the Japanese were offering no serious resistance, "he decided to accept battle south of the Sha ho"—a very modified idea of the offensive!

The Manchurian Army had crossed the Hun ho by the evening of the second day, but was exhibiting the utmost caution in its movements.

The Commander-in-Chief also showed his cautiousness in regard to both his flanking detachments; he restricted the wide turning movement which Rennenkampf proposed to make on the east, and he held back Dembovski on the west.

Chapter IV. shows how little was done by the Russians during the third and fourth days of their hesitating advance. On the Japanese right, Umezawa had waited until dark on the evening of October 7th and had then withdrawn his brigade undetected by the enemy. The news that Pien-niu-lu-pu was evacuated was received with incredulity on the morning of October 8th, and the Russians very cautiously occupied it during that afternoon.

Pp. 152—153 give an account of General Rennenkampf's engagement on October 8th at Wei-ning-ying, when he attacked the extreme right of the Japanese position, which faced east covering Pen-hsi-hu. A squadron and four horse artillery guns sent to the high ground on the left (south) bank of the Tai-tzu ho enfiladed the Japanese line, and obliged them to fall back. But this success was not followed up.

The Japanese were now forming up in line 7 miles north of Liao-yang, Oku's IInd Army with its left on the Sha ho, Nodzu's IVth Army astride of the Mandarin Road, and Kuroki's Ist Army at Yentai Mines with his right flank drawn back to the Tai-tzu ho at Pen-hsi-hu.

Chapter V.—The Russians had no fresh news on the morning of October 9th. The Commander-in-Chief directed General Stakelberg to limit his operations on that day to the attack of the advanced positions; he was to get into "positions of readi-

ness" for a decisive advance to envelop the Japanese right flank. The ground of this flank is described in detail: the country was mountainous, very complicated for troops' movements, and the position occupied by the Japanese was precipitous in front and offered no facilities for attack by night. Indecisive fighting occurred. Rennenkampf's troops again were hotly engaged, gained ground and lost it. The Eastern Force had not achieved any real success by the end of the fifth day.

The task of the Western Force on October 9th had been to keep the enemy employed. General Bilderling proposed to move with some ostentation over the Sha ho, still keeping his troops astride of the railway. The Russians met with a local success at Ho-ti-ku and Wu-lai-tai-tzu. Ho-ti-ku, a prominent hill feature just east of the Mandarin Road, and some 3 miles south of the Shi-li ho, was held by about a battalion of the enemy. The Russian commander used one company, covered by artillery fire, in a frontal attack, and under shelter of the railway embankment moved up seven companies to turn the position, which was then hurriedly evacuated by the Japanese. Only a small part of the troops in the Western Force was in action on October 9th, and much entrenching was done by the remainder. On this day a new group was formed in the centre, consisting of the IVth Siberian Corps and Mishchenko's mounted troops; it made fair progress and definitely located the main position of the enemy on a line east and west of Yentai Mines.

The net result of the fifth day showed little progress. The Eastern Force was blocked in the passes and had to leave some of its artillery behind. The Centre and Western troops had gained a little ground, but had not facilitated the task of the Eastern Force; according to the official account the Manchurian Army was now in temporary positions from which it would commence decisive operations.

On the other side, all three Japanese armies had received orders to advance, relatively weak numbers were engaging the Russian Eastern Force, taking advantage of the strong natural features on the east. Marshal Oyama was preparing to fall on the Western Force.

Chapter VI.—General Stakelberg finding that he was stubbornly opposed decided to suspend his attack and devote October 10th to further reconnaissance. He issued orders to the Eastern Force to continue entrenching itself where it was. Meanwhile the Commander-in-Chief, unaware of the situation of the Eastern Force, sent Stakelberg instructions to wheel his force to the right and take up a line extending to the Tai-tzu ho, which implied possession of the positions still occupied by the Japanese. Stakelberg replied that he could not execute these instructions before October 12th or 13th; and General Kuropatkin assented, but piously hoped that "not a single day would be lost without serious necessity." Stakelberg then issued orders for the Eastern Force to attack at dawn on October 11th.

Pp. 189 to 193 relate the story of the fighting on the left flank in which a detachment of IIIrd Siberian Corps under Colonel Garnitski took part. These troops had not received the order to stand fast, and on the morning of October 10th were advancing against the Shih Shan (Lautkalaza) position under cover of fog. Suddenly the mist cleared, the attack was revealed and came under heavy fire, but many of the troops were able to reach dead ground. The subsequent tactics employed by the Russians furnish good examples of the use and abuse of covering fire. Two companies of Colonel Nekrasov's battalion pushed forward covered by artillery fire which kept the Japanese off the crest of the position, but later the Russians were unable to deliver the assault and were forced to fall back by the fire of their own guns.

On October 10th General Bilderling received orders that the Western Force was to entrench on a line approximately that of the Shi-li ho. In advance Ku-shu-tzu (a little south of Ho-ti-kou) was to be occupied with three battalions from the Xth Army Corps, and Temple Hill opposite the centre was also held.

About 1 p.m. troops of the Japanese 5th Division tried to turn the Russians out of Ku-shu-tzu and delivered three attacks during the night all without avail. About 3 p.m. Oku's troops attacked Erh-tai-tzu held by some of the XVIIth Army Corps. The Japanese counterstroke on the Russian right front was now developing; Oku's 4th Division was also endeavouring to envelop their right, covered by the 1st Cavalry Brigade which had moved out to Sandepu near the Hun ho. On the night of October

10th—11th the Japanese moved in closer to their enemy with a view to a general advance next morning.

October 10th was a fateful day; on it the initiative passed from the Russians to the Japanese, who had divined their opponent's plan, realized that the Western Force was the weaker, and were proceeding to crush it. The 1st Army Corps of the Russian General Reserve was now on the Sha ho and close behind the Centre: the VIth Army Corps was behind the right about 10 miles in rear of the fighting line. General Kuropatkin considered the latter corps his "strategical reserve," but he had given General Bilderling permission to call on it for aid in the event of the Western Force being pressed by the Japanese.

Chapter VII., the longest in this volume, deals with the turning point of the battle. The morning of October 11th found General Kuropatkin still persevering in his plan. The Western Force was to stand fast, the Centre was to press forward, while the Eastern Force attacked and rolled up the Japanese right. The Russians had now definitely located the three Japanese armies, but were under the false impression that the 1st Army was reinforcing towards the east. The Eastern Force continued to act in two main groups: the 1st Siberian Corps was to attack the Chengkou Ling, Tu-men-tzu Ling and Ta Ling, the IIIrd Siberian Corps to storm Shih Shan (Lautkalaza), and the IInd Siberian Corps remained in reserve. General Stakelberg gave out that the object of the operations was the attack of the Japanese advanced positions, and the occupation of the passes at all costs. The front of his operations was about 14 miles, and he did not discover until later that he was actually attacking the main Japanese position. The orders emphasized the importance of keeping up communication between the troops, flag signalling being specially mentioned—a branch of signalling which had been little developed in the Russian Army. The south-eastern part of Shih Shan, known also as Rocky Hill, was the scene of desperate fighting (pp. 221—227). The Russians gallantly endeavoured to scale the natural walls of the Japanese position. The Japanese did great execution by the time-honoured method of dislodging boulders, and hurling stones, and even the corpses of their dead, upon the escaladers. The Russians could not progress, but they were not defeated, and they prepared to renew the attacks at nightfall.

The attacks of the 1st Siberian Corps under General Gerngross were no more successful. The natural obstacles and the Japanese resistance were too great, notwithstanding that the attacks were continued through the night. A good description of the preparations for, and the execution of, a night attack on the Ta Ling by seven companies of the 34th East Siberian Rifle Regiment is given on pp. 238—240.

The swinging blow by Kuropatkin's left had been parried by the Japanese right; their counter was now falling upon the Russian Centre. The brunt of this counterstroke fell upon the IVth Siberian Corps and the troops under Generals Mau and Mishchenko. Fierce fighting took place on Temple Hill, Nan Shan, and Doublehorned Hill.

General Kuropatkin's concern for his men is exemplified on p. 276. Two companies of the Novocherkas Regiment on their way to garrison Doublehorned Hill met the Commander-in-Chief who enquired their mission. On learning this he replied: "Why so many of you? One company is enough there; the other may rest." So one company only at first took post on this hill—the key to the central position. The account given of the preparations made by the Japanese for the attack of Doublehorned Hill is very instructive (pp. 279—281). The Japanese storming force, according to this account, outnumbered the Russians five times.

The Western Force had been ordered to take up the line occupied on October 10th by its advanced guards. The Xth Corps was on the Shi-li ho, the XVIIth Corps in and about the village of Yen-tao-niu-lu.

The bulk of Oku's IInd Army attacked the latter: a notable counter-attack delivered by the 9th (Ingermanland) Regiment is described on p. 250. Eventually the Russians were driven back. They determined to retake the village by night assault. Four battalions under Colonel Martinov stormed the village in the dark, and routed the surprised Japanese (pp. 253 and 254). The Japanese attack on Shi-li ho Village was repulsed largely by the fire of a battery which had made by day

adequate preparations for night firing, a good example of the value of artillery at night (p. 254).

On October 11th the initiative definitely passed over to the Japanese; the Russian offensive was spent, and their further action for the remaining days of fighting was restricted to warding off the blows of their enemy.

Chapter VIII.—During the night of October 11th—12th the Japanese prepared for further offensive operations against the Russian Centre and Western Forces. General Kuropatkin had great cause to be anxious lest his centre should be penetrated, and his right flank turned. He endeavoured to reinforce the centre, using General Stakelberg's reserve, IInd Siberian Corps; and he ordered General Bilderling to retire, an order which led to some misunderstanding and confusion. The IVth Siberian Corps offered an obstinate resistance in the centre, but had to give ground by the end of the day; and the XVIIth Corps was driven back across the Sha ho. The Eastern Force, discouraged by the failure of its night attacks, and alarmed for its left flank by the appearance of Prince Kanin's 2nd Cavalry Brigade, also began a retrograde movement. This chapter is rich in tactical lessons, in particular, attention may be drawn to the description of the Japanese attack on Shi-li ho Village (p. 307).

Chapter IX.—A long appreciation of the situation on the evening of October 12th shows that the collapse and retreat of the XVIIth Corps was not then known at General Headquarters; it refers to a Japanese "demonstration" against the right of the Western Force. By this time, if General Kuropatkin had been kept adequately informed as to the situation of his own troops, it should have been evident that Oku's attack was no mere demonstration. We see that General Stakelberg, who also was unaware of the defeat of the XVIIth Corps, intended at first to hold his ground. He was, however, anxious for his flanks, and had just cause for uncertainty as to how he stood for reserves. By the Commander-in-Chief's orders his IInd Siberian Corps in the space of a few hours had been withdrawn, restored and again diverted to assist the Centre. But about 1 p.m. the order for retreat was received from General Headquarters. This gave Stakelberg the first news that the XVIIth Corps had been forced back to the Sha ho. He was now directed to withdraw the Eastern Force northwards, to keep touch with the rest of the army and protect its left flank.

A Russian success of importance was achieved on the Chao-hsien Ling by Colonel Lisovski's detachment (Ist Siberian Corps) which encountered and stopped a brigade (Matsunaga's) sent by Kuroki to cut off the retreat of the Eastern Force. The narrative then proceeds with the arrangements made to withdraw the Eastern Force to near Pien-niu-lu-pu.

The Western Force was now behind entrenchments. The XVIIth Corps, north of the Sha ho, spent October 13th in restoring order. Fortunately for General Bilderling the Japanese were not active here, and the fighting was confined mainly to the artillery. The VIth Siberian Corps was definitely allotted to General Bilderling on this day.

A heroic battle raged in the centre about La-ta-shan, and the troops under Generals Mau, Zarubaev (IVth Siberian Corps) and Mishchenko suffered very heavy losses. Here is an example of the fighting (p. 359). For four hours a part of Mishchenko's force withstood a determined attack by Kuroki's troops (1st Guard Division). So heavy were the losses that in the half-company alongside the general only five men remained in the ranks. Ammunition ran short, and one company met the assault with stones and cold steel; six boxes of ammunition were brought up at the critical moment, firing was resumed, the assault was repulsed, and the Japanese dead lay within 16 paces of the trenches. At nightfall the Russians fell back.

No decisive events occurred on this day. The historian considers that the Japanese now appreciated the dangerous situation of the Eastern Force if the Russian Centre was broken, and henceforward applied all their efforts to this task.

Chapter X.—On October 14th the Eastern Force continued its retreat with little molestation and came into line with the rest of the Army behind the Sha ho. General Kuropatkin now withdrew the Ist Siberian Corps from Stakelberg's command. In the centre, General Mishchenko and the 1st Army Corps were heavily engaged, and for several hours the last-named corps was in a precarious position as the Russian

troops on both flanks had fallen back. A remarkable confusion of orders is recorded on p. 933; the 37th Division (1st Army Corps) received simultaneously orders to attack and to retire; to solve the difficulty the division did neither, but stood fast. The principal action of the day concerned the Xth Corps about Houtai, south of the Sha ho. The Xth Corps had been worried for most of the night, and at dawn on October 14th the Japanese stormed Kan-chia-la-tzu, a village on the Mandarin Road, and drove in the centre troops of the corps. So impetuously was the attack followed up that the Japanese captured three batteries which only became aware when too late that the enemy were close upon them (p. 369). Later in the day the Xth Corps attempted to recover ground, but their attack failed and the Corps was withdrawn to the north bank of the Sha ho. The Western Force engaged in serious fighting at La-ma-tun and Lin-shin-pu, and the latter place was lost. A well-delivered counter-attack took place at Ta Ling Tun, on the right of the XVIIth Army Corps. Here the Russians gallantly recaptured some of their guns. General Kuropatkin had intended Bilderling to keep the VIth Siberian Corps in reserve, but it was brought up into the front line at 7 a.m. and directed to advance to the Sha ho. Although the tactics adopted led to heavy loss and to no direct success, yet it relieved the pressure on the XVIIth Army Corps and enabled them to hold La-ma-tun and the ground generally.

Chapter XI.—The events of October 15th are told in only sixteen pages. The Eastern Force, all of which was now on the north bank of the Sha ho, engaged in no serious action. In the centre General Kuropatkin was at work collecting a general reserve. He ordered General Stakelberg to send him 24 battalions, and collected 24 more from the 1st Corps and IVth Siberian Corps. With these troops the Commander-in-Chief contemplated the delivery of a counterstroke from the right centre, but circumstances prevented the accomplishment of this design. The Xth Corps threw up new entrenchments behind the Sha ho, astride of the Mandarin Road. The XVIIth Corps endeavoured without success to recover ground at Lin-shin-pu, and lost La-ma-tun. The loss of La-ma-tun may largely be attributed to the effort to form a corps reserve by withdrawing battalions from the front line. The neglect to inform adjacent troops of what was going on led them to think that a general retirement was in progress, and so the troops in La-ma-tun fell back unnecessarily (pp. 407, 408). On this day it became evident to the Russians that the Japanese offensive was weakening.

Chapter XII.—To those wearied of the long tale of Russian hesitation and failures, this chapter will bring a sense of relief. The narrative of the night attack and recapture of Putilov and One Tree Hills provides a brilliant episode in a monotonous record of ill success. Just where the Mandarin Road crosses the Sha ho, that river makes a northerly bend which encloses a little group now known as Putilov and One Tree (or Novogorod) Hills. From these eminences the Russian position could be enfiladed, and General Kuropatkin decided that they must be retaken. Pp. 435 to 442 and *Plate* 46 describe the operations. An artillery preparation from well-concealed batteries commenced at 3 p.m. on October 16th, and 25 battalions in two columns were to deliver an enveloping attack at 6 p.m. The left column became prematurely committed to the attack; but, in spite of the difficulties entailed in fording the river and advancing for over a mile in the dark, the Russian right column approached unopposed to within 400 yards of the Japanese trenches, and then carried them at the point of the bayonet. Sixteen guns were taken and Putilov Hill was secured. Between 9 and 10 p.m. One Tree Hill was also captured, but the difficulties of intercommunication were such that the captors were unable to hold it owing to the fire from their own infantry, and the Japanese regained possession though only to be ejected finally at 3 a.m. on October 17th. The capture of Putilov Hill marked the conclusion of the Sha ho operations, which, according to the Russian view, ended indecisively.

Chapter XIII. is devoted to the miscellaneous work carried out on the Russian lines of communication in the immediate theatre of operations.

The arteries of supply were extremely varied. The Western Force depended upon the main line of railway, although the bridge over the Hun ho, partially destroyed by the Russians during their retreat from Liao-yang, had first to be repaired. The

Eastern Force was supplied by the Fushun Colliery branch line, which was in such bad condition that traffic on it was restricted to a speed of 6 miles an hour. Junks on the Liao ho and Hun ho carried stores and food for Kossakovski's and Dembovski's detachments. Field tramways could not be used as most of the material had been lost or scattered during the retreat. Nor did uniformity prevail in regard to transport. Army transport vehicles and hired Chinese carts were commonly used, but General Rennenkampf had pack transport, and Colonel Madritov was given a free hand in furnishing his detachment with both food and transport from local resources. The Army of Manchuria had little cause to grumble at the inflow of its food supplies. The maintenance of ammunition stocks does not appear to have been so successful, and great anxiety prevailed lest the reserves at the front should be totally exhausted. The extraordinary efforts made to get a special train load of ammunition through from Kharbin to Mukden are related on pp. 464 to 466.

After dealing with road construction and telegraphs (12 bridges were provided over the Hun ho besides the railway bridge), the chapter concludes with the evacuation of the sick. The plight of the wounded was indeed pitiable; brought from the battlefield to the railway mainly in springless transport vehicles, they were loaded into trains of every description, without any sorting out, and passed on to Kharbin. Out of 45 train loads—30,701 men—sent off between October 14th and 25th, only 11 were proper hospital trains. There was great lack of medical *personnel*. The resources of Kharbin were unequal to the situation. Trains were kept as long as three days before they were off loaded. The station roads were congested and covered with blood-stained bandages and filth indescribable. Baked bread was unprocurable, hot food could only be provided for one meal in the day. Such was the picture in the rear 330 miles from the field of battle.

The special measures necessary to cope with the wholesale leakage of able-bodied men from the ranks on the pretext of detached duty in the rear are of interest (p. 472). Many hundreds of men fit for duty found on the trains were systematically collected, and escorted again to the front.

The Appendices, 49 in number, consist of orders, instructions, memoranda, reports, and telegrams bearing on the operations, but too diffuse to be included bodily in the narrative.

The order of battle, and composition of the Army of Manchuria just prior to the Battle of the Sha ho constitute Appendices 47 and 49 respectively. The "Notes" occupy only six pages, of which three are devoted to Colonel Martinov's explanations in justification of his action in evacuating La-ma-tun.

The maps are the disappointing feature of the volume; they are poorly printed, and of all sorts of shapes and sizes. Those which illustrate the operations as a whole are so crowded with names and detail as to be almost unreadable. The larger scale maps illustrating particular incidents in the fighting leave little to be desired.

The narrative of the fighting on the Sha ho presented in this volume is necessarily compiled almost entirely from Russian sources of information, it therefore gives in most cases only one side of the story, and the picture presented lacks the perspective and breadth of view which should be obtained by judicious blending of the several experiences of the opposing forces.

The 23 officers who collaborated under the French General Staff in translating this history from the Russian original may well be congratulated on the result of their labour. The French edition is easy to read, clearly expressed, and free from the stilted style which so often pervades a translation.

PART II.—The Second Part of Volume IV. relates the story of the winter period of the campaign, after the Battle of the Sha ho, and the events leading up to and culminating in the Battle of Sandepu. It contains also in a supplement the narrative of General Mishchenko's raid on Ying-kou. The chapter headings are as follows:—

Chapter XIV.—Situation of the opposing sides after the Sha ho operations during the winter.
Chapter XV.—Strengthening the positions.
Chapter XVI.—Plans of operation prepared during the winter.
Chapter XVII.—Operations during the winter lull.

The Battle of Sandepu.

Chapter XVIII.—Elaboration of the plan of operations.
Chapter XIX.—Deployment of the IInd Manchurian Army. Preparation of the operations.
Chapter XX.—Assumption of the offensive. Battle of 25th January, 1905.
Chapter XXI.—Operations of January 26th.
Chapter XXII.—Operations of January 27th.
Chapter XXIII.—Operations of January 28th. Retreat of the IInd Manchurian Army. Fighting at Chang-tan-ho-nan.
Chapter XXIV.—Organization of the immediate rear after the Battle of the Sha ho.

Supplement.—General Mishchenko's Raid.

Chapter I.—Preparation for the raid: description of the country.
Chapter II.—Operations of the cavalry up to Ying-kou station.
Chapter III.—The attack on Ying-kou station. The return of the cavalry.

Chapter XIV.—The Russian historian attributes the failures of the Sha ho operations to the almost total absence of local reserves, as well as to the insufficiency of the General Reserve; and he points to the success which ensued at Putilov Hill on October 17th after the General Reserve had been formed afresh on the previous day (p. 12).

This success inspired in General Kuropatkin a desire to renew the offensive at the end of October, and General Bilderling also put forward a scheme. But these plans did not fructify. Both sides were wearied, weakened, and short of ammunition; and although sniping was incessant, and skirmishes occurred frequently, the opponents devoted themselves during the remainder of the year to entrenching their ground and reorganizing their formations. The wastage in the Russian Army had been great: battalions were reduced to 400 men, and the deficiency in officers was serious. On October 24th General Kuropatkin addressed a long telegram to the Tsar asking for more troops. The divided responsibility for command, which had hitherto existed between the Viceroy and the Commander-in-Chief, was now removed, and General Kuropatkin was given full powers on October 26th. Reinforcements were arriving rapidly, and on November 10th the troops in South Manchuria were organized into three groups, the Ist, IInd, and IIIrd Manchurian Armies, respectively, under Generals Linievich, Bilderling, and Kaulbars. Still, by the end of November the units at the front were only up to 75 per cent. of their establishment, and drafts amounting to 50,000 men needed to complete them to war strength were only due to arrive by the end of December.

The new formations asked for were expected in January, 1905. The chapter concludes by describing the difficulties which arose during the winter. Prolonged rains in Northern Manchuria had hindered the collection of supplies at Kharbin, and various circumstances had combined to hinder the expected increase in the traffic capacity of the Siberian and Chinese Eastern Railways. The troops required warm clothing, felt boots, and tools. The Chinese authorities had been obstructive and Chinese transport drivers had proved unreliable and had to be replaced by Russian soldiers. But these difficulties had all been met by January 15th, 1905.

Chapter XV.—At the opening of this chapter a general sketch is given of the entrenched lines within which the armies lay throughout the winter. The trenches made originally during the Sha ho operations were constantly improved and added to, until they grew into an almost continuous belt of fortifications extending for 33 miles in which were interspersed—fortuitously—redoubts, lunettes, and villages in a state of defence. The effect of this was to chain the troops to their trenches and greatly to discourage offensive operations; indeed, even small reconnoitring parties often had much difficulty on their return to find the narrow gaps available in the lines of obstacles. Moreover, movement was attended with danger and difficulty in rear owing to fougasses and obstacles which had been allowed there. The IIIrd Manchurian Army had two lines of defence—not with a view to greater security, but on account of vacillation as to which of two positions should be occupied in the

event of the Japanese resorting to the offensive (p. 49). Units took duty in the trenches in reliefs for periods of two to four weeks. Constant sniping prevailed. Food, fuel, and water could only be brought up at night. Niches were dug in the reverse slopes of the trenches for the use of men and officers, and stoves were provided for making tea. Local reserves sheltered in ditches with lean-to overhead cover. The reserves were more comfortable in dug-out hutments for 30 to 50 men warmed with stoves, and fitted with plank beds.

The Japanese were considered to be very strong in the centre—about the Mandarin Road. Page 60 gives their estimated numbers as 180,000 bayonets, but it was uncertain whether the 8th Division was present. Three lines of defence were said to exist between Liao-yang and the Sha ho; there were few closed works and the Japanese relied largely on high wire entanglements as obstacles.

The situation in rear of the Japanese armies, as then known, is described on pp. 61—65, in view of the raids which ensued. The lines of communication were weakly protected by quite small posts for about 200 miles between Dalny and Liao-yang.

Chapter XVI.—In this chapter the various plans for resuming the offensive put forward by army commanders, and by the staff at General Headquarters, are examined at great length. The intention to resume the offensive existed with General Kuropatkin from October 15th when the Russian attack on Putilov Hill was crowned with success; but action was postponed owing to the reduced numbers of the units, the shortage of ammunition, and the general exhaustion of the troops. The VIIIth Corps was due to arrive towards the end of November, and it was decided to wait for this, as well as for drafts to fill up the gaps in the units already present. With the arrival of the VIIIth Corps, the Russians would have seven corps in the fighting line and three in reserve. But Kuropatkin's intentions to move in December were frustrated by the failure of the Chinese Eastern Railway to do what had been expected of it. Not only were drafts in arrear, but the troops had not then been properly equipped with the warm clothing and entrenching tools necessary for an advance. On November 25th the Commander-in-Chief telegraphed to the Tsar that he considered it essential to have superiority in numbers, and he proposed to take the offensive in January without waiting for the XVIth Corps and the three rifle brigades.

On December 17th General Kuropatkin circulated an appreciation of the situation to the three commanders of armies and requested their opinions. They all considered that the main blow should be directed against the Japanese left flank, and the plan eventually adopted was based on their recommendations. The plan is given in detail on pp. 102 to 104. Briefly, the Ist Army had to stand fast on the left, the IIIrd Army was to advance in the centre, and the IInd Army would make the turning movement from the right. Elaborate arrangements were projected for deceiving the enemy. Dummy artillery was to be used freely; local contracts were to be given out for food and forage to be delivered in the area of the Ist Army, and troops were to be moved to the east by day and taken back to the west again at night. But on January 2nd, 1905, Port Arthur fell and the situation was changed. Nogi's Army thus released would be on the Sha ho in February, more reinforcements from Russia could hardly be expected in view of the political situation in Europe. "It therefore seemed necessary to take advantage of the transient situation favourable to us, in S. Manchuria and to strive to win a decisive victory." Three rifle brigades and the XVIth Corps were on their way to the front. "It was considered not expedient further to delay the assumption of the offensive by waiting for the 25th Division (of XVIth Corps) but to act immediately the three rifle brigades arrived." The final impetus to action was the realization that if the Russians waited longer the Japanese would themselves take the offensive. Although this chapter contains much that is of interest, it ends with disappointment, for "all the various plans elaborated during the winter lull were only partly put into operation when the advance of the IInd Army ended in the Battle of Sandepu."

Chapter XVII. opens with a general sketch of the fighting which took place from the end of October to the middle of January. It was limited with a few exceptions to unimportant skirmishes, minor raids, and small reconnaissances in force. In the latter the Russians seem to have shown more activity than their opponents, and considered that they served to keep up a cheerful spirit among the troops. Of the

larger operations the defence of Temple Hill by Colonel Popovich Lipovat is worthy of note. A detachment of about four companies of infantry occupied this advanced position on October 17th and entrenched it during the night. The colonel repeatedly represented the necessity of artillery for the defence of the position, but his requests were ignored; and after holding it for nine days under almost continuous artillery and rifle fire, and withstanding for 10 hours the Japanese assault on October 27th, the battered Russians withdrew in good order.

On November 23rd the Russians carried out an extended reconnaissance along their whole front, with the object of seizing prisoners in order to ascertain the units of the troops opposing them. A moonlight night was purposely selected to facilitate movement, and to this the failure is mainly attributed. Only 11 Japanese were taken, and the Russians lost 80 men killed or wounded. On the following day the Japanese retaliated by attacking General Rennenkampf's force on the east; the attacks were repeated daily until finally repulsed on November 28th. General Linevich wished to follow up the success by sending Rennenkampf to the Tai-tzu ho, but the Commander-in-Chief would not sanction this enterprise.

Chapter XVIII.—Under the sub-headings "Influence of the Preceding Events," and "Influence of Port Arthur," this chapter repeats a great deal that has been explained earlier in the volume. The remainder of the chapter deals with preparation of the final plans for the advance. The circular memoranda and instructions issued from General Headquarters were exceedingly voluminous. On December 21st General Kuropatkin circulated his own scheme for taking the offensive, and invited the commanders of armies to express their views. All favoured the attack on the Japanese left, but Bilderling wished to wait for the arrival of the XVIth Corps and the three rifle brigades.

On December 31st another circular was issued in which the Commander-in-Chief announced his intention to attack as soon as the XVIth Corps began to arrive. The fall of Port Arthur altered the aspect of affairs; an immediate advance became necessary, viz., to forestall the reinforcement of Oyama's armies by that of General Nogi.

Meanwhile, on January 9th, with a view to delaying the arrival of Japanese reinforcements, General Mishchenko had been sent with some 7,500 mounted troops to raid the enemy's communications. He had returned on January 16th without having achieved any tangible result.

On January 19th General Kuropatkin issued his final plan. The immediate objective in this was the envelopment of the Japanese IInd Army (Oku); the ultimate object was to drive the Japanese behind the Tai-tzu ho. The advance was to begin on January 25th. Minute details were entered into as to the tactics to be employed. Information regarding the enemy formed the subject of separate instructions, and in these the movement of the IInd Manchurian Army was restricted. An appreciation of the probable plans of the enemy, given on p. 190, indicated that the fall of Port Arthur was expected, and that the Japanese might take the offensive after the middle of January. The Japanese forces on the Sha ho had been assessed at 260,000 men on January 4th; but shortly before the advance started information came in which showed that the previous estimates were excessive. It is interesting to notice that the Japanese on their part greatly underestimated the strength of the troops on the Russian right (p. 202). The end of the chapter relates the situation of both sides in the middle of January. The general dispositions of the Japanese had altered little since October. Kuroki's Army was on the east, Nodzu's occupied the centre, and Oku's Army on the west extended from the railway to the Liao ho. "The whole Japanese front was a maze of barbed wire"; their lines consisted of trenches and defended villages with only a few redoubts.

Chapter XIX. describes the preliminary operations leading up to the battle. The deployment of the IInd Manchurian Army proceeded very deliberately, and the historian considers that "success depended upon surprise, but the early advance of the various units of the IInd Manchurian Army, and its gradual deployment, undoubtedly disclosed to the enemy the real meaning of our concentration." The precautions ordered to prevent leakage of information are detailed on p. 211. A continuous outpost line was placed. The preparations made in forming magazines

and laying down branch railways and tramways are given here. The arrangements for intercommunication were elaborate; telegraphs, telephones, and relays were to be provided. Reports were to be rendered every two hours. The instructions included headings under which information was to be furnished; one item being "a list of trophies captured from the enemy." Communication between General Headquarters and the staffs of armies was maintained largely by specially detailed officers of the General Staff. The troops were ordered to carry 250 rounds of ammunition per man. The last part of the chapter gives a description of the country and of its tactical features. The ground was generally level, and favoured the defensive. The locality was thickly populated, the villages easily defensible. Roads were in good order; troops could only move with difficulty across the furrowed fields, and transport not at all. The weather was misty and bitterly cold, the night temperature 20° F. The ground was as hard as iron.

Chapter XX. narrates the first stage in the Russian advance. During the previous week two incidents occurred to disturb the arrangements. On January 18th the Japanese attacked General Rennenkampf's force on the eastern flank; and two days later General Mishchenko on the west reported that a hostile column of 2,500 infantry and mounted troops was moving north-west on to the Liao ho. The latter news in particular caused anxiety, and General Kuropatkin personally directed Grippenberg to put off the offensive for two days, while Mishchenko, reinforced by the 14th Division should fall upon this column. Grippenberg, however, ignored this order, and among the reasons which he gave for so doing is the following remarkable equivocation:—

"When the Commander-in-Chief at our private interview ordered me to put off the advance until the 27th January, he did not cancel his previous written orders to advance on the 25th January."

General Grippenberg issued his orders on January 23rd (see Appendix 40), and on January 24th he informed the Commander-in-Chief that he would advance at dawn next day without waiting for the 14th Division. The Japanese move was only a feint, and the 14th Division after three days' fruitless marching rejoined the VIIIth Corps on the morning of the advance. A description is given of the positions of both combatants just prior to the advance. The IInd Manchurian Army had Mishchenko's and Kossakovski's mounted troops on the extreme right, next came the Ist Siberian Corps. The VIIIth Corps was in the centre, and the Xth Corps on the left. The Provisional Rifle Corps was in the rear on the Hun ho as a reserve. General Grippenberg's intention was to turn the left of Oku's Army by seizing the positions which lay between the Hun ho and the Sha ho, beginning from the Hun ho. The elaborate orders to regulate the employment of the artillery are given on p. 262. The artillery of the IIIrd Manchurian Army was to support the advance of the IInd Manchurian Army. The Ist Siberian Corps was to cross the Hun ho, seize Hei-kou-tai, and then co-operate in the attack of Sandepu. The VIIIth Corps ordered to attack Sandepu was only to proceed when Hei-kou-tai had fallen. The *rôle* of the Xth Corps was to demonstrate only, and its artillery was to support the VIIIth Corps. The narrative then relates the experiences of each corps in turn, and this procedure is repeated in all the subsequent chapters describing the fighting. The Ist Siberian Corps moved off about midnight January 24th—25th: the outpost villages were soon taken, but Hei-kou-tai was obstinately defended and was not captured until 10 p.m. The attack on Sandepu by the VIIIth Corps, delayed until dusk, was disjointed and unsuccessful in spite of bombardment all day long by the combined artillery. The Xth Corps turned the Japanese advanced troops out of the nearest villages, but this display of initiative alarmed the Commander-in-Chief, who telegraphed to the corps commander: "I have told General Grippenberg that the Xth Corps will not advance, please understand this order is to be strictly adhered to." An account of the Japanese operations, taken from Japanese sources, shows that the troops in the neighbourhood of Sandepu consisted mainly of cavalry—8 squadrons, 3 companies of infantry, 6 guns, and 6 machine guns.

Chapter XXI. deals with the third day of the battle. General Grippenberg's orders for January 27th directed that the advance was to be continued, the objective remaining unaltered. The VIIIth Corps was to capture Sandepu, and then send on

the 15th Division to seize the villages behind that place. Again General Kuropatkin disapproved of his subordinate's intentions; he informed General Grippenberg that it was "inadvisable that the IInd Manchurian Army should undertake decisive operations all along the front," and requested him to limit himself to taking Sandepu. Thus, the historian says: "we see that the operations of January 26th had commenced with a certain disagreement between the Commander-in-Chief and the commander of the IInd Manchurian Army." The Russians were unfortunate in their weather; in two parts of the field, troops went astray in the fog and falling snow. General Lesh's detachment of the 1st Siberian Corps, which had been sent to co-operate with the VIIIth Corps by attacking Sandepu from the south, lost its way and became engaged elsewhere. The VIIIth Corps moved off to the attack in a blizzard and went astray; direction was eventually regained, but the general attack by the 14th Division only developed about 4 p.m., and two regiments got out into the south side of Sandepu. This division, which had just made two forced marches, had been on outpost duty on January 24th—25th, and then in action all day, was exhausted. The men fell asleep in the ranks and lay in the snow. The commander asked that his division should be relieved. To crown all the Japanese set fire to the part of the village which they had relinquished. It was impossible to hold the ground which had been won, and at 2 a.m. the Russians fell back unnoticed by the enemy. The temporary success however was magnified, and the false news that Sandepu had been captured spread with far-reaching results.

A very lengthy explanation of the circumstances involving the evacuation of the captured portion of Sandepu is given on pp. 315 to 333. The chapter ends with General Grippenberg's plans for continuing the attack on the next day, and with a short description of the actions of the Japanese, whose troops in Sandepu had received a timely reinforcement about 7 p.m. on January 26th.

Chapter XXII.—The Battle of Sandepu furnishes a striking example of the confusion which may ensue from meagre and faulty information in the progress of operations. Generals Kuropatkin and Grippenberg both thought at first that Sandepu was taken, and their respective orders issued under this impression had to be altered, with corresponding effects all down the chain of command. At 8 a.m. on January 27th, General Grippenberg decided to continue the attack on Sandepu. But the previous orders had led to a partial dispersal of the artillery required to prepare and support the attack. These guns had to be assembled afresh, and in fact no further attack on Sandepu ensued on this day, and the IInd Manchurian Army was kept inactive.

As the VIIIth Corps was exhausted, General Grippenberg at 8 a.m. ordered the Provisional Rifle Corps to take up the attack on Sandepu; but the day was frittered away, and at 5 p.m. Grippenberg informed Kuropatkin that he proposed to deliver the attack "to-morrow." The feature of January 27th was the remarkable initiative displayed by General Stakelberg in handling the 1st Siberian Corps. He decided to seize Su-ma-pu (a village 5 miles south-west of Sandepu) and met with vigorous resistance; a deadlock ensued. Grippenberg sent a general officer to ascertain the situation, and to impress on Stakelberg that "he must refrain from the offensive and act defensively." The latter sent back the spirited reply that "it was essential to capture Su-ma-pu in order to retain hold of Hei-kou-tai"; and added: "the spirit of the troops is splendid, they themselves desire to finish with Su-ma-pu by a night assault." He persisted with his intentions, and gained the southern end of the village at 4 a.m. on January 27th—28th, but after a desperate struggle his troops were forced to relinquish their hold. General Kuropatkin was much displeased at Stakelberg's enterprise; he was already anxious lest the Japanese should be concentrating about Sandepu with a view to counter-attack. General Mishchenko also engaged in an active offensive on January 27th, and was wounded. The 1st and IInd Manchurian Armies were entirely passive throughout the day.

Chapter XXIII. relates at great length how the Russians came to abandon the offensive and withdrew to their former winter quarters.

On the morning of January 28th, the continuation of the attack on Sandepu was still Grippenberg's main objective; and the Provisional Rifle Corps was preparing to carry this out. But at 8 a.m. the Japanese themselves attacked this corps in

force; this attack was driven off, but it had far-reaching results. General Grippenberg now proposed to hold the enemy in front and to attack both his flanks, and the Provisional Rifle Corps was told to make no advance without special orders. The Xth Corps, on the Russian left, was directed to attack, but hardly had it moved forward when the corps commander received another order to be ready to resort to the defensive. General Headquarters were alarmed lest the Japanese should be about to fall upon the IIIrd Manchurian Army—the Russian Centre. The Ist Siberian Corps was again heavily engaged. General Stakelberg fell back from Su-ma-pu, and at 2 p.m. the Japanese made an attempt to get into Hei-kou-tai. This failed, but the attack was repeated at intervals in the dark, and culminated in a general assault at midnight. The Russians held their ground.

General Grippenberg's plans for January 29th are discussed on p. 401. He still proposed to revert to the offensive on that day, and assembled a conference to draw up a plan for the attack on Sandepu, but, says the historian: "Sandepu had lost its former significance in consequence of the necessity of first defeating the enemy's active troops."

An important section of this chapter is devoted to: "The Commander-in-Chief's orders directing the offensive movement to cease." Throughout the day the Commander-in-Chief's anxiety lest the Japanese should be preparing a coup grew more and more acute, and at 8 p.m. on January 28th he telegraphed to General Grippenberg's Chief of Staff: "Withdraw forthwith from the advanced line . . . the troops will fall back to-night." A confirming telegram said: "An advance of a considerable force of Japanese upon the IIIrd Manchurian Army has been discovered. It is necessary for a time to abandon the capture of Sandepu. The IInd Manchurian Army will concentrate on the left bank of the Hun ho, and take up a line for an obstinate defence." And so once more General Kuropatkin gave up the initiative.

The narrative then deals with the withdrawal of the several corps to the positions allotted to them; the measures taken by the IIIrd Manchurian Army to meet the expected attack, and the action of the Chan-hun-ho-nan from January 31st to February 1st. This village had been seized by the Japanese early on January 29th. The 4th East Siberian Rifle Regiment was sent to retake it, but could make no headway owing to the havoc wrought by the enemy's machine guns. After a night attack a footing was gained on February 1st, and the Japanese were finally ejected next day. The account of the main operations taken from Japanese sources shows that on January 28th the Japanese main objective was Hei-kou-tai.

The story of General Grippenberg's recall to Russia is given on p. 418. On January 30th he telegraphed direct to the Tsar asking to be recalled on account of ill-health, and on His Majesty demanding "the real reasons for your request," General Grippenberg replied: ". . . Apart from my health, the real cause which compels me to request to be relieved of the command of the IInd Manchurian Army is that I have been completely deprived of the initiative and independence which is my right, and also because of the painfulness of the situation resulting from the impossibility of doing useful work for our cause, which is in such a miserable state." And certainly the Commander of the IInd Manchurian Army had ample grounds for complaint in these respects. The chapter concludes with statistics of losses during the operations.

Chapter XXIV. deals with the organization of all the administrative services at the front during the winter of 1904—1905. The matters dealt with include supply, transport, railways, roads, telegraphs, ammunition and ordnance, medical and sanitary services. The arrangements made to house the drafts, amounting to some 40,000 men, in the vicinity of Mukden are of interest. Large numbers were quartered in the Chinese villages, a rent of from 1 to 3 roubles per night being paid for each house occupied.

Extensive use was made of horse tramways to facilitate supply. The preparations made to supply food and forage for Mishchenko's raid are given on p. 461. The attempts to keep the matter secret were not very successful, as transport was hired for the supplies and of course the contractors had to be informed as to their destination.

The Appendices consist of various reports, states, orders and telegrams *in extenso*.

No. 5, a telegram dated January 2nd, 1905, from General Kuropatkin to the Minister of War, gives a very good idea of the natural difficulties with which the troops had to contend. No. 11, a telegram dated December 28th, 1904, reveals the deficiencies in clothing, tools, supplies, etc., in the Manchurian armies. This telegram is also remarkable for its length: it occupies more than six pages of print—about 2,500 words. Nos. 23 and 24, a memorandum and a report by General Linevich, discuss the proposed offensive operations. No. 28 gives the minutes of the conference held on January 10th, 1905, at General Grippenberg's Headquarters to consider the plan to be adopted in the offensive. No. 34 is the order of battle of the Russian forces in Manchuria on January 14th, 1905. No. 40 contains General Grippenberg's Orders of January 11th, 1905. The notes are unimportant. The maps showing the situation generally suffer from lack of clearness. The largest scale maps are good.

THE RAID ON YING-KOU BY THE CAVALRY DETACHMENT UNDER GENERAL MISHCHENKO.

Chapter I.—The first part of the chapter deals with the situation of the Russian cavalry after the Sha ho, and with several proposals to employ it actively. On December 24th General Kuropatkin ordered Mishchenko to examine the country south of the Liao ho as soon as the rivers froze, and recommended that the reconnaissance should be carried out by parties of 25 to 50 men. A week later Port Arthur capitulated and it became very important to delay the transfer of Nogi's Army to Liao-yang. A scheme to dispatch the cavalry to the south of Hai-cheng was under consideration at General Headquarters, and on January 4th General Kuropatkin himself suggested that Ying-kou should be raided by a force under Mishchenko to consist of 12 cavalry and Cossack regiments, 6 batteries of horse artillery, and pack transport.

General Mishchenko rendered a report (Appendix No. 1.) on January 5th, in which he proposed that his force should march on Ying-kou and Ta-shi-chao, the distance to Ying-kou being 80 miles. He proposed to move in three columns on a narrow front. Three days' forage and five days' rations were to be carried by the transport, as well as two days' rations on each man. The transport convoy was to consist of 1,500 pack animals, besides 600 pack horses in regimental transport. Ammunition was to be carried in carts. This scheme was adopted generally, and the Commander-in-Chief's instructions to Mishchenko form Appendix No. 2. A mixed force was formed under General Korsakovski to assist the raiding cavalry to return. The latter part of the chapter describes the country over which the raid was to travel. It consisted of a plain, mainly of black soil, well cultivated and closely populated along the river banks. The rivers could be crossed on the ice, but their steep banks often required preparation. Water was not easy to obtain. The country generally was suited for cavalry action, and capable of supporting the troops engaged in the raid. The fears that the locality had been drained of its resources proved unfounded. The season was favourable and the weather clear.

Chapter II. narrates the start and progress of the raid from 8th to 11th January. The whole force comprised 71 squadrons (or sotnias) and 22 guns, a fighting strength of 7,000 to 7,500 men. The instructions for the march constitute Appendix No. 5. Fighting *en route* was to be avoided. General Samsonov objected from the outset to the presence of transport and desired to trust to the country, but was over-ruled by Mishchenko. General Mishchenko divided his force into three columns—Right, Centre and Left—under Generals Abramov, Samsonov, and Teleshev, respectively. The concentration of Si-fan-tai was covered by the IInd Manchurian Army. The fighting troops marched off at 3 p.m. on January 8th and covered about 20 miles that evening. On January 9th the columns crossed the Liao ho, and marching only at a walk bivouacked at Davan 23 miles further south. The transport moved out of Si-fan-tai on January 9th, and at once got into difficulties. The animals were ill-broken and fractious. They were led in strings of five, the loads constantly came off, mules lay down, the column strung out, the speed attained was only $1\frac{3}{4}$ miles per hour, and bivouac was reached only at 10 p.m. Mishchenko ordered half the loads to be distributed to the troops, who having found ample supplies on route did not require any more.

On January 10th the columns marched towards Niu-chuang. Three mixed sotnias were organized for the demolition of large bridges on the railway. One sent to the north of Hai-cheng first lost its way, then stalked up to a snowdrift in mistake for a bridge, and, failing finally to find a bridge, blew up the line in several places. Another partly wrecked a train. No important railway structures were destroyed, and the damage actually was repaired in six hours. It is said that these parties covered 120 miles in 22 hours. The right and centre columns became engaged with two companies and some hostile cavalry at Ka-li-ho. Two officers were killed, one a volunteer from the French Army. The transport again hindered Abramov's column. The troops bivouacked 20 miles further south after 18 hours in the saddle.

Increased precautions were deemed necessary on January 11th. The Tai-tzu ho was crossed at noon, and the Japanese troops in Niu-chuang evacuated that place. Demolition parties sent to the railway north and south of Tai-shi-chao effected only trifling damage. "The transport continued greatly to delay the movement of the force" (General Abramov's diary). The force bivouacked between Niu-chuang and Ying-kou after a march of 21 miles. About 550 carts with supplies for the enemy had been captured.

Chapter III.—The raid culminated in an attack on Ying-kou Station on January 12th, and the first part of this chapter described this locality. The railway village had been put into a state of defence, and was covered by a rampart whose exterior slopes had been watered to render it unclimbable. The surrounding marshy ground presented a field of ice giving no foothold. Mishchenko's information as to the strength of the garrison was conflicting, but it appears to have been about 1,300 men. The orders for the attack are given in Appendix No. 10. A detachment was sent 5 miles east to cut the railway and stop reinforcements reaching Ying-kou, and another detachment was employed to deliver a feint attack from the east. The greater part of the force was kept in reserve. The real assault was to be delivered from the north only after a prolonged bombardment, and nineteen squadrons from various regiments were placed under Colonel Khoranov for this task. They carried twelve pack loads of guncotton and a quantity of kerosene. The artillery soon set fire to the stores in Ying-kou, and at 6 p.m. Mishchenko sent orders to Khoranov: "There is no one in the station, attack at once and destroy everything there." The attackers very soon got into difficulties on the smooth ice; and, being illuminated by the glare from the burning stores, came under heavy fire. No progress could be made, and at 7.40 p.m. Khoranov gave orders to withdraw. Nothing had been achieved, and he had lost 61 men killed and 232 wounded or missing. Mishchenko now decided to fall back to the army; his reasons are given on p. 85. The retirement began on the morning of January 13th. The force was hampered with wounded, and so could only travel at a walk. Thaw had commenced on the Liao ho, and the thin ice was crossed with difficulty. On January 14th Japanese infantry from Niu-chuang began to cross the Liao ho, but were checked by artillery fire; in the fighting which ensued the Russians lost 48 men killed and wounded. At one time General Teleshev's column lost touch, and Mishchenko was preparing to turn back to his aid when news came in that he was coming along. During the day the force marched 19 miles. No further fighting occurred. The raiding force joined hands with Korsakovski's troops on January 15th, and was broken up on the 19th.

The results of the raid are summarized at the end of the chapter. The raiding force covered 167 miles in 8 days. The damage it effected was insignificant, and the force lost 365 officers and men killed and wounded. At the end of the raid the troop horses were in fair condition and capable of fresh work. The transport was in a sorry plight: 327 animals had been lost, 458 were in a bad state, and the equipment was ruined. Only 36 per cent. of the supplies carried had reached the troops. General Mishchenko attributes this collapse to the carelessness of the *personnel*, "who did not trouble to feed or even water the animals," and says in his report: "The transport was a useless encumbrance."

Appendices Nos. 6, 7, 8 and 9 contain the orders for the raiding force from 8th to 11th January. Appendix No. 11 gives the orders for retreat. The maps which deal with the raid are clear.

NAVAL AND MILITARY ESSAYS: BEING PAPERS READ IN THE NAVAL AND MILITARY SECTION AT THE INTERNATIONAL CONGRESS OF HISTORICAL STUDIES, 1913. 243 pp. 8vo. Cambridge, 1914. University Press. 7s. 6d.

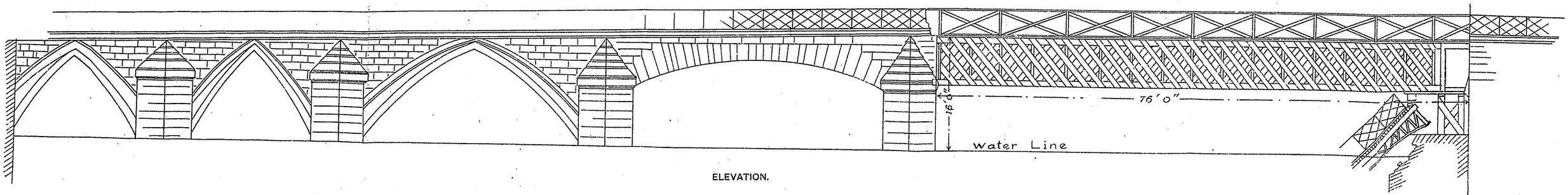
The naval essays consist of the following:—Historians and Naval History, by Sir J. K. Laughton; Staff Histories, by J. S. Corbett; Naval History from the Naval Officer's Point of View, by Capt. H. W. Richmond; Samuel Pepys as a Naval Official, by J. R. Tanner; Naval History and the Necessity of a Catalogue of Sources, by Lieut. A. Dewar.

The military essays are: The Difficulties Encountered in Compiling Military History, by Colonel Sir Lonsdale Hale; The Value of the Study of Military History as Training for Command in War, by Lieut.-Colonel F. B. Maurice; The Practical Application of Military History, by Lieut.-Colonel N. Malcolm; Précis of the Plans of Napoleon for the Autumn Campaign of 1813, by J. Holland Rose; The Influence of Tactical Ideas on Warfare, by L. S. Amery; Field Marshal Prince Schwarzenberg, a Character Sketch by Dr. J. F. Novák; A Defence of Military History, by Prof. C. W. C. Oman; Foreign Regiments in the British Service, 1793—1815, by C. T. Atkinson.

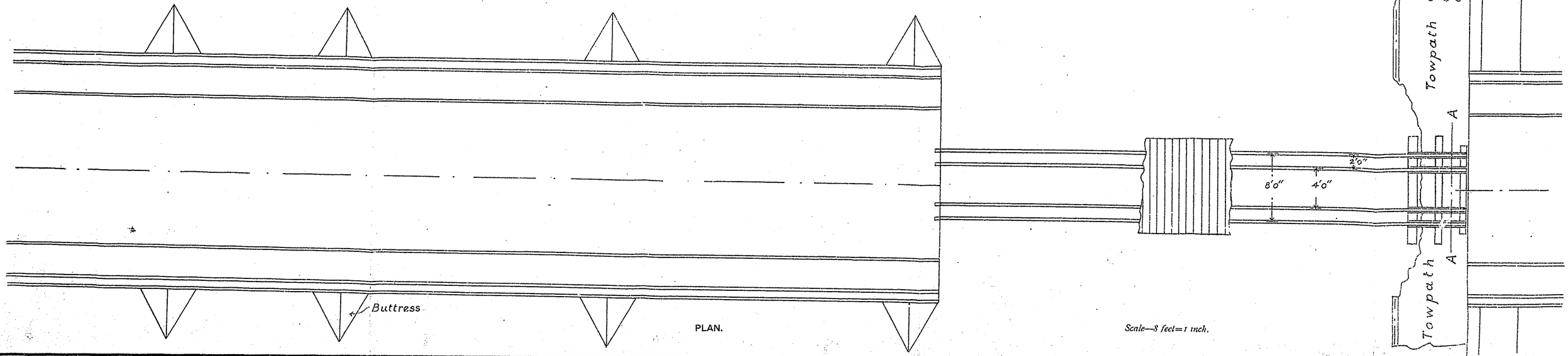
This is an admirable ollapodrida, which from the variety of its contents should find many readers. In the naval section, "Pepys as a Naval Official," is an essay which will appeal to everybody. The amiable Samuel once wrote, we are told, an official minute to the effect that "Englishmen, and more especially seamen, love their bellies above anything else" (Dr. Johnson made a remark to very much the same effect), and, acting on this text, he appears to have done splendid work to the end that the Navy should be punctually supplied with good victuals. He preached a crusade against drunkenness in the Navy, supplied it with chaplains whose "piety, learning and conformity" were above suspicion, and, generally speaking, he remains a model to the Civil Service for all time, though of course it should hastily be added that this applies to his public, not his private, life, as disclosed in the delightful diary. In the military section, Colonel Sir Lonsdale Hale's "Difficulties encountered in compiling Military History" is of great interest. Writing of the German Official Account of the Franco-German War of 1870–71 he says, "It is a marvellous example of *suppresio veri* from beginning to end. Go through that book and you will seek almost in vain, in this history of the actions of human beings like ourselves in stress and difficulty, for any record whatever of anyone in the German force having made a mistake or done anything he should not have done, and yet this book is military history." Mr. Corbett, in his "Staff Histories" in the naval section, makes a remark to very much the same effect: "They labour under two drawbacks. One is, that frankness about political and other external deflections is not entirely possible, since the time has not come when such matters can be laid openly upon the table. The other that, since they are written in the lifetime of the men who fought them, there is a tendency to modify criticism." Prof. Oman, in the concluding paper, "A Defence of Military History," rightly takes the late J. R. Green to task for his amazing statement in his "History of the English People," that "the only war which has profoundly affected English society and English government is the Hundred Years' War with France (1336—1451)."

All these Naval and Military Essays, from which the above are but a few random extracts, are of very great interest. The book forms part of the "Cambridge Naval and Military Series," of which it is to be hoped many more volumes will be published.

RE. WORK AT THE FRONT.—(A). REPAIR OF OLD BRIDGE AT ——



ELEVATION.



PLAN.

Scale—8 feet=1 inch.