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CONTENTS.

CONTENTS.

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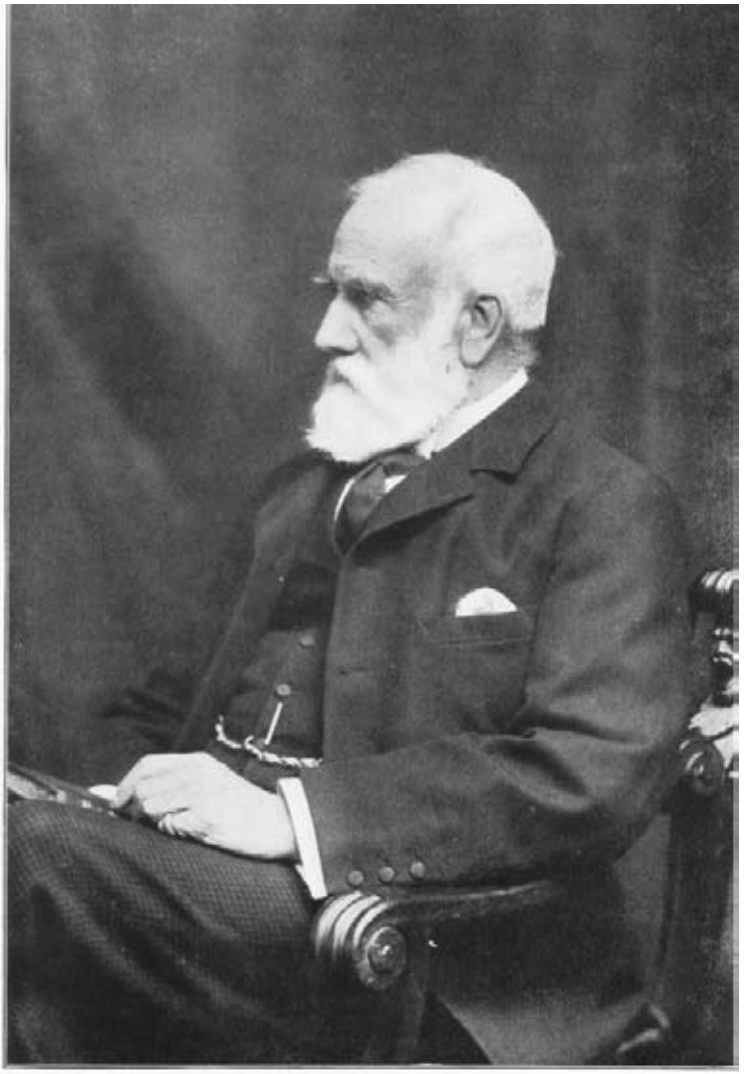

General F. H. Rundall, C.S.I., R.E.

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GENERAL F H RUNDALL RE

Major-General John Heron Maxwell Shaw Stewart.

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MAJOR-GENERAL STEWART

REPORT ON ELECTRO-PNEUMATIC AND AUTOMATIC RAILWAY SIGNALLING INSTALLATION ON LONDON & SOUTH WESTERN RAILWAY.

By LIEUTS. G. C. V. FENTON AND W. G. TYRRELL, R.E.

AUTOMATIC signalling has not been widely adopted in the railways of Great Britain, although many hundreds of miles are in operation in the United States of America.

Electro-pneumatic signalling on the system of the British Pneumatic Signal Co., Ltd., is installed on the London and South Western Railway at the following places:—Staines Station and Triangle Junction; Andover and Grateley (inclusive); Salisbury Station; Basingstoke (inclusive) to Woking Junction (exclusive).

In this system compressed air is the power used to move points and signals. Electricity is used to control the compressed air between stations, and to a limited extent in stations.

Compressed air is supplied by steam-driven air compressors, situated at Fleet, Andover, Salisbury, and Staines. There are auxiliary compressors at Woking, Basingstoke, and Grateley (oil engine drive), which would only be used in case of breakdown to the other plant.

The ordinary types of stop and distant signals are used. The distant signals are fitted with the Coligny Welch Distinguishing Distant Signal Lamps, which show ordinary red and green lights by night, and in addition, on the right-hand side, as seen by drivers approaching them, an illuminated fish tail, showing by night a white light (see *Fig.* 1).

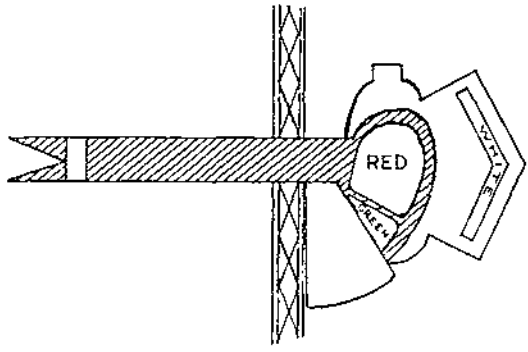

FIG. 1.

All the signals are placed on specially constructed signal bridges spanning the lines referred to. The signals are thus placed directly

over the line to which they refer, avoiding any confusion which exists under the old system of placing fixed signals by the side of the line.

Fig. 2 is a diagrammatic representation of the down-starting signals at Farnborough Station. *Fig.* 3 represents the up-starting signals at Winchfield Station.

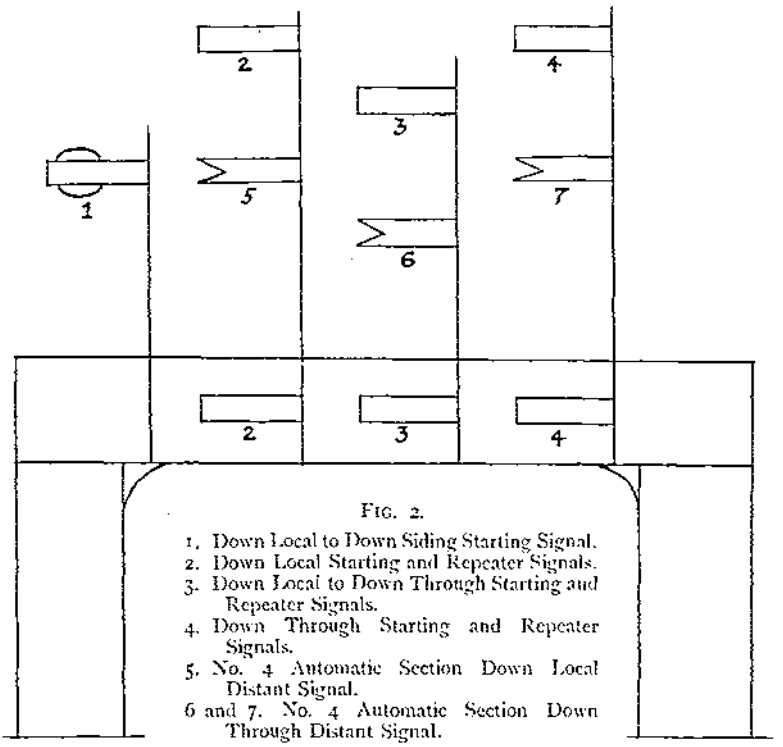

FIG. 2.

1. Down Local to Down Siding Starting Signal.
2. Down Local Starting and Repeater Signals.
3. Down Local to Down Through Starting and Repeater Signals.
4. Down Through Starting and Repeater Signals.
5. No. 4 Automatic Section Down Local Distant Signal.
6 and 7. No. 4 Automatic Section Down Through Distant Signal.

Fig. 4 represents the signal bridge on the London side of Pirbright Junction signal box. *Fig.* 5 (see *Plate*) shows the position and arrangement of all signals from the up side of Winchfield Station to the up side of Farnborough Station. *Fig.* 6 (see *Plate*) shows the arrangements between Farnborough and the up side of Pirbright Junction. Whenever there are points to be moved, such as junctions, crossovers, and turnouts into sidings, there must be a signal box to control the points and the signals in the immediate vicinity.

All signals worked from boxes are normally at danger, and are shown thus in *Figs.* 5 and 6. Between stations, *i.e.*, where there are block sections, in which there are no switches, the signals are worked automatically by the trains. The signals at the beginning of any of these sections only go to danger to protect the train while it is in that section, the normal position being "off." Each automatic home

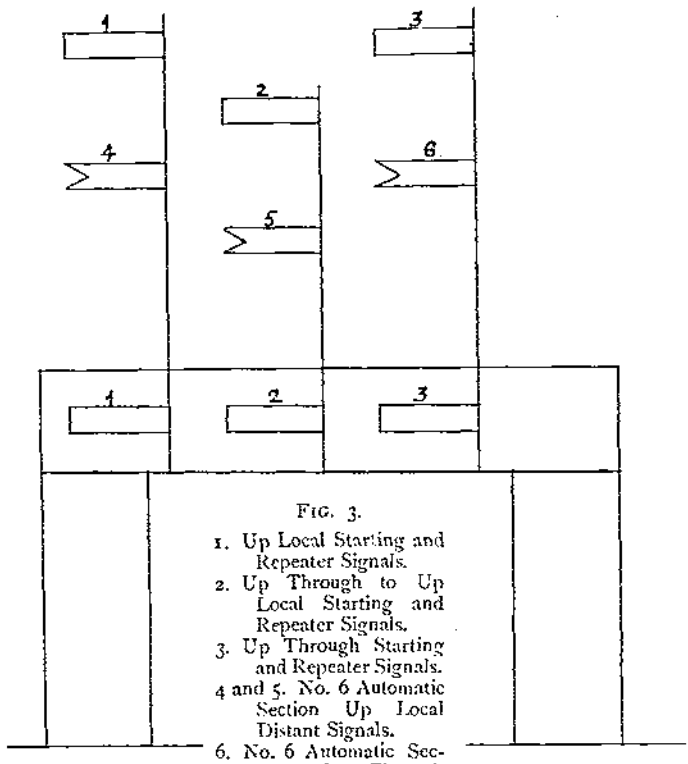

FIG. 3.

1. Up Local Starting and Repeater Signals.
2. Up Through to Up Local Starting and Repeater Signals.
3. Up Through Starting and Repeater Signals.
4 and 5. No. 6 Automatic Section Up Local Distant Signals.
6. No. 6 Automatic Section Up Through Distant Signals.

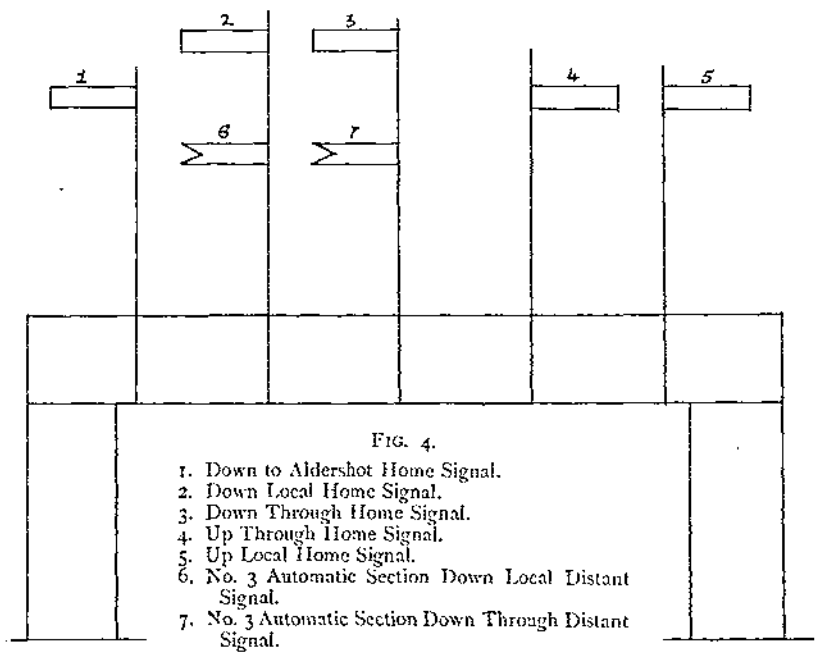

FIG. 4.

1. Down to Aldershot Home Signal.
2. Down Local Home Signal.
3. Down Through Home Signal.
4. Up Through Home Signal.
5. Up Local Home Signal.
6. No. 3 Automatic Section Down Local Distant Signal.
7. No. 3 Automatic Section Down Through Distant Signal.

signal has its corresponding distant signal on the first signal bridge in rear. A distant signal cannot be in the "off" position when the home signal above it is at danger.

The most noticeable difference between manual and power installations is in the equipment of the signal boxes. The results of both systems, as far as the movement of signals and switches is concerned, are the same, but the means of accomplishing these results are different, and the difference is most apparent in the signal boxes. The row of long levers, which are universal in manual-worked boxes, is replaced by a number of small handles, which take up very little room, and are very compact, thus being completely under the eye of the signalman. The physical exertion on the part of the signalman is, in this, as in any power system, reduced to a minimum.

The handles in the pneumatic-worked boxes perform the same function as the levers in the manual-worked boxes. For the sake of consistency, and to avoid confusion, the name lever is retained. In manual boxes the mechanical interlocking is always placed horizontal and under the floor. In a pneumatic box the parts of the interlocking are much smaller, but of the same construction, and the interlocking frame is placed vertical, in front of the frame which supports the levers.

Every signal box has a large scale diagram showing the position of all switches and signals, and also a table showing the mechanical and electrical interlocking.

Every lever has, on a plate, the numbers of levers which must be moved before it. As examples, a signal for a crossover could not be pulled off until the points had been moved to the right position, and the plate on the signal lever would bear the number of the point lever; a distant signal lever would have on its plate the numbers of the home and starting signals.

The distant signals controlled by a box are usually so far away that they cannot be seen. An indicator is therefore provided in the box which shows the position of the distant signal by means of a miniature distant signal arm.

Indicators, with miniature semaphore arms, are also provided to show the state of the line for both approaching and departing trains as far as the next signal box on either side. The section working the indicator is, in each case, from a box starting signal to a box home signal. The danger position of the miniature arm indicates that a train is on the line, and the "off" position that the line is clear.

A Board of Trade regulation requires that audible and visual warning should be automatically given of the approach of a train, in accordance with which the indicator for approaching trains is provided with a bell (a different tone for each indicator), which rings when the arm goes to the danger position.

DIAGRAM SHOWING THE NORMAL POSITION OF THE SIGNALS,

INCLUDING

FARNBOROUGH AND FLEET SIGNAL BOXES, ALSO FOUR INTERMEDIATE AUTOMATIC SIGNAL SECTIONS.

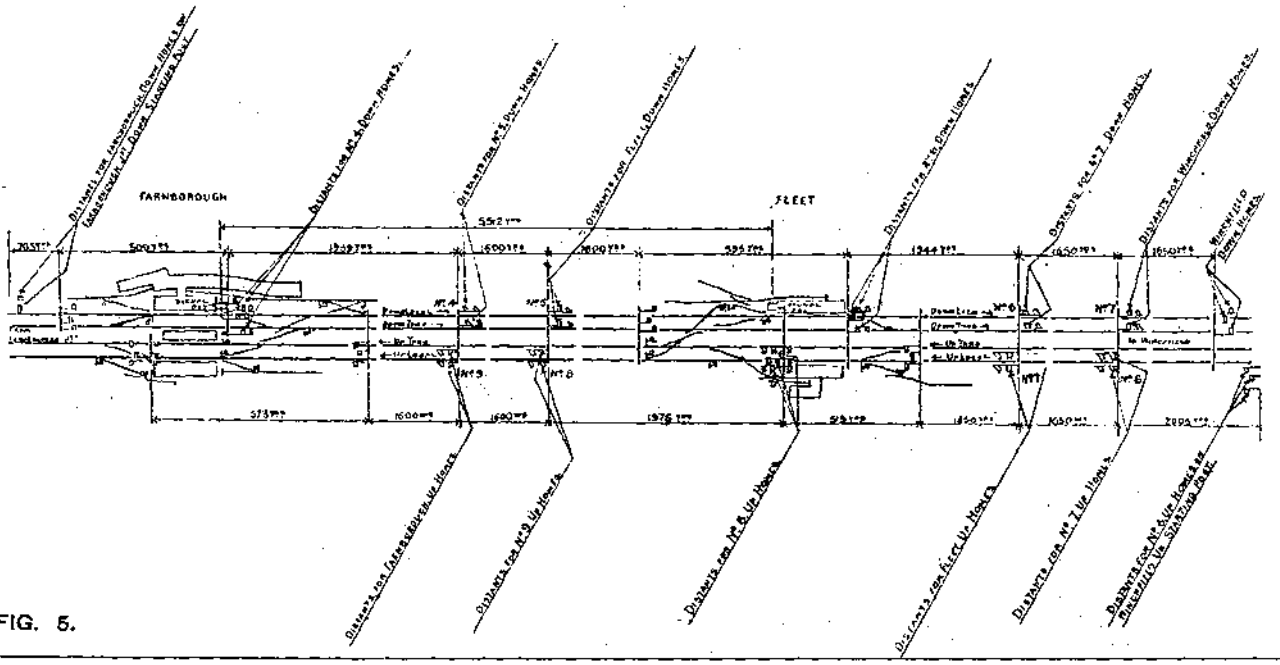

FIG. 5.

PIRBRIGHT AND STURT LANE JUNCTIONS

AND

ONE INTERMEDIATE AUTOMATIC SIGNAL SECTION.

DIAGRAM OF LINES, ETC.

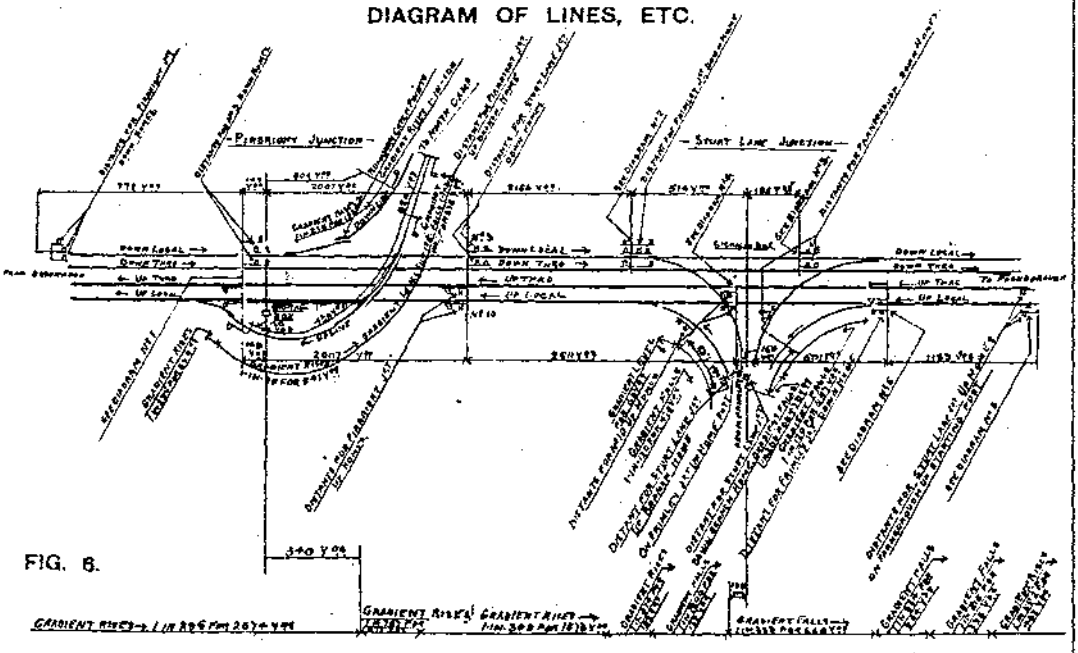

FIG. 6.

Electric-bell signals are provided between boxes, one bell for each pair of up and down lines. There are two bells each way and two plungers for working those in the adjacent boxes on a four-track road. The four bells in a box have different tones, so that they need not be watched.

In the ordinary working (electro-pneumatic system) only warning and departure signals are sent. When a departure signal is received from the box in rear, the warning signal is sent to the box ahead. Telephonic communication is also provided between the boxes.

The first automatic signal outside a box home signal is controlled electrically by the home signal, and may not come off unless the home signal is off. This causes delay at certain times, and an electric switch has, in consequence, been placed in the Sturt Lane box to unlock the down local automatic signal immediately outside the home signal.

The system of the British Pneumatic Signal Co. is called the low-pressure system. The pressure used to move switches and signals is 15 lbs. per square inch. Air at this pressure is controlled by relay valves, which are worked by air at 7 lbs. pressure.

The signals on automatic bridges are moved by air at 10 lbs. pressure. The pressure in the distributing mains is 80 lbs. per square inch.

The chief characteristic of the low-pressure pneumatic system is the diaphragm valve (see *Fig.* 7). It is operated from the signal box by air at 7 lbs. pressure. This raises the diaphragm, which is 8 inches in diameter, and allows air at 15 lbs. pressure to pass through the valve as shown by the arrows. The lowering of the diaphragm closes the supply and opens the exhaust. The diaphragm only requires to be raised $\frac{1}{4}$ inch. As this valve performs a similar function to an electric relay, it is called a relay valve, and will be denoted in diagrams by the letter R.

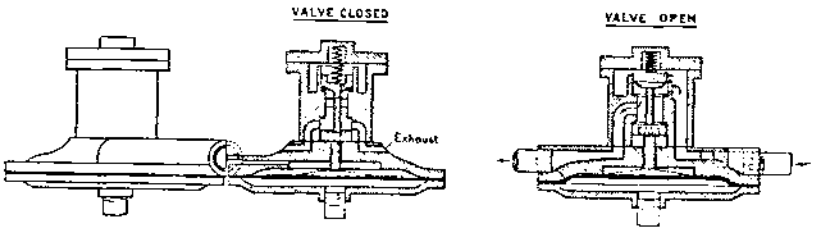

FIG. 7.—*The Double Diaphragm and Valve.*

The cylinders for operating switches are 10 inches in diameter, those for signals 5 inches in diameter, and the air pipes from the box to the switches and signals are $\frac{1}{2}$ inch in diameter.

Fig. 8 is a diagram showing the arrangement of pipes, etc., for operating a switch and indicating back to the box that the switch is in the desired position. The principal parts are :—

S. Switch rails.
s. Switch rod.
sl. Lock rod.
M. Motion plate.
C. Switch cylinder.
D. Indicating valve.
R_2, R_3, R_4, R_5. Relay valves.
L, L_2. Operating bar and slide valve.
I, I_2. Indicator cylinders.
H. Interlocking tappet.
X. High-pressure air supply, 15 lbs. per square inch.

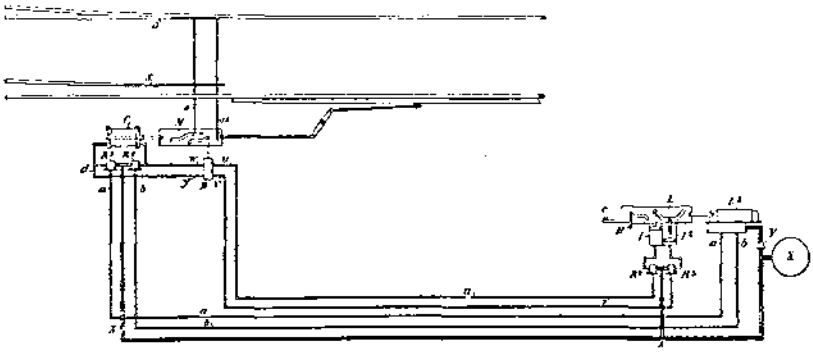

FIG. 8.—*Diagram of Switch and Lock Movement.*

To move the switch the signalman pulls L out until the top of the piston I_2 comes up against the shoulder in the slot. L_2 moves at the same time and admits air at 7 lbs. pressure from X through the reducing valve V to pipe *a*. This acts on the relay valve R_5, which admits air at 15 lbs. pressure to the left-hand end of the switch cylinder C, and moves the piston and motion plate completely over to the right. The movement of the motion plate is divided into three parts. The first part moves the indicator valve D, closing communication between W and U, and removes the stud from lock rod *sl*, but does not move the switch rod *s*. The second part moves the switch by means of the rod *s*, but does not move the indicator valve. The third part of the movement can only take place if the switch is properly closed and the slot in *sl* is opposite the stud. The indicator valve is at the same time moved farther across and opens communication between *y* and *v*. This allows air from R_5 to travel through *dyv* to R_3, which admits air from supply X to cylinder I_2. The piston I_2 is raised, and by means of the inclined slot forces L and L_2 through the remainder of the stroke. This indicates to the signalman that

the points have been moved and locked. The movement of L2 opens *a* to exhaust, thereby lowering the valve in R5, which cuts off the supply from X to C and exhausts C*dyu*. This makes R3 act similarly and exhausts air from I2. There is now no pressure in any of the pipes. The movement of H effects the proper mechanical locking.

To move the switch back again the lever is pushed in until stopped by piston rod I. Air is admitted to *b*, and the switch is moved by air in the other set of pipes in a similar manner to that described.

Fig. 9 is a diagram showing the arrangement of pipes, etc., for operating a signal. The principal parts are :—

A. Signal arm.
A2. Operating cylinder.
B. A connection from pipe *n*, which is open to the cylinder when the piston is at the bottom.

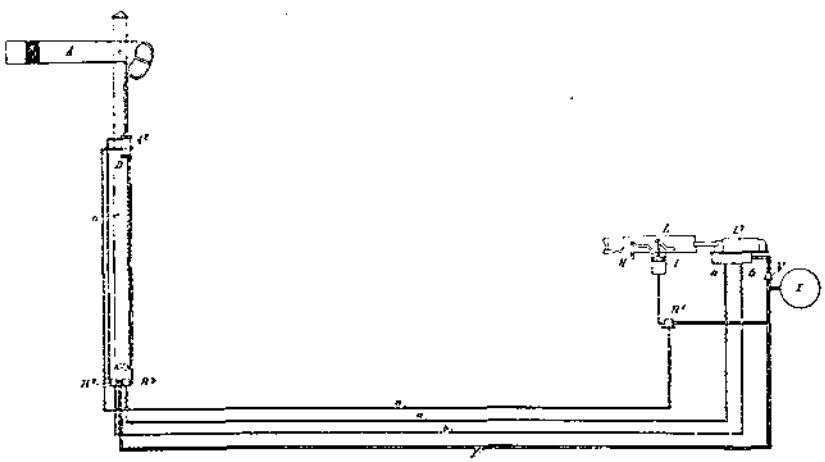

FIG. 9.—*Diagram of Semaphore Movement.*

The remaining parts are lettered as before. When the signal is moved to the danger position the completion of the movement is indicated as with a switch. It is not considered necessary to indicate that the signal is in the off position, as it does not jeopardize the safety of a train. Only one indicating pipe and one indicating cylinder are therefore necessary.

To lower the signal, L is pulled the whole way out and moves L2. Air at 7 lbs. pressure is admitted to *a* and works R3. This admits air at 15 lbs. pressure to the bottom of A2. The upward movement of piston A2 brings the arm to the "off" position, where it remains as long as L is kept out. To replace the signal L is pushed in until stopped by the top of piston rod I. The accompanying movement of L2 opens *a* to exhaust. This affects R3, which closes the supply

of air from X and exhausts the air from under A2. The same movement of L2 admits air to *b*, which acts on R2 and admits air from X to *e* and the top of A2. This restores the signal to the danger position. When the piston reaches the bottom of the cylinder air is admitted through B to pipe *n* and operates valve R1. This admits air from X to I, raises piston I and moves L through the remainder of the stroke. L2, being moved with L, opens *b* to exhaust, and through valves R2 and R1 exhausts pipes *e* and *n* and cylinder I.

Where two or more roads lead off a single one great economy in space and pipes can be effected by working all the signals off one lever and using a selector valve attached to the switch. Which signal is lowered will then depend on the position of the switch.

In *Fig.* 10 signal 1 refers to the left-hand road and signal 2 to the right-hand road. The selector valve is attached to the switch indicator valve, and joins AD or AC according as the switch is set for the left or right-hand road. With the switch set as shown in the

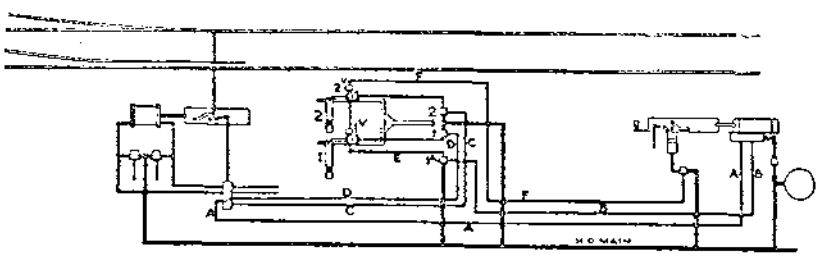

FIG. 10.—*Diagram of Selected Signal.*

diagram, A is connected to D, as shown by the dotted line. On pulling the lever, low-pressure air is admitted to AD and works relay valve 1, and causes signal 1 to come to the "off" position. On replacing the lever the air is exhausted from AD and from the underside of cylinder 1. At the same time low-pressure air is admitted to B and acts on relay 1*a*. The relay admits high-pressure air to E and the top of cylinder 1. When the signal has returned to the danger position the air passes through indicator valve 1^v to cylinder 2, through indicator valve 2^v and pipe F to the relay under the replacing cylinder, and causes the lever to complete its stroke. Air is then exhausted from B, E, and F as in ordinary working. The object of the indicating air passing through both signal cylinders and indicator valves is to indicate that both signals are at danger, which is the only indication which is of any use in this case.

The next point to consider is the employment of track circuit in conjunction with the pneumatic working of switches and signals.

The sequence of events will be as follows:—The signalman lowers a signal to admit a train to an unoccupied section; the train, on passing the signal, replaces the lever in the box and causes the signal

to resume the danger position; the lever is now held locked, and cannot be pulled to allow another train to enter the section until the *whole* of the train now occupying the section has left it.

The principal additional articles necessary to effect this are the relay, the electro-pneumatic valve, and the electro-pneumatic cut-off valve.

The relay consists of an electro-magnet placed in the track circuit. When energized it attracts an armature to which a contact is attached, and causes it to close a secondary circuit. When the track circuit is broken or otherwise interrupted the secondary circuit is broken.

The electro-pneumatic valve consists of an electro-magnet, to the armature of which a valve is attached. When the magnet is energized air is admitted through the valve, otherwise it is closed.

The electro-pneumatic cut-off valve is similar in construction, but opposite in action. When the magnet is energized the valve is closed, otherwise air is allowed to pass through the valve. When these valves are closed the outlet pipe is open to exhaust.

Fig. 11 is a diagram showing the arrangement which enables a train to return a signal to danger without the intervention of the signalman. The additional apparatus is :—

ER. Electrical relay.
M. Electro-pneumatic cut-off valve.
C. Replacing cylinder.
IB, IB1. Insulating joints at each end of the section.
TB. Track circuit battery.
K. Circuit breaker for secondary circuit.

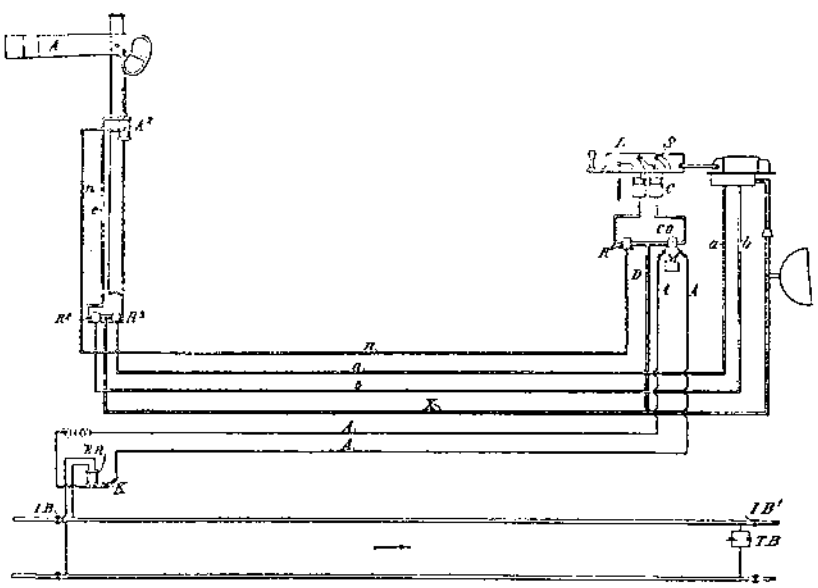

FIG. 11.—*Diagram of Replaced Signal.*

The signal is lowered to admit a train as described before. The signal being in the "off" position, a train approaching from the left passes the joint IB and short-circuits the battery TB. This de-energizes the relay ER, and the secondary circuit through A is broken. This de-energizes the magnet of the cut-off valve, and air is admitted from X to C. The piston C being raised moves the lever to the right, until the top of the piston rod comes in contact with the shoulder in the slot S. Air is now admitted to pipe *b*, and the signal and lever are replaced as before described. As long as the train is in the section the air is held in the cylinder C, which, by means of the shoulder in slot S, holds the lever in the normal position. When the train leaves the section both circuits are completed and C is exhausted, allowing the top of the piston rod C to fall below the shoulder. The signal may now be pulled "off" for another train.

Fig. 12 shows the arrangements for automatic working in stations. When it is desired to close a signal box at night, through lack of

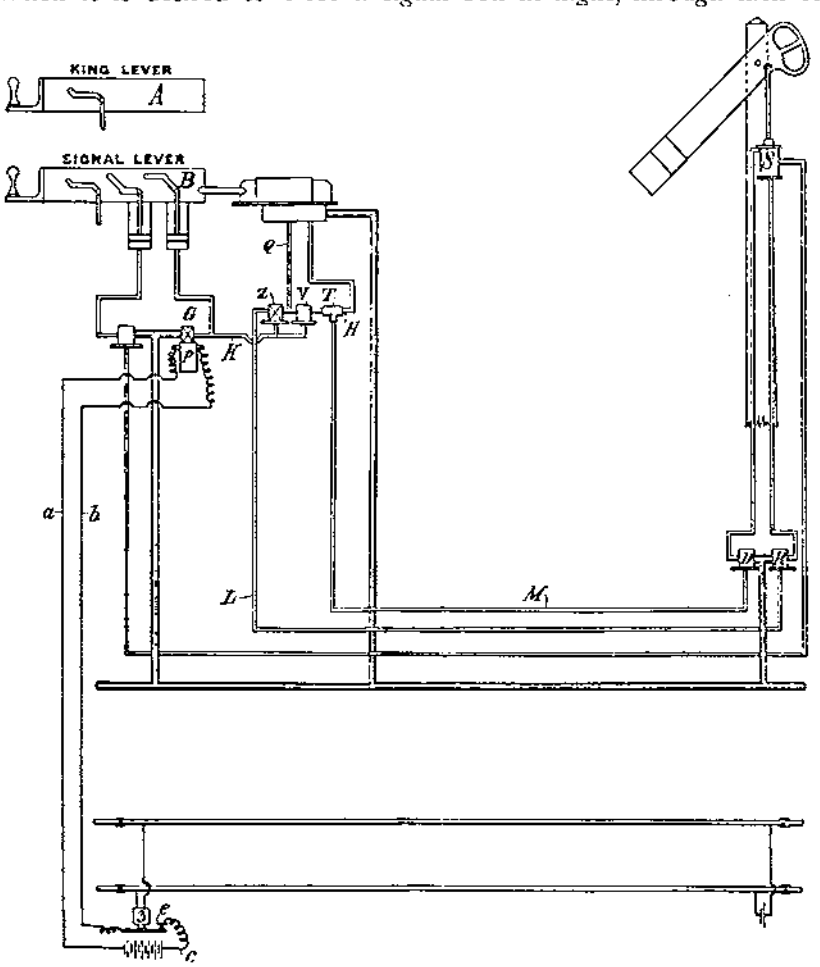

FIG. 12.—*Automatic Station Signal Working.*

work necessitating the movement of switches, the signals may be made to work automatically without increasing the length of the sections. In order to close a manual-worked signal box the two adjacent sections must be thrown into one.

To work automatically all the roads are set for through running and the signals pulled. The king lever is then pulled out and locks all the signals in the "off" position by means of mechanical interlocking. On a train entering the section from the left the relay 3 is de-energized, and the secondary circuit broken at *e*. This de-energizes P and allows air to pass through the cut-off valve G to cylinder B. As the lever is locked in the "off" position B is unable to act, and the air passes to Z and V. Z is a cut-off valve, which now closes the passage of air from Q to L and exhausts the air from the underneath side of the cylinder S by way of pipe L. At the same time the relay valve V admits air from Q to the slide valve T, which cuts off M from the exhaust through H, and allows the air from Q to enter M and act on relay valve D, thereby causing the signal to return to danger. When the train leaves the section, relay 3 is energized, circuit *abc* is made, and magnet P is energized, which by working valve G exhausts the air from under cut-off valve Z and relay V. Air is now admitted through Z to L, and M is exhausted through T to H, due to V being closed. This affects relays D and R, so that the air is exhausted from the top of cylinder S and let in at the bottom, which brings the signal to the "off" position.

Fig. 13 shows the electro-pneumatic valve; *a* is the air supply, *e* the outlet to work, and *d* the exhaust. When the magnet M is energized the armature A and rod *r*, with valves *v*1 and *v*2 attached, are raised. This closes the exhaust from *e* through *c* to *d*, and allows air to pass from *ab* to *e*. In the normal condition (*i.e.* de-magnetized) air cannot pass from *ab* to *e*, and *e* is open to exhaust through *c* to *d*.

Fig. 14 shows the electro-pneumatic cut-off valve.

This valve is opposite in its action to the previous one. When the magnet is energized air cannot pass from *ab* to *e*, and *e* is open to exhaust through *d*. In the normal position (*i.e.*, demagnetized) *e* is cut off from the exhaust through *d*, and air can pass *ab* to *e*.

Fig. 15 shows a portion of a line signalled by the electro-pneumatic automatic system. The line is divided into sections or track circuits by placing insulated joints, J1, J2, J3, J4, at the entrance to each section. The abutting rails in each section are joined together at the joints by bonding wires to make the circuit continuous. Each track section is provided with a track battery of two cells in parallel. The batteries are connected to the rails at the end of the section farthest from the signals. For each section there is a relay R1, R2, R3, R4, connected to the rails at the entrance to the section. The relay, when energized, closes the main circuit at A1, A2, A3, A4. Each semaphore arm is provided with an electro-pneumatic valve as

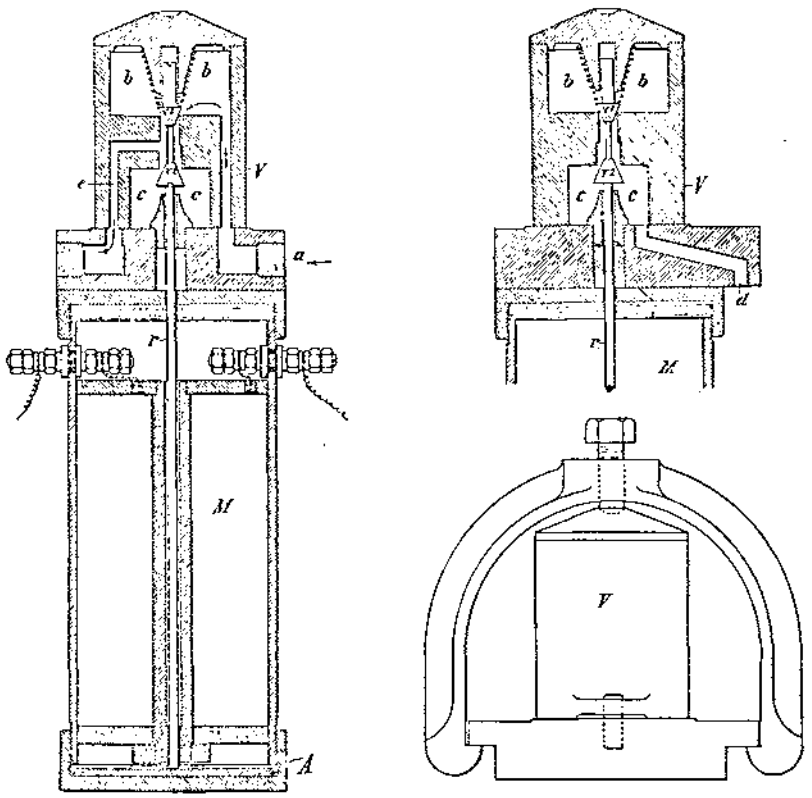

FIG. 13.—*Electro-Pneumatic Valve.*

already described. When the magnet is energized the valve admits air at 10 lbs. pressure from a reservoir to the operating diaphragm which lowers the signal. When the air is exhausted the signal goes to danger by gravity. The air supply for the reservoir is taken direct from the main pipe through a reducing valve.

Each distant signal valve magnet is in a circuit from the main battery which operates the corresponding home signal. Each of these circuits has two circuit breakers in it, one of which is attached to the home signal which is above the distant signal on the same post, and the other to the home signal next in advance (*i.e.*, the home signal to which the distant refers).

The two circuit breakers worked by a home signal close the circuits when the home signal is at safety and break them when at danger.

Suppose a train, represented by a pair of wheels and an axle X, to have entered Section 3. Battery B_3 will be short circuited and relay R_3 de-energized. This breaks the main circuit from B8 at A_3 and de-energizes the electro-pneumatic valve M6, and causes the home signal to go to danger, as already explained. When the home signal

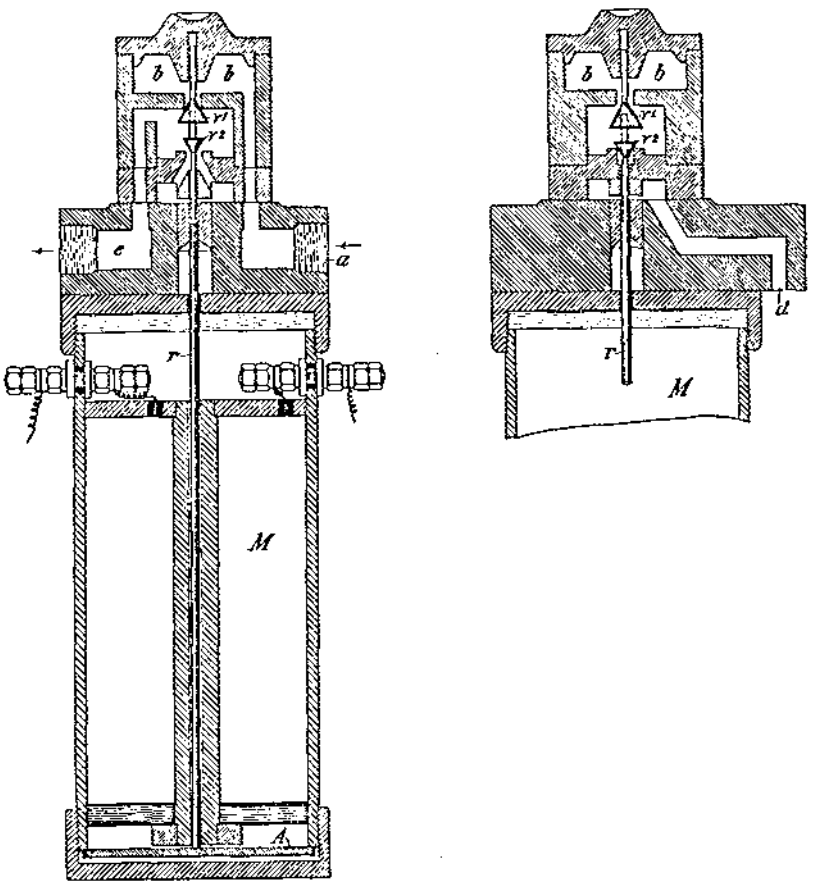

FIG. 14.—*Electro-Pneumatic Cut-off Valve.*

goes to danger the contacts C6 and C5 break the circuits in which they are placed. This causes the magnets of valves M5 and M3 to be de-energized, and the distant signals on posts 3 and 2 go to danger.

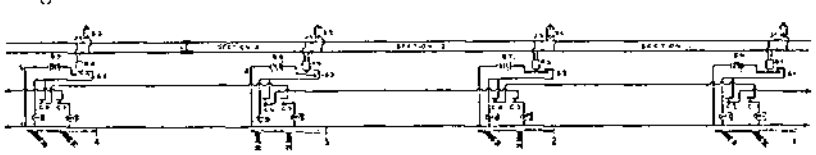

FIG. 15.

When the whole of the train has left the section the broken circuits are re-established, and home signal 3 and distant signal 2 go to the safety. In the meantime home signal 4 has gone to danger to protect the train, and opened circuit breakers C8 and C7. This keeps distant signal 3 at danger and causes distant signal 4 to go to the danger position.

Fig. 16 shows on a larger scale the mechanism for working the automatic signals. The following are clearly shown :—

Insulated joints. Shown J1, J2, J3, J4, in *Fig.* 15.
Track and main batteries—B3 and B8.
Relay and circuit breaker—R3 and A3.
Electro-magnetic valves—M5 and M6.
Electrical connections to circuit breakers C5 and C6 on home signal.
Main air pipe.
Reducing valve.
Diaphragm operating valves.
Rods from above to signals.

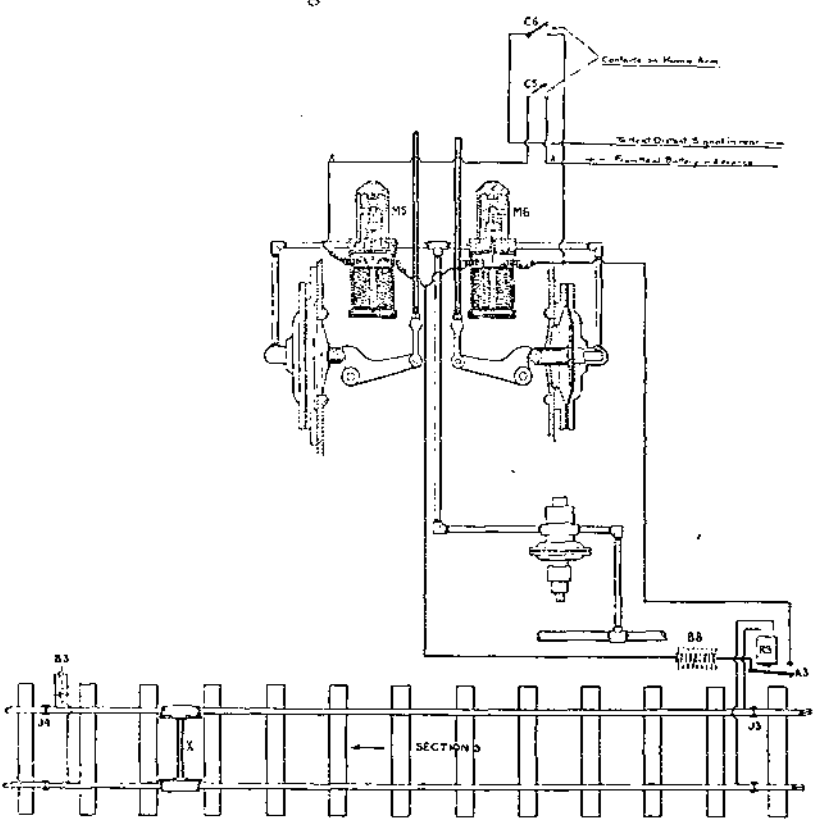

FIG. 16.

Having described the working of the electro-pneumatic signalling, it now remains to discuss the advantages and economies of the installation. The first point of economy is in the wages of signalmen, as it is claimed that one signalman can do the work of three, and all the manual labour in connection with intermediate blocks between stations is done away with by using the automatic bridges. From

the mechanical point of view it is a great advantage, as all rods and wires are abolished, and replaced by underground pipes, which does away with all danger to officials moving about the line, and also reduces the wear and tear of moving parts to a minimum. The train movements can be effected much more rapidly by means of the pneumatic system than by any manual plant, and the physical labour required of the signalman is practically negligible. The automatic indication also relieves him of considerable mental strain, and he is thus less likely to be overcome by fatigue during long hours.

There are six characteristic features in this system—

(1). It requires no force but air.
(2). The air pressure is always low, being normally 15 lbs. per square inch.
(3). Every movement is accomplished by air pressure and quite independent (except on automatic bridges) of gravity, springs, or withdrawal or reduction of pressure.
(4). Except when a switch or signal is being moved or an indication given, all operating and indicating pipes are subject to atmospheric pressure, and no more.
(5). The final portion of the stroke of the "lever" is automatic, requiring no effort or care on the part of the operator.
(6). Signal levers, which are replaced by track circuits, are automatic for the whole return stroke and require no attention from the signalmen for this portion of the operation.

The system fulfils completely and economically the three chief functions of a railroad switch and signal device.

(1). To provide *power* to move the switches or points and signals.
(2). *Concentration* in one cabin of control, all switches and signals in a given field.
(3). Interlocking of the controlling parts of different switches and signals, so that it is impossible to give conflicting signals.

There is a marked advantage over the "all electric," owing—

(1). To the primary cost being less.
(2). The electric current required to work the signals is small, and in fact is not sufficient to ring an ordinary electric bell.
(3). The batteries required are of very simple pattern, and any person of ordinary intelligence can look after them and maintain their efficiency.

Also over high-pressure systems—

(1). There is no possibility of trouble from condensation of moisture in pipes.

(2). Annoyance from leaks is practically abolished.

(3). A smaller quantity of air is used, thus making the service of the compressor less.

(4). The action is quicker (this advantage having been found from actual tests, with high and low-pressure pipes).

(5). If any extra power is required to make any movement or indication, an extra 50 per cent. of pressure can be introduced without increasing very materially the pressure in the pipe.

(6). If any alterations have to be made or a fault occurs, the end of the pipe can be easily closed by a block of wood driven in, all without shutting off the compressor or main source of supply.

Safety is assured in this system, owing firstly to the fact that all signals are held at the "all clear" position by pressure of air in the pipes, and, should any fault occur, the signal automatically goes to the stop or danger position by gravity. Also the passing of a train automatically sends the signals to the "stop or danger positions," and thus does away with the dangerous effect of negligence on the part of the signalman forgetting to return his signal to danger, which is possible on the ordinary lever system; thirdly, on the track all instruments are on closed circuit, and any failure in the electrical conductor or battery will put the signal on that circuit to danger, and retain it in that position until the defect is remedied.

We are indebted to the courtesy of the British Pneumatic Railway Signal Company, Ltd., for the details of working and arrangement of the system and diagrams illustrating the same.

APPENDIX I.

SPECIAL INSTRUCTIONS FOR INTERMEDIATE AUTOMATIC BLOCK SIGNALLING SECTIONS ON L. & S.W. RAILWAY.

When a driver finds an automatic home signal at danger, he must, if the signal be not lowered in the interval, wait at that signal three minutes, and after arrangement with the guard of the train, proceed cautiously, at a speed not exceeding 5 miles an hour, as far as the next home signal, and keep a sharp look-out, being prepared to stop clear of any obstruction.

o o o o o

A telephone is provided in a box, which may be opened by a carriage key, on the down line side in close proximity to each automatic signal bridge, and each instrument is connected to the station-to-station circuit.

AIR IN WATER PIPES.

By CAPT. P. H. KEALY, R.E.

DAGSHAI is a hill station in the Himalayas situated about 20 miles from Kalka at the foot of the hills, and 40 miles from Simla; it contains accommodation for over a battalion of British infantry, in addition to some 70 families.

The prevalence of enteric fever in the station for some years past, caused the question of the water supply to be considered in 1897. Up to that time the supply had been derived from two springs situated on the Dagshai Hill itself, about 500 feet from the top, distribution of the water being effected by means of mules. One spring, which was situated just below the native bazaar, was especially liable to contamination. In 1897 the Government of India sanctioned a scheme for an entirely new water supply. Under this scheme, three springs were to be acquired about $5\frac{1}{2}$ miles to the north of the station. These springs, known as Chobal, Jobal, and Kaitree, had been used chiefly for irrigation, and for "cooling babies' heads."* The relative positions of the new springs to each other and to Dagshai are as shown.

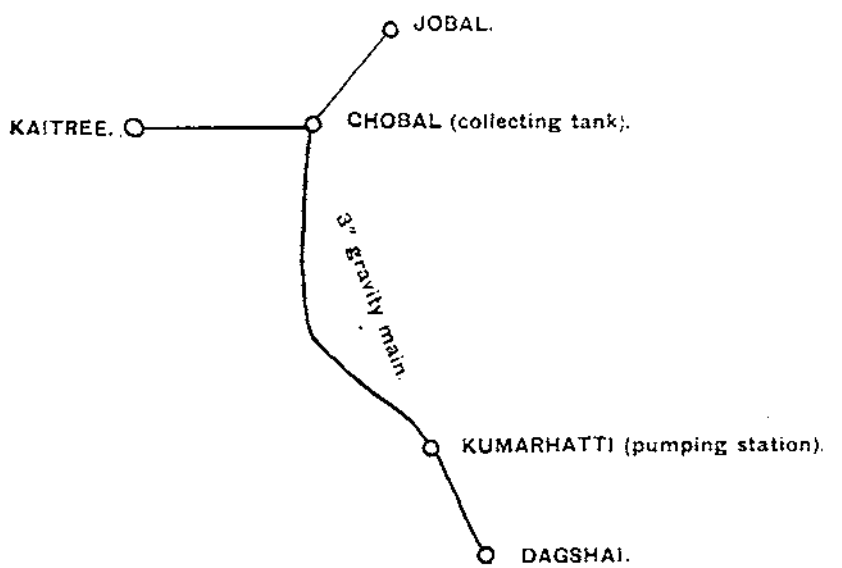

FIG. 1.

* This is the term actually used in the report, and describes a means of putting babies to sleep, which is peculiar, I believe, to the Simla Hills. It consists in placing the baby in a recumbent position, with a small stream of running water flowing on its head; the effect is found to be very soothing.

The water was to be collected at Chobal—the nearest spring—run in by gravity to the foot of the Dagshai Hill—known as Kumarhatti—and from there pumped up into reservoirs at the top of the hill, from which it would be distributed by gravity.

This project was carried into effect in 1898. The safe minimum yield which could be counted on from the springs, is given in the report to the project as 28,000 gallons in the 24 hours, and as far as I can ascertain, the springs have never dropped as low as this since the installation has been started. But whilst there has always been a sufficiency of water at the springs for the needs of the population of Dagshai, it has not always been possible to provide a sufficiency of water at the end of the gravity main at Kumarhatti, so that sometimes Dagshai has had to go short of water, and a good deal of trouble and anxiety has been caused to those in charge of the supply.

It is the behaviour of this gravity main which may prove of interest to those dealing with similar systems of water supply.

A section of the main is shown below. The main is of 3-inch cast-iron pipes, with spigot and socket joints.

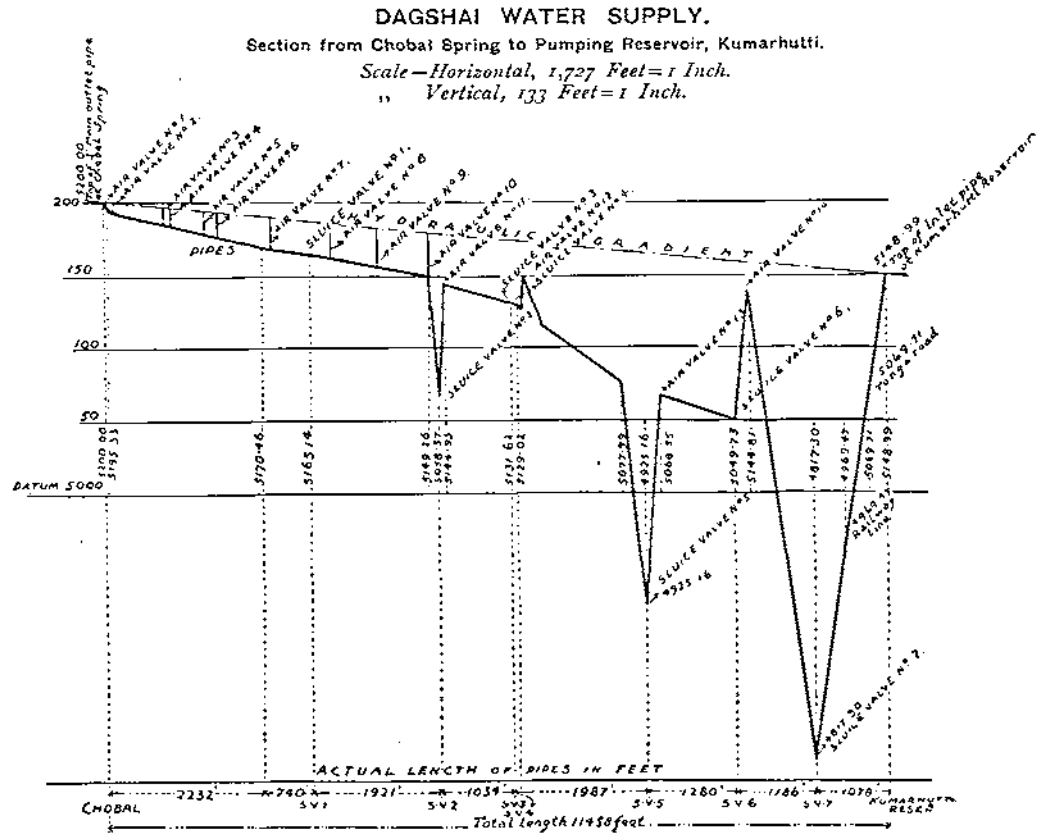

FIG. 2.

The inflow which the pipe should give at the Kumarhatti reservoir is about 31,000 gallons in the 24 hours, calculated by Fanning's formula. The records of the inflow at Kumarhatti go back to July, 1900, and from these it is found that about April or early May each year, the inflow has started dropping below the normal flow and becoming irregular; and this in spite of there being sufficient water at the springs for the main to run at its full capacity. In 1904 and 1905 things became so bad that serious inconvenience was felt in Cantonments. Consequently in 1905, it was decided to duplicate the 3-inch main during the ensuing cold weather, so as to ensure a sufficient supply reaching the pumping station at Kumarhatti. The records of the flow along the double main for part of 1906 and 1907, again showed a diminished and irregular flow at the same time of year.

The chief explanation of the trouble lies in the air in the pipe. The pipes are laid 3 feet deep, but the line follows a devious course on the sunny side of the hill. The water at Kaitree and at the collecting tank is very much aerated, and this aeration always increases with the increase in temperature, and the decrease in the yield of the springs, *i.e.*, about April and May. The line when laid was provided with air valves at the usual and obvious points, numbered 11 to 14 on *Fig. 2*. During 1902 and 1903 the log kept at Kumarhatti shows a regular inflow of 36,000 gallons daily; but this does not represent the true state of affairs, as this flow was only obtained after frequent washing out of the line and adjustment of air valves, and for short periods only during the day. During the hot weather in 1904–05, the question was complicated by the heavy incrustation which took place in the main. This further accentuated the air trouble, so that several times the inflow of water at Kumarhatti reservoirs ceased altogether. When this occurred it was necessary to carefully wash out the line by means of the sluice valves until the air had been got rid of. In 1905, 3,000 feet of the line, which appeared to be the worst portion as regards incrustation, were taken up, cleaned, and relaid. The work on the rest of the line was undertaken during the winter 1905–06, and by 13th April, 1906, the whole of the old line had been taken up, cleaned, and relaid, and a second 3-inch main had been laid alongside the old line in the same trench. On opening out both lines it was found that all available water was being carried to Kumarhatti, which satisfactory state of affairs lasted till May 5th, when a sudden drop in both lines and an overflow at the collecting tank proclaimed a return of the air trouble. This was located chiefly between the collecting tank and No. 1 washout, and it was decided to insert some air valves in this length, two spots being selected where a rise of a few inches in the line had been noticed when relaying. The form of air valve adopted consisted of a length of ½-inch pipe, screwed into a hole bored in the 3-inch pipe, and carried up vertically some feet. It was evident that the right

spots had been selected, as on piercing the 3-inch pipe there was an escape of compressed air for some five minutes. Another valve was also put in near the collecting tanks, these valves being the present Nos. 2, 5, and 7. The effect of these measures was to raise the supply at once from 44,000 to 56,000 gallons. After May 24th the flow was regular till the springs began to drop, all available water being carried from May 24th onwards till the rains broke, and the full capacity of the pipes was reached on July 1st. It was hoped that trouble with the line was now ended, but disappointment awaited us when on April 7th, 1907, air in the line was again the cause of anxiety. The only hope of remedy seemed to be in increasing the number of air valves between the collecting tank and No. 1 syphon. As there were apparently no more even slight rises in the line, it was decided to put in more valves, similar to those already provided the previous year, at sharp bends and at the head of the syphon. This was done with irregular results, till April 27th, by which time it had been discovered that the ½-inch pipes had been carried up too high, and that owing to this there was a column of water formed in each pipe, which prevented the proper escape of air. The height of the hydraulic gradient was accordingly found in each pipe which had been inserted, and the pipe was then cut down to within 6 inches or 1 foot of this point. A cap was also given to each pipe, and from that date the ½-inch pipes have discharged the air freely, and all available water has been carried by the mains. The new valves inserted during 1906 and 1907 are numbered 1—10.

The records for 1908 show a *steady* fall in the flow, corresponding to the drying up of the springs—which have been unusually low this year owing to bad rainfall—all available water has been carried, and it appears as though the air trouble has been solved. The water however being so hard, incrustation will probably cause further trouble and a diminished flow shortly.

From the experience gained on this line, it would appear necessary to take account sometimes of a series of sharp horizontal bends in a pipe line, as well as of vertical ones, with a view to the provision of air valves, and where the conditions are suitable the cheap ½-inch pipe used as above described forms an efficient substitute for a more expensive arrangement.

The pipes would act still better as air valves, if it were arranged, when laying the main, to provide a slight rise at the points where it was intended to insert an air valve.

HOME DEFENCE.

By Colonel S. A. E. Hickson, D.S.O., R.E.

In his article on Coast and Home Defence in the November *Journal* Colonel Reynolds appears for the most part to concur with me, though questioning whether infantry is not more important than artillery for mobile coast defence. My excuse for asking for a further brief hearing is a desire to prevent the confusion of arguments I have used with opinions, or the application of special instances as universal principles. It is always permissible to use an extreme case to enforce an argument, but this does not make the extreme case a universal one. I offer therefore the following further observations for the consideration of those interested in the coastal branch of home defence.

(1). In the national division of labour for home defence it is primarily for those whose homes are on the coast to prevent, if possible, the enemy from landing on those coasts. They are themselves our real fixed defences. If we can get them out of the homes in which they are now fixed to man even fixed guns, that will be at least one step in advance. If they can be sufficiently trained to act on the outbreak of war as semi-mobile troops, whether artillery or infantry, so much the better. My endeavour has been to show that though fixed guns may be required in special cases, such as Folkestone or Torquay, a more or less mobile coast defence should be aimed at.

(2). A better gun, of small calibre, for coast defence purposes than the modern 18-pr. and 15-pr. field gun converted it would be difficult to find. Anchored, and firing direct from the coast, or anywhere else, their fullest possible value is obtained. They are, in fact, practically fixed guns, as well as mobile. Half-a-dozen men manning one of these guns would command some 6 miles of coast far more effectually than could the same number of infantry alone. It is true that the guns must have infantry as escorts, but this does not make infantry without guns as effective as infantry with them.*

(3). I concur with Admiral Close, who, writing to the *Morning Post* on September 2nd, observes that the landing of a raiding or invading force is far more likely to be effected in small steamers than in boats. Whether against such small steamers or larger transports, artillery would be the more effective weapon. At the same time there are evidently cases where machine guns and rifles, in the hands

* Which is more truly mobile tactically—a gun commanding an arc of 6 miles extreme measurement or a rifle commanding, say, 2 miles?

of men who can move quickly about, would be invaluable, and they are no doubt a necessity in support of the guns.

(4). Colonel Reynolds says: "The curse of fixed defences is that they render so many men immobile." Sufficient distinction however does not seem to be made between "fixed defences" and "fixed guns." The forts on our land fronts are fixed defences, but fixed guns cannot be used there. Strictly, fixed guns can only be used on the coast, where defence works of the nature of field fortifications are generally sufficient. The distinction is important, as the cost of land forts of the Port Arthur type is, out of all proportion, large as compared with the cost of coast batteries for fixed guns.

Finally. The danger of raids lies in surprise owing to steam power, the short distance to be covered, and the numerous coastal bases available to our enemies. Unless therefore there are trained territorial troops in sufficient numbers all along our exposed coasts, the concentration of a sufficient number at a given point in time to resist a landing and overcome it on the coast would be extremely difficult, if not impossible, to effect.

If we turn to history we find that in 1539, we were able to call up so many trained men in the south-east of England that the Austrian Emperor of that day thought better of his projected invasion from Dunkirk, and dispersed his armaments. The French Ambassador, Marillac, reported in that year as follows:—"In Canterbury, and the other towns upon the road, I found *every English subject in arms* who was capable of serving. Boys of 17 or 18 have been called out, without exemption of place or person."* It is instructive to compare this invasion of 1539 with that threatened by the French, also from Dunkirk, in 1744, just 200 years later. The revolution of 1649 had taken place in the interval, and the English nation had adopted the creed of Individual Liberty in place of its more ancient creed of Service, the creed of the days of Cressy, expressed in the words of the motto of the Prince of Wales, *Ich dien*—I serve. Consequently, in 1744, we had hardly a trained soldier left in England to put into the field, and we were saved from immediate danger by a storm, which, whilst it favoured Admiral Norris, was contrary to Admiral Roquefeuille off Dungeness, and destroyed the French transports at Dunkirk. Later we were saved by European complications, the South German invasion of France calling Louis XV. south from Holland, and bringing Frederic the Great to his assistance.

* MS. State Paper Office, Second Series, quoted by Froude, *History of England*, Vol. III., p. 162. The French invasion of 1545 was, if Mr. Froude's account be accepted, likewise defeated partly by the territorial volunteers of Sussex, partly by weather, partly by plague. See Vol. IV., p. 138. It is not always remembered that in the 16th century we were threatened alternately with invasion by Germany, France, and Spain. Of these, the Armada alone was fairly defeated at sea.

EFFECTIVE MILITARY ORGANIZATION AND CONTROL.

By LIEUT.-COLONEL J. A. GIBBON, R.E.

THE regulations enforcing decentralization and the chain of responsibility in units are most explicit, and few will be found who do not, in theory at any rate, agree with them. It may be useful therefore to consider why there is sometimes such a considerable difference between theory and practice in this matter, and how far it is practically possible for units serving at home to maintain an organization such as is enjoined by these regulations.

There are probably few, if any, units in which this organization does not exist on paper; that is to say, there is a nominal roll, kept more or less to date, in which each officer, N.C.O., and man is allotted to a half-company, section, or sub-section.

But organization to be effective requires very much more than this. It means that the commander of each sub-unit must be responsible in every respect for the *personnel* of his unit, and of his unit only, in the same way as the commander of, say, a battalion is responsible for his battalion.

Such an organization can exist in practice. The writer remembers some years ago hearing two Horse Artillery subalterns quarrelling in deadly earnest over a "rotten driver and pair of horses," which one accused the other of trying to "stick him with." These officers had realized what responsibility meant, and took a corresponding interest in their units. Unfortunately not many junior military officers have the advantage of such a position and training, and it may be useful to consider why this is the case.

Constant changes make the maintenance of a decentralized system somewhat troublesome; but in the case of R.E. officers this is not really serious, since all our junior officers have had sufficient training to enable them to take a command. The difficulty in the case of N.C.O.'s will be considered later.

Shortage of officers is a much greater difficulty. Where there is only one subordinate officer in a unit, the commanding officer cannot,

except in special circumstances, or for a short time, hand over command of half his unit to his junior, while he himself has to command the other half as well as the whole; so that in this case the junior officer cannot usually have a command of a sub-unit, but must act as his superior's personal assistant; that is to say he has to ascertain his commander's ideas on every subject and carry them out, without having any real responsibility for the result.

But probably the commonest reason of all for centralization is unwillingness to face the risk of work being improperly done by others who are not considered fully competent, either from lack of experience, or from want of a sufficient sense of responsibility.

Every officer without exception likes "to have a show of his own to run," but in practice it not unfrequently appears, with junior and inexperienced officers, that they do not realize the responsibility which must go hand in hand with authority, and that they must be called to account for anything amiss in their units whether they have had direct control over it or not.

On the other hand, it is very unpleasant for a commanding officer to have to find fault with his juniors, especially if they are nearly of his own standing; while a senior officer with a keen sense of his responsibility is not unnaturally reluctant to hand over charge to one who does not fully realize his responsibility. Rather than face the difficulty of getting the work done to his satisfaction by his junior therefore he too often does it himself, hardly perhaps realizing that immediately he does this the chain of command is broken, and the system collapses. This means that the junior's work becomes limited to carrying out certain specified and therefore more or less routine duties, in other words to doing what he is told, and he finds that "he is not allowed to do anything," and his work is uninteresting.

It is not necessary here to plead in favour of effective organization. A centralized system is bound to be a failure, since it must break down directly it is tested by any practical work where the C.O. is necessarily dependent on his officers and N.C.O.'s, even though it comes sucessfully through the ordeal of a barrack square inspection. Nay more; it is in itself a failure, since the proper training of officers and N.C.O.'s is much more important than that of the men. Moreover, the C.O. himself is the one who has most to lose by such a system. No officer can hope to be really successful in the higher commands who has not learnt the art of making the best of his subordinates. This needs not only firmness, but patience, tact, knowledge of character, and above all experience. The officer who has shirked the difficulties of getting work done through others will not suddenly acquire the art in the stress of war, or when he finds himself in some position where it is indispensable.

The principles on which "Operation Orders" are based in *Combined*

Training, lie at the root of all successful command, whether in peace or war. For instance, "orders should contain everything that a subordinate cannot arrange for himself, and nothing more."

Junior officers fail to give satisfaction at least as often, because they have no clear and definite idea of what is required of them, as they do from undue interference in matters of detail.

To make a subordinate quite clearly understand what he has to do, while leaving him free to make "his own dispositions for the purpose of carrying it out," is by no means easy, and requires both experience and clear thinking. The officer who is immersed in details which ought to be carried out by his subordinates has generally no time for this.

Few junior officers will be found who do not readily respond when their duties are put before them in the right way; but where an officer persists in abusing his liberty by doing nothing, the best remedy is not to take away the liberty, but to make him keep a diary showing exactly what he has done each day and at what times.

Another essential principle of command as laid down in *Combined Training* is that orders must always be given through the proper channel. It is necessary to emphasize this point, as in practice it often seems very troublesome to carry out.

What may be called the higher art of command, that is, the power of getting work done through subordinates, is not easily acquired by an officer, even though he fully understands how to get men to follow and obey him personally. But if this is difficult for an officer, much more is it difficult for a N.C.O.; hence, owing to frequent changes, it is seldom possible in a unit at home to make permanent effective subdivisions of N.C.O.'s commands, though this does not prevent the junior N.C.O.'s of a section or sub-section being allotted specific duties under their seniors.

There is a story of an Irishman, who explained that the reason why his landlord had not been shot was that "what's everybody's business is nobody's business"; and so it is in a unit without effective interior organization—a great many things which ought to be done, and could easily be done, both as regards discipline and training, go by default because it is everybody's business, therefore nobody's business, to do them.

Effective organization stands for effective discipline as well as effective training. Thus it follows that the senior N.C.O. of a sub-unit should always inspect his men on parade and report. Occasional inspection by the officer then suffices; but the N.C.O. who fails to report an untidy or dirty man must be dealt with drastically. The result will come as a pleasant surprise to the commanding officer who tries this system for the first time. The training of the soldier also becomes a comparatively easy matter, provided the officers and

N.C.O.'s have a clear idea of what it is they have to teach their men, and what standards are required in the various subjects.

For instance, it is not enough that a N.C.O. should be held responsible that his men can march. It must be laid down that they have to be able to march a certain distance in a certain time without sore feet; and of course the N.C.O. must have opportunity given him of bringing his men up to that standard.

It has been said of great commanders that they possessed "the supreme merit of trusting their subordinates." Such trust is not a blind reliance on the part of the commander, but a reasonable confidence, based on experience and knowledge of character, that the task he has assigned to his subordinate will be carried out. There is a great contrast between such a commander and the officer who mistakes interference in certain details for general control, or worse still, who spends his time in doing as much of his subordinates' work as possible, and then expects them to do the rest.

Surely therefore we should not be deterred by the difficulties of, at times, getting work efficiently done through our subordinates, but should take every opportunity of trying to learn by experience how to command.

ORGANIZATION OF THE MOUNTED UNITS OF THE ROYAL ENGINEERS.

By COLONEL A. G. DURNFORD, LATE R.E.

THE following alterations should be made in the Paper on the "Organization of the Mounted Units of the Royal Engineers" which appeared in the *R.E. Journal* for October last:—

Page 235, line 27 *et seq.*, should read:—

"In 1900, during the late South African War, *three* additional Field Troops were raised—one of these was disbanded in 1902—and on the 15th April, 1907, when the Bridging Companies were reduced, two more were formed."

Page 242, *before* "*4th Field Troop* (*formed April*, 1907)" *insert*:—

4th Field Troop (*formed August*, 1900).

Capt. Ridout	1900-1902
Lieut. L. C. Jackson	1902

when the troop was disbanded.

THE R.E. HEADQUARTER MESS.

(*Continued*).

By LIEUT.-COLONEL B. R. WARD, R.E.

Arranged in a group round the large picture of Sir John Burgoyne in the north annexe are portraits of the following four officers :— Lieut.-General William Skinner, Major-General Sir William Green, Lieut.-Colonel Sir Richard Fletcher, and Major-General Sir Henry Durand.

Lieut.-General William Skinner* (1700—1780) is the senior military engineer commemorated in our gallery of portraits. He obtained his warrant as Practitioner Engineer on the 11th May, 1719, and commenced his duties at the Ordnance Office in the Tower of London. In 1724 he was employed on the first general survey of Gibraltar, and did duty there throughout the siege conducted by the Spaniards under the command of the Conde de las Torres in 1727. In 1741, during the War of the Austrian Succession, he was appointed Chief Engineer at Gibraltar, succeeding Jonas Moore, who had been killed at the Siege of Carthagena. In 1746, after the suppression of the Jacobite rising in Scotland, Skinner was appointed Chief Engineer of North Britain, with orders to construct such defence posts as would effectually control the Highlands. He was employed for several years making surveys and plans, and in 1749 commenced the construction of Fort George, which was completed in 1753. General Wolfe, who was afterwards killed at Quebec, wrote in 1751 that the new work, which was estimated to cost £106,000, would, when completed, "be the most considerable fortress and best situated in Great Britain." In 1757 the officers of the Corps first received military rank, and Skinner was gazetted Colonel on the 14th May of that year, being the senior of a batch of 52 Engineer officers gazetted on that day, receiving at the same time the Royal Patent appointing him Chief Engineer of Great Britain. In the following year he reported to the Master-General of the Ordnance on the new defences of Gibraltar, and until his death in 1780 he was constantly employed on fortification works all over the United Kingdom. The defences of Fort George, Fort Augustus, Edinburgh Castle, fortifications at Milford, Plymouth, Portsmouth, etc., are testimonies of Skinner's

* See *Dictionary of National Biography*, Vol. LII., p. 350, and Porter's *History of the Corps*, Vol. II., p. 382.

work. Scarcely had Skinner completed the Milford work when the Government, becoming alarmed for the safety of Gibraltar, sent him back to the Rock to make all sure in case of attack. In 1760 he was sent to Belle Isle on, probably, some secret mission, as a preliminary to the anticipated descent upon the place. In 1761 he was promoted Major-General, and in 1770 Lieutenant-General.

His long service of 61 years has probably been exceeded by Sir John Burgoyne only, and by no other officer of the Corps. He was buried in the churchyard of St. Alphage, Greenwich, where there is a stone slab to his memory. His original portrait hangs in the Convent—the residence of the Governor—at Gibraltar. The picture in the Mess is a copy of the Gibraltar portrait, and was presented in the names of his great-great-grandson, Major Thomas Skinner, C.M.G., and of the latter's son, Lieut. Monier Williams Skinner, R.E., on the 17th August, 1875.

The original device of the Corps—a soldier in classical armour with shovel and wheelbarrow—seems to have been devised by Colonel Skinner in 1757, when military rank was first granted to Engineer officers, and is given below.

The title "Royal" was not granted to the Corps till the 25th April, 1787, seven years after Skinner's death. He and Lord Heathfield are the only military engineers commemorated in our portrait gallery whose whole service in the Corps belongs to the pre-Royal epoch.

General Sir William Green, Bart.* (1725—1811), was appointed a Practitioner Engineer in 1743. He resigned the appointment of Chief Engineer of Great Britain in 1802, when old age and infirmity compelled him to retire on a pension. His war services extended over a period of 38 years, from the Battle of Fontenoy in 1745 to the

* *Dictionary of National Biography*, Vol. XXIII., p. 58, and Porter's *History of the Corps*, Vol. II., p. 391.

end of the famous Siege of Gibraltar in 1783. In 1747 he was wounded at the Battle of Val, in Flanders, and in 1759—the year of victory—he was with Wolfe on the Heights of Abraham, on which occasion he was again wounded.

No British Engineer of the 18th century attained so much distinction both in the field and as a designer of defence works.

In 1772, when he was Chief Engineer of Gibraltar, King George III. granted him a warrant to raise a Company of Military Artificers. This step was taken on Green's strong recommendation, and marks the origin of the rank and file of the Royal Engineers. His service at Gibraltar extended over a period of 22 years—from 1761 to 1783. He was 36 years of age when he first reported for duty at the fortress, and when he left it at the age of 57 he was still the same active, energetic engineer as when he first began his reports and projects for improving the defences.

The following is General Skinner's letter forwarding Green's estimate of £50,000 for reconstructing the Gibraltar defences :—

"Greenwich, 30th August, 1770.

"Right Honble. and Honble. Gentlemen,

"In consequence of your orders, I have considered and examined Lieut.-Colonel Green's projects and reports on the present state of the works at Gibraltar, and herewith enclose my opinion and report of same. Lieut.-Colonel Green has been very exact in his account of this place. I speak by my own knowledge, there is hardly fifty yards that doth not vary in the advantages or disadvantages for or against the attacker. And I cannot help adding that an Engineer, to understand and know this place, must not only reside there for some time, but he must not be idle and remain in his quarters when there. For the man that designs to make himself master of the defences of this place must be perfectly acquainted with every rock, every precipice, and every fort and foible on the mountain, to be ready on a call for its defence, as well as a knowledge of the round or circuit of the walls. This knowledge of the mountain cannot be obtained but by great labor as well as time; the different precipices vary in their nature so very much that they may easily deceive a passenger, and appear in a very different light at first sight to what they would do on his closer examination of them, both within and without. For I do conceive, and I think I can affirm, that there is not a known place that is so peculiarly circumstanced and situated in Europe as Gibraltar is, and which with a proper garrison may be so advantageously defended."

The estimate was sanctioned, and Green had the good fortune to complete the work during the seven years of peace that followed.

At the close of his service at Gibraltar, in November, 1781, during the great siege, when the enemy opened a cave on the eastern side of the Rock, which Green had closed up before the siege, he made a personal reconnaissance to ascertain what was going on, being

lowered down the face of the Rock several hundred feet. Evidently his 57 years sat lightly on him.

Few members of the Corps deserve or have obtained more honour than he. He was made a baronet for his services, was thanked by both Houses of Parliament, and was Chief Engineer of Great Britain in 1787, when the Corps to which he belonged, and on which his exploits and services had shed so much lustre, was granted the addition of Royal to their former title.

As the originator of the rank and file of the Corps, and as the Chief Engineer in one of the most famous sieges in history, few will deny to Green in the 18th century the position occupied by Burgoyne in the 19th century—that of the greatest Royal Engineer of his time.

Lieut.-Colonel Sir Richard Fletcher, Bart.,* K.C.H. (1768—1813), was gazetted a Second Lieutenant in the Royal Artillery on 9th July, 1788, and was transferred to the Royal Engineers on the 29th June, 1790. His war service began in the following year, and continued, with but short intermissions, until he was "killed by a musket ball at the mouth of the trenches" before San Sebastian on the 31st August, 1813.

Fletcher joined the staff of Sir Arthur Wellesley as C.R.E. in 1809, and for the next four years the name of no other Engineer officer occurs more frequently in the Wellington Despatches. In 1811 he was made a Knight Commander of Hanover, created a baronet, decorated with the gold cross for Talavera, Busaco, Ciudad Rodrigo, and Badajoz, and was permitted to wear the insignia of the Portuguese Order of the Tower and Sword.

Colonel Landmann—whose portrait is also hanging in the Mess—had handed over the command of the Royal Engineers in the Peninsula to Fletcher in August, 1808, immediately after the Battle of Vimiera.

Early in 1813 Colonel Landmann met Sir Richard Fletcher in England at a dinner party just before his return to the Peninsula as C.R.E. on the staff of the Duke. "He had already," writes Colonel Landmann in his *Adventures and Recollections*, Vol. II., page 336, "seen much more service than any other officer in the Corps of Royal Engineers. He had assisted at the capture of all the islands in the West Indies taken by us at the commencement of the great war. . . . He had been in Egypt, and I believe at Copenhagen, and had been present at most of the battles and sieges under Wellington. . . . In short, I have reason to believe that he would have had more medals than the great Duke himself."

He seems to have had a presentiment of approaching fate, for he remarked to Landmann after dinner, "The pitcher may go once too often to the well."

* *Dictionary of National Biography*, Vol. XIX., p. 319, and Porter's *History of the Corps*, Vol. II., p. 404.

Within a month of his landing in Spain he was killed at the storming of San Sebastian by a ball from a wall-piece, which passed through his neck.

Sir Richard was buried with three other Engineer officers—Capt. C. S. Rhodes, 2nd Capt. G. Collyer, and Lieut. L. Machell—on the height of St. Bartholomew, opposite San Sebastian. The background of the picture in the Mess represents the fortress before which he fell.

A committee was formed in 1829 with a view to the erection of a monument in Westminster Abbey to the memory of Sir Richard Fletcher. Major-General Sir Alexander Bryce, C.B., was president of the committee, Colonel John T. Jones, C.B., and Lieut.-Colonel C. W. Pasley being amongst the members of the committee. Mr. E. H. Baily, R.A., was the artist selected to carry out the work in the north-west tower of the Abbey.

The circular calling for subscriptions is signed by Colonel Pasley, and closes with the following words:—"A Monument to Sir Richard Fletcher cannot be considered merely as a personal tribute to the Merits of that distinguished Individual. It is no less a Record of the Services of the Corps, of which he was the Representative in the Peninsular War; and it will be impossible to inspect it without also calling to mind the services of those Gallant Officers, by whose zeal and exertions he was so ably supported, and so many of whom fell like him, in the execution of their Duty, during that memorable Contest."

Major-General Sir Henry Marion Durand,* K.C.S.I., C.B. (1812—1871), obtained his commission in the Bengal Engineers in 1828. Lieut.-Colonel Pasley wrote of him at Chatham in the following year as being "one of the most distinguished young Engineers whom I have ever had under me, both in respect to diligence, ability, and conduct" (*R.E. Professional Papers*, Vol. XXII., New Series, p. ix.). His after-career in India was a most distinguished one, both as a soldier and civilian. His war services included the first Afghan War of 1838, the second Sikh War of 1849, and the Mutiny of 1857, when, in the words of the Governor-General, "Colonel Durand saved our interests in Central India until support could arrive."

His services as a civilian were at least equally striking. He was Private Secretary to Lord Ellenborough, the Governor-General, from 1842 to 1844. From 1844 to 1848 he was Commissioner of Tenasserim. After the Sikh War of 1849 he was appointed Political Agent at the Court of Scindia at Gwalior. From Gwalior he was transferred to Bhopal, and from thence he was promoted to Nagpore. In March, 1857, he was selected to take charge of the Central India Agency, one of the most important political charges in India. Two months afterwards the Sepoy outbreak at Meerut occurred. "The history of Sir Henry Durand's tenure of the appointment is in fact the

* *Dictionary of National Biography*, Vol. XVI., p. 244, and Porter's *History of the Corps*, Vol. II., p. 489.

history of the Mutiny in Central India" (Thackeray's *Biographical Notices of Officers of the Royal (Bengal) Engineers*, p. 139). During the course of the year he held Indore and re-conquered Western Malwa, thus clearing the way for Sir Hugh Rose's Campaign in Central India. He was Foreign Secretary in India from 1861 to 1865, during the Governor-Generalship of Lord Canning, Lord Elgin, Sir William Denison—whose portrait hangs close by—and Sir John Lawrence.

From 1865 to 1870 he was a member of the Governor-General's Council in charge of the Military Department, and in May, 1870, he was appointed Lieutenant-Governor of the Punjab, an appointment which he held until his tragic death—the result of an accident—on the 1st January, 1871.

Lord Mayo, the Governor-General, in publicly announcing his death, said: "Her Majesty has lost a true and faithful servant, the Viceroy an able and experienced comrade, the Punjab a just and energetic ruler, and the Indian service one of its brightest ornaments" (*Dictionary of National Biography*, Vol. XVI., p. 246).

In the Mess portrait Sir Henry's great services as a civilian are indicated by his representation in diplomatic dress. His services as a soldier have also been commemorated by his brother officers by means of a medal named after him, which is annually bestowed by the Commander-in-Chief in India upon the most deserving native officer or non-commissioned officer of the Indian Sappers and Miners. The medal commemorates on the obverse a striking feat of arms in which, as Lieut. Durand, he took a prominent part in the First Afghan War of 1838. He was with Sir John Keane's column in the advance northwards to Cabul, and it fell to his lot to undertake the duty of blowing in the gates of Ghazni, an operation rendered necessary by the absence of any siege train. "Capt. Thomson, the Chief Engineer, had advised the assault of Ghazni by the Cabul gate, and Durand was selected to place the powder-bags and to fire the train. The operation was a very hazardous one. The little party had to advance without any cover and exposed to the fire from the outworks, and to approach the gate by a narrow, winding road-way, lined on each side by a loopholed wall, while the enemy were known to be on the alert. The powder—300 lbs.—was carried in bags by native sappers, a sergeant carried the hose, and Durand headed the party. On arriving within 150 yards of the gate they were discovered and fire opened on them, but pushing rapidly on they reached the gate without the loss of a man. The powder-bags were quickly laid against the gate, and Durand, with the assistance of the sergeant, laid the hose to an adjacent sally-port, where they took refuge while firing the train. The explosion was successful, the Cabul gate of Ghazni was blown in, and Ghazni fell on the 23rd July, 1839."*

* *Dictionary of National Biography*, Vol. XVI., p. 244.

MEMOIRS.

COLONEL HENRY ROBERT MEAD, LATE R.E.

By 'H.' AND 'W.'

HENRY ROBERT MEAD--son of an eminent architect who died young—was born on the 20th April, 1836, and died at his residence, 161, Gloucester Terrace, Hyde Park, on the 9th October, 1908.

He was educated at Bath, and joined at Addiscombe in 1854. He received his commission in the Honourable East Indian Company's Engineers on the 7th December, 1855, joined at the S.M.E., Chatham, in 1856, and was appointed to the Madras Engineers, arriving in India on the 26th December, 1857.

He was appointed Assistant Engineer, Department of Public Works, on the 12th January, 1858, and remained in this Department during the whole of his service, rising through all the grades until he became, in 1887, Chief Engineer for Irrigation, and in October, 1888, Officiating Chief Engineer and Secretary to Government, which position he held until his retirement in 1889.

He married in 1875 while on leave to England.

His work was mainly in the Irrigation Branch of the Department, in which he very soon showed his talent and capacity for work, and he was, in 1864, entrusted with the important duty of investigating the conditions for the distribution of water to the various branches of the Caveri River, from which the great system of irrigation in the delta of that river is supplied. In 1866 Capt. Mead submitted his report and proposals, in dealing with which the Government expressed their "appreciation of the able and thorough manner" in which he had performed the duty entrusted to him. Most of the proposals then made were before long carried out with admirable results, but one of the most important of the proposed works, that for regulating the distribution between the Caveri and its first and main branch—the Vennar, and for excluding destructive floods from the delta, was shelved. Year after year however its necessity became more and more apparent, and Colonel Mead had the satisfaction when Superintending Engineer of the 6th Circle of seeing the Caveri-Vennar Regulator, advocated by him so many years before, taken in hand; this fine work was completed in 1886.

Colonel Mead also did excellent service in carrying out irrigation

and navigation in the Eastern Delta of the Godavari, and on many and various public works in the Madras Presidency.

After retirement he settled in London and found ample employment in public work. He was a member of the old Paddington Vestry in 1890, and remained a representative until his death. He was an Alderman of the Borough Council from October, 1902 to 1906, and for a number of years was Chairman of the Finance Committee and Vice-Chairman of the Assessment Committee. One who was here associated with him writes: "I know how much indebted the Borough is to his sagacity, his industry, and his independence of character."

Those who had the privilege of knowing and working with him during his career would speak in the same terms. One of his chief characteristics was his hatred of humbug; he was straightforward in everything, and the thoroughness of his character ensured work being well done, and earned him the love and esteem of those who worked with him.

Of his private life one can hardly write here; he leaves those who will mourn his loss inexpressibly, and his old comrades and friends will miss, so long as they live, the true and honest friend who has gone before them.

GENERAL F. H. RUNDALL, C.S.I., R.E.

By COLONEL F. M. RUNDALL, C.B., D.S.O.

GENERAL FRANCIS HORNBLOW RUNDALL died on the 30th September, 1908. He was the youngest son of the late Lieut.-Colonel Charles Rundall, of the H.E.I.C.'s Service, who at the time of his death was Judge-Advocate-General of the Madras Army. Born in 1823, he obtained a cadetship at Addiscombe in 1839, being gazetted second lieutenant in the Madras Engineers in 1841. On completion of the usual course at the S.M.E. he proceeded to India, and, in 1843, was appointed adjutant to the Madras Sappers and Miners. In 1844 he entered the P.W.D., being appointed assistant to the late General Sir Arthur Cotton, K.C.S.I., both for the preparation of the designs, and subsequently for the construction, of the great irrigation works in the Godaveri District. Pending the sanction of Government for the necessary expenditure, Rundall was ordered to the Tanjore District so as to acquaint himself with the irrigation works there. His next appointment was that of District Engineer at Vizigapatam and Ganjam, which he received in 1851, and from which he was transferred as District Engineer of the Godaveri District in 1855. Here he remained until 1859, in which year he became Superintending Engineer of the Northern Circle and Departmental Secretary to Government, and finally, in 1860, he was made Consulting Engineer to the Government of Madras for the Irrigation Canal Company's works.

In 1861 Rundall was granted special leave to act as Chief Engineer to the East India Company's irrigation and canal works in Orissa and Behar. In this capacity he designed and constructed the weirs and other large works across the Mahanadi and Brahminy Rivers, and the canals leading from them, thus successfully irrigating a part of India which had previously been frequently devastated by appalling famines. From 1866 to 1870 he was Chief Engineer for Irrigation and Joint Secretary to the Government of Bengal, and in 1871 he became Inspector-General of Irrigation and Deputy Secretary to the Government of India. Rundall was now in close touch with the great irrigation works all over India, and kept himself *au fait* in matters connected with them by personal visits of inspection.

After 30 years' arduous work in India, Rundall succeeded to "Colonels' allowances"—then termed "off reckonings," but he was still permitted to retain the appointment of Inspector-General for a further period of two years.

In 1874 he was finally transferred to the unemployed supernumerary list, on which his name appeared until the day of his death.

Although nearly all his service was spent in the hottest plains of India, and also in most malarious districts, Rundall only once took leave to England, and that not until he had spent 20 years on end in the plains of India. In 1875 he was created a Companion of the Star of India in recognition of his services.

Only those who have seen, or have had to cope with Indian rivers, can realize the great engineering skill required to bridle and control the vast rivers such as he had to deal with, rendered still more difficult by their being subject to sudden rises and tremendous floods. Perhaps some small idea of the vastness of the irrigation work in India, may be formed by General Rundall's reply to one who criticized a Paper he once read on storing and utilizing the tidal power of the Thames. His critic politely pointed out that "The gallant general does not appear to realize that 10,000,000 gallons of water pass under London Bridge per hour." To this the General replied "We do not measure water by gallons in India, but by square miles."

In 1876 General Rundall proceeded to Egypt, at the invitation of the (then) Khedive, to examine the delta of the Nile and to submit plans and estimates for its irrigation. The details of the estimates which he submitted would of course occupy too much space for mention in the present memoir; suffice it to say that he proposed to construct a mighty dam not so very far from the site of the present one at Assouan. Nothing further was done however, as the Khedive was bankrupt and there was no money available at the time for anything in Egypt, and Rundall therefore returned to England.

In 1883 a powerful syndicate was formed to construct a Palestine canal, and General Rundall was employed to give it the benefit of his advice and valuable experience. The project was a vast one, involving as it did the introduction of the Mediterranean Sea into the heart of Palestine, the opening up to commerce of such places as Damascus and the surrounding country, and the passage of the largest vessels from the Mediterranean and the Red Sea *viâ* the Jordan Valley and the Dead Sea, and thence by prodigious cuttings and tunnels to the Gulf of Akaba. Unfortunately this project in which he was keenly interested had to be abandoned for various causes.

General Rundall was married in 1846 to Fanny Ada, daughter of Capt. William Gardner Seton-Burn, of the 3rd Light Dragoons, and resided the last 18 years of his life with his daughter, Mrs. Wingate Pearse. All his life he was a deeply religious man, and his open-handed generosity won him the deep respect and love of all who knew him, whilst his love for his Corps and his interest in its doings and all that concerned it, never flagged.

The dates of General Rundall's promotions were:—Captain, 1854; Lieutenant-Colonel, 1861; Brevet Colonel, 1868; Colonel, 1869; Major-General, 1869; Lieutenant-General, 1878; General, 1885; and, finally, Colonel Commandant of the Royal Engineers in 1876.

form, it will be conceded, a most distinguished list of contemporaries. With two of them Shaw Stewart's name was connected—with Perkins, because of a memorable encounter at Addiscombe; Shaw Stewart and Perkins, who were excellent friends, having been chosen as representatives to settle by boxing a dispute between their terms; and with Charles Gordon, by serving on the Committee of the Gordon Boys' Home.

From Addiscombe Shaw Stewart was appointed to the Madras Engineers on June 13th, 1851, and, after the usual two years at Chatham, he joined at Madras on the last day of 1853. The following six years' service was of the usual kind, and requires no comment beyond stating that his promotion both in the Corps and in the Public Works Department was unusually rapid. He became 2nd Captain on the 24th November, 1858, and District Engineer in February of that year. Shaw Stewart had however volunteered for service during the Mutiny with the Saugor Field Force, and both the General Commanding the Division (Sir George Whitlock) and the Brigadier-General applied for him, but he was thought to be too young for so important a position, and Capt. Hemery* was appointed. In 1859 he was selected by Colonel Bell, Chief Engineer, to prepare the Code of Regulations for the Department of Public Works (Madras), and though war with China prevented its completion, he was thanked by his Government for "the diligence, patience, and ability" he had brought to the work.

Disappointed of active service during the Mutiny, Shaw Stewart's opportunity came in March, 1860, when he was ordered to China in command of the Madras Sappers with the Expeditionary Force. This formed part of a British and French armament sent to obtain redress for loss incurred near the mouth of the Peiho in the previous year. The allied force moved forward on August 12, and Shaw Stewart was present at the action of Sinho on that day, and afterwards at the capture of Tangkoo, August 14; Taku Forts, August 21; Battle of Tangchow, September 21; and siege operations before Peking in October. Lieut.-General Sir J. Hope Grant, G.C.B., the Commander-in-Chief, testified in despatches to his zeal and good service. On October 24, 1860, the treaty was signed in Peking by Lord Elgin and Prince Koon, brother of the Emperor, and the Madras Sappers returned home, having "well sustained the ancient reputation of the Corps."†

The other Engineer officers with the detachment were Lieut.

* Edward Hemery, 2nd Lieutenant, 9. 12. 1842; retired as Colonel, 25. 11. 1864; services: Aden, 1846; Mutiny, 1858. His name is next senior on the Madras list to the late Colonel J. C. Anderson, C.S.I., foremost in his day as an Irrigation Officer.

† Madras Government Order, No. 222, 18th January, 1861.

MAJOR-GENERAL JOHN HERON MAXWELL SHAW STEWART.

By MAJOR W. BROADFOOT (LATE R.E.).

THIS distinguished officer died at his residence, 7 Inverness Terrace, London, W., on July 6, 1908, having nearly completed his seventy-seventh year.

Born at Springkell, Dumfriesshire, on September 9, 1831, he was the second son of John Shaw Stewart, Sheriff of Stirlingshire, and grandson of Sir Michael, the fifth baronet, whose seat, Ardgowan, is beautifully situated on the Clyde, near Greenock. The family is an old one, descended from Walter, the High Steward, and Marjory, daughter of Robert Bruce; their grandson became Robert III., King of Scotland, in 1390, and his son, Sir John Stewart, of Ardgowan, founded the house.

The subject of this notice was but nine years old when his father died, and his guardians, prejudiced against public schools in England, sent him to a school called "The Grange," at that time popular with Scottish families, but with little apparently to recommend it as a place of education. Among his schoolfellows were Sir Mountstuart Grant Duff and Lord Macnaghten; but the six years spent there he looked on as lost. He afterwards was sent to Bath to prepare for Haileybury, with the view of entering the Indian Civil Service; this was given up, and, instead, a cadetship to Addiscombe was obtained on the recommendation of Lady Mary Stewart, from Sir John Cam Hobhouse, President of the Board of Control. He joined in August, 1849, and has mentioned as contemporaries Major J. A. Nutt (Vice-Consul, St. Sebastian) and Major Malcolm Paton, of the Cairnies, Perth, who retired from the Bombay Engineers in 1864.

He had however other fellow students at the College whose names are better known:—Major Pat. Stewart, an officer of great promise, identified with telegraphic service in India and Persia, and General Sir Æneas Perkins, K.C.B., A.D.C. to Queen Victoria, both of the Bengal Engineers. In the Bengal Artillery Field Marshal Lord Roberts, of Kandahar, Pretoria, and Waterford, and General Sir James Hills-Johnes, G.C.B., need no further description to military readers. In the home Royal Engineers of similar standing were Sir John Cowell, K.C.B., Sir Gerald Graham, G.C.B., and Charles George Gordon, whose name may dispense with rank and decoration. These

Trail, who afterwards served in the Punjab in the accounts department (he died a Colonel in 1892); and Lieut. A. J. Filgate, who retired as Colonel in 1890, after distinguished service in the same department. Being subalterns, they had to be content with the medal and clasps for the campaign, but Shaw Stewart, in addition, received a brevet majority.

Though the story of the war and the plunder by the French troops of the Summer Palace are familiar, some extracts from letters to his family may be given; they are interesting, and testify to excellent power of observation and description. After the action of Sinho Shaw Stewart records in a letter dated August 25th:—

"I was out all the night of the 13th * * *. I had one companion with me, Major Fisher, of the R.E.; we literally felt our way along, for we could scarcely see anything. When we got to the inner ditch we heard a sentry cough, and he too seemed to have heard us, for they began to burn blue lights. We threw ourselves down, and a few shots they fired must have passed over us. When they were quiet we retired, as we had got all the information we wanted, and then began our work. It was 4.30 a.m. before we returned to camp, and at 5.30 a.m. the order was given for the advance to the assault. The attack was almost entirely an artillery one—the Armstrong guns manœuvred splendidly, and in less than two hours we were ordered forward with pontoons and scaling ladders—(I was interrupted here by a message from the General, and have not had a minute since). This left us in rear of the Taku Forts—they are eight in number, and very strong indeed, especially on the seaward side, which is almost impregnable. Every advantage, too, has been taken of natural defences, for while the sea mud and the river protect them to a great extent, on the land side numerous canals and deep ditches have been dug, which give us a good deal of bother. On the 17th I accompanied the General on a reconnaissance of the position, and the next two days I was busy getting bridges ready for crossing the Force over the ditches. On Sunday evening, the 19th, we moved out, and during the night, and the following day and night, we were incessantly employed in fixing bridges, making dams across ditches, and making batteries. We had five batteries ready by Tuesday morning, and at 5 a.m. the assault began. I had been out the whole of the two nights before, and through sheer fatigue was obliged to snatch two hours' sleep, so did not get up till about 7 or 8 a.m. There was then a very vigorous cannonading going on, and very soon afterwards the storming party was sent forward. I followed with them, and after a little we succeeded in escalading the wall, and soon the Union Jack and the Tricolor were floating from the highest point. The Tartars fought splendidly—everyone was surprised at the courage and obstinacy they displayed. Our losses were slight, 22 officers wounded, 180 men killed and wounded. French—4 officers wounded, and 90 men killed and wounded. I was twice splattered with mud by a round shot, and Sir Robert Napier had his glasses carried away while holding them to his eyes."

Again, dated :—

"OUTSIDE THE WALL OF PEKIN,
"*25th October*, 1860.

"We marched towards Pekin on the 5th, and, after two days' wearisome toiling in quest of the Tartars without being able to bring them to any general engagement, took up our quarters in a suburb on the North side of the City. By some most unaccountable mismanagement or misunderstanding the French went on straight to the Emperor's magnificent Summer Palace, containing a collection of works of art and curiosities, European and Asiatic, certainly without a rival in the world. This they began to sack and destroy * * *. The plunder was of the richest description, indeed such magnificent property I have nowhere seen, and the dreadful and wasteful destruction of these beautiful gems of art quite went to one's heart. I suppose that such a unique collection exists nowhere in the world, and three-quarters of the beautiful collection have been ruthlessly destroyed. I rode out there yesterday and spent some hours in very sad meditation among the sack of the Palace. The pleasure grounds are beautifully laid out and do credit to the taste of the nation, said to contain the best gardeners in the world. (Here I am suddenly called out for another reconnaissance of the City). I shall not try to describe the splendours of that unique spot—it is about 5 miles from Pekin, and covers 20 or 30 square miles—the whole of which is laid out as a park and covered throughout with the most tasteful mingling of hills and water, rocks, trees, and grass, with palaces, temples, grottoes, and summer-houses scattered about everywhere, every building being furnished in the most lavishly magnificent style."

Terms were discussed, and only complied with at the last moment.

"After this we took possession of the North wall of the City, and on the 17th a message was sent to the Chinese to the effect that if a certain fine was not paid (for each of the prisoners who had been tortured and murdered) by 10 a.m. on the 20th, we would march on the immense City Palace, take it and destroy it. Again they kept us waiting till the last minute, and last Saturday, the 20th, our men had actually fallen into their ranks to march on the Palace, when we got notice that the sum demanded had been paid. So that twice within a week we were disappointed at the very last. To me, personally, it has been very tantalizing, as on the first occasion I was to have blown open the gates, and on the second I would have been Commanding Engineer, and would have led the storming party. * * *. We had a grand promenade through the City to a large Temple, which had been fitted up for the signing of the Treaty. The ceremony was a very imposing sight. The building chosen was about 4 miles from the Gate, and the Barbarians marched in force and in grand state, to the edification of the Celestials. Such a crowd of Mandarins was never before seen by Barbarian eye—there must have been at least 500—some of them were very venerable fine-looking men."

In 1862 Major Shaw Stewart came home on sick leave and next year on return to duty he was appointed Under-Secretary to the

Madras Government in the P.W.D. He applied for the command of the Madras Sappers during the Abyssinian War, but withdrew his request at the instance of Sir Robert Napier; and he has recorded that "the post has been filled most worthily by Harry Prendergast,* who has already greatly distinguished himself in the Mutiny Campaign." In 1867 he became Consulting Engineer for Railways; and in September, 1871, when on furlough, he married Mary, daughter of Colonel Collyer, R.E., and returned next year to India with the rank of Lieut-Colonel. During 1876—78 he was employed on famine relief; his services, specially in connection with the management and control of the Madras Railway as a means of supply, were efficient and of great value. In 1883 he was appointed an additional member of the Legislative Council, and, a few days after, Secretary to the Government in the Public Works Department, thus attaining what is ordinarily the highest position open to those in his profession. He received a good service reward in 1885, and retired the following year with the rank of Major-General; in accepting the resignation the Governor in Council recorded "his very high appreciation of the service which that able and zealous officer has rendered to the State during the long period of his connection with the Public Works Department."

Major-General Shaw Stewart settled in London, joined the Paddington Vestry, in 1890, and did much useful work on it, and afterwards on the Borough Council as an Alderman. Though he seldom spoke and always briefly, he commanded respectful attention and had considerable influence; specially, perhaps, with those members, who, though not seeing with him precisely eye to eye, held their colleague in high esteem. He was on the Board of the South Indian Railway Company, latterly becoming its managing director, and was active in many charitable institutions. Thus, he was a governor and trustee of St. Mary's Hospital, a governor of the Gordon Boys' Home, on the Council of the Royal Military Benevolent Fund, for many years a director of the Royal Caledonian Asylum, and a member of the Committee of the R.E. Charitable Fund. He was a Fellow of the Royal Society of Edinburgh and of the Royal Geographical Society, on whose Council he served for a few years. His time therefore was fully and usefully occupied almost to the date of his death.

General Shaw Stewart in his younger days must have been above the average height, strong, and well built; in later years he stooped

* Now General Sir Harry N. D. Prendergast, G.C.B., whose services are varied and distinguished—Persian War, 1857; Mutiny, 1857–8, V.C., medal and clasp; Abyssinia, 1867–68, medal and Brevet Colonel; commanded British Burma Division, 1883; Upper Burma Expedition, 1885; served as G.-G.'s Agent in Baluchistan and Baroda; Resident, Mysore, 1891–2.

a good deal, but always had a distinguished appearance, good features, and a pleasant manner. He was fond of sport, took much interest in Indian turf matters, and was for several years judge at the Madras races. He played rackets and lawn tennis in India, was a great walker, and fond of shooting. An old member of Lord's, he latterly spent much time there, to his great satisfaction.

He leaves a widow, two sons, and two daughters, and the many letters of condolence, received by them after his death from the various bodies with which he was connected, bear testimony to his good work.

The following lines by Rudyard Kipling have been suggested as fitly summing up General Shaw Stewart's character :—

"E'en as he trod that day to God, so walked he from his birth,
In simpleness and gentleness and honour and clean mirth.

* * * *

Who had done his work and held his peace and had no fear to die."

TRANSCRIPTS.

THE MASKING OF FIELD DEFENCES.

Epitome of an article by V. Veitko in the December, 1907, number of the *Eenzheenernee Zhoornal.*

MASKING, as an auxiliary to fortification, is by no means an innovation, and some methods of masking are as ancient as the art of war itself. None the less, under modern conditions, views on this subject have considerably developed, although it is still considered as a subsidiary and not an essential branch of field engineering training.

At the present time, the Russo-Japanese War having opened discussion on various branches of military science, it is natural that this question of masking should receive some attention. Opinions appear to be divided, some maintaining that it has become so important--and is on the verge of becoming so much more important—that it deserves to be treated as a separate subject in military technical education, while others would argue that the importance at present attached to the subject is only the result of the usual enthusiasm for novelties.

Although truth is generally supposed to lie about midway between conflicting opinions, the object of the present paper is to contend that masking deserves to be raised to the status of an independent science, and, furthermore, that success in the struggle of fortification with modern firearms and against the artillery of the future, will depend not on digging, but on masking.

As a matter of fact, the reason that masking received so little attention in the past, is that trench-work has always hitherto been able to hold its own against artillery. Earth and other easily available materials were the efficient and trustworthy allies of the Engineer, who could make his defences with a light heart, well knowing that all the chances of success were on his side.

Originally defences took so simple a form that there was no necessity for special knowledge, or for specially trained experts for their construction. This necessity only arose as, by the gradual improvement of artillery, it became necessary to make the works more solid and complicated in design, the materials remaining unchanged. But as time went on it was found to be not sufficient merely to increase the quantity of materials used, but their quality had to be carefully scrutinized, until, finally, the enormous progress recently made in the development of artillery has driven the defence to the employment of such materials as concrete, iron, and steel, to burrow deeply in the earth, and use enormous parapets.

Under these conditions, it is hardly possible to hope for many further discoveries in the search after reliable materials for defensive works, and, at any rate, the materials mentioned above already far exceed the limits of what can be expected as available in field warfare. What is more unfortunate is that whereas the limits of what is possible in field defence have thus been exceeded, the chances of further improvement in artillery are still boundless.

It remains then for us to seek out some new line for our ingenuity, and we will first study the following data, which may suggest a new departure in the methods of the defence:—

The experience of the Russo-Japanese War has shown—

(1). That no known form of field fortification—independently of the quantity or quality of materials used in its construction—is proof against artillery fire. It is true that there were casemates in the Hsipingai position claimed by their makers to be proof against the Japanese high-explosive shells; but their roofs were covered with 10 feet of earth, resting on beams 12·25 inches in thickness, and such beams can hardly be considered as material ordinarily available in field warfare.

(2). That casemates and other works escape when it is not possible to find their range, as, for example, occurred in the case of the mortar batteries at Port Arthur.

From these premises it may be argued:—

(*a*). That it is more essential to preserve a work from view than to protect it from fire.

(*b*). That ordinary works can give protection from bullets and from splinters only, but that when a work is concealed from view, and consequently also from fire, it gives cover from shells of all kinds.

(*c*). That concealment from view (or masking), appears to be a surer means of opposing the artillery of the future than by digging.

It may be contended that these arguments tend to the disparagement of digging, but this is not the case. It is only desired to reverse the existing order of "first make a trench and then mask it" by contending that first of all a locality should be masked, and later on, if circumstances permit, it should be entrenched.

The value of masking first began to be appreciated in the Boer War, and the fact that as a science it did not at once attain its full importance was apparently due to the poverty and scantiness of existing methods. Since then the Russo-Japanese War has not only emphasized its importance, but has supplied abundant material for a thorough investigation of the subject from all points of view. We will now proceed to sift some of this material, and seek out the aims and objects which should form the foundation of this new "science" of masking.

The information at our disposal may be collected into the following groups:—

Colouring.—It is well known that during the Boer War the British carried paint with their guns and coloured their carriages to match their surroundings. At the time this action appeared to be childish, but since then times and views have changed, and no surprise was caused when, on mobilization, the Russian fleet was painted grey, and the troops were

clothed in a colour made up of grey, yellow, and green. This had become as much a matter of necessity as it soon became for the troops to cover their fur caps with the sections of their portable tents, to make them less conspicuous from afar.

So colouring, as a means of masking, is worthy of every consideration, but, it will be acknowledged, that the question of how the colouring is to be carried out is still subject to discussion, and that existing methods are rather the result of blind imitation than of intelligent research. It may therefore be of interest to study some examples from natural history which may assist us in considering the subject.

It is well known that, in the equipment provided by Nature for assisting animals in their struggle for existence, colouring is an important item. All animals are coloured some "defensive" shade, in accordance with their manner of life, to protect them against the foes which prey upon them.

Limiting ourselves to only a few natural phenomena which seem to bear a special relation to military masking, we will quote the following:—

(1). The colouring of the various types is not identical, but is toned to the conditions of their life or to the colouring of their habitat. Thus creatures which feed on bright flowers and fruits are clothed in bright colours (butterflies, humming birds, etc.), or those which live among grass and leaves are coloured green, or those dwelling in sand or among stones, or on the bare surface of the earth are tinged with various shades of brown, yellow, and grey—in fact earth colour (as partridges, hares, lions, etc.).

(2). Animals which change their dwelling places are parti-coloured. Similarly some animals whiten in winter and become darker in summer.

(3). Some animals can even change their actual colour (cameleon).

(4). All animals are darker on their backs than under their bodies, an arrangement which counteracts the effect of the shadow cast by their bodies when sitting.

(5). All animals possess the instinct of seeking shelter under conditions which harmonize with their colouring, and of adapting themselves to the light; the art of coming out into the light under favourable conditions of day or night illumination, and of lying hid in surroundings which absorb their colouring, attains a perfection in the animal world which is worthy of our imitation.

In applying these phenomena to the masking of fieldworks, the following conditions must be taken into account:—

(*a*). The general shade of the locality.

(*b*). The colouring of local objects.

(*c*). The effect of the light.

(*d*). The object to be attained by the work which we are colouring.

As an example of (*a*), when a parapet is placed in ground covered with grass, it is generally turfed over. But this method, which seems so simple, sometimes produces the very opposite result from what is intended. When the slope of the parapet differs considerably from that of the surrounding ground, the shade of the former becomes different from that of its surroundings, and the new work is clearly visible.

When a parapet is placed in ground bare of vegetation, it is necessary

to take into consideration the colour of the excavated earth. Thus a parapet of excavated sand appears darker than the surrounding ground, and should be covered with dry sand taken from the surface. Excavated gravel is also darker than that on the surface, while with black and vegetable soil the reverse is the case. Similarly a parapet in a cornfield would be masked not with sods, but with straw.

Instances are not wanting when the outer slopes of parapets have been dressed with the foliage stripped from the brushwood with which the inner slopes were revetted. This foliage quickly fades, and the parapet shows up as a very conspicuous black strip in the landscape. In the same way, where the general shade is variegated, the parapet should be coloured in variegated shades to match it. This is particularly necessary in the masking of large earthworks, such as redoubts, which occupy large sections of the horizon.

All this applies with equal force to the colouring of the troops. During the war various colours were recommended, sometimes yellow, sometimes green, and sometimes brown, and really all were right, as everything depends not on the colour, but on the shade of the locality in which it is applied. For this reason at times a colour is suitable and at other times it is quite unsuitable. It is unfortunately impracticable to change the colour of uniforms to match their surroundings, but this need not prevent small bodies of men, detailed for special duties, being disguised in this way to match the colouring of the localities at the time of their special action.

In the same way as animals know how to select hiding places which match their colouring, so the troops might be taught not only how to make use of local cover in the advance, but also how to select localities which best match the colour of their uniforms. But further than this, if it is sometimes worth while muffling the wheels of guns and the feet of horses with straw or rags to prevent noise, surely there is no reason why the troops should not on occasions be specially disguised with a view to concealment. But this most important question of masking *troops* does not come within the scope of this article, except in so far as it affects the masking of the fieldworks which they occupy, for of course the best efforts of the engineer in masking the works are wasted, if the troops occupying them unmask them by some article of their equipment, as for instance was the case in Manchuria with the fur caps worn by the Siberian corps.

Turning now to (*b*), the uses to which local objects may be applied are:—(i.) as points of orientation for those reconnoitring a position, a use which is repeatedly shown in the temporary names given to parts of an enemy's position, such as "One-Tree Hill," "Temple Mount," "Farmstead Field," etc.; (ii.), it is sometimes more expedient to adapt local objects for defence than to throw up separate trenches and works, and (iii.) they are frequently utilized as screens or natural masks, while many of these local objects on a position such as trees, bushes, corn, villages, etc., will considerably affect the general tone of the place, or will mark it with patches, lines, or blotches, as is the case with groves of trees, roads or canals, burial grounds or small hamlets.

Now in masking it is not only desirable to screen certain objects from

view, but it is also necessary to prepare false objects which may attract the attention and draw off the fire of the enemy in a wrong direction; and in this counterfeiting of local objects a great deal can be done by a judicious use of paint. We propose later on to describe the preparation of counterfeit local objects by means of screens, but we will here mention that by means of colour it is possible to show up false objects and to obliterate real ones, a fact which is extremely useful when putting local objects in a state of defence.

(*c*). The effect of the light has considerable influence on the colouring of local objects, and consequently when masking for instance a parapet, it is well to consider how it stands with reference to the sun, how the brightness of its lighted-up faces may be neutralized and the depth of its shadows relieved, and to study how its lighting up is affected by local objects in its vicinity.

It is found that it is always easier to discern an object by the shadow which it casts, than by its own shape or colour, and consequently a parapet is not completely masked unless the shadows which it casts are also screened from view. This circumstance accentuates the importance of avoiding, when making a parapet, all straight lines and plane surfaces, as they cast sharp and distinct shadows.

(*d*). Hitherto masking may be said to have been merely an auxiliary to trench-work, but when it is understood that concealment is generally more effective than earth cover, not only trench-work, but all sapper training will combine in the service of concealment. Thus, if hitherto all the work on a position has been devoted to giving cover to the troops, now it will become a part of the duty of the Sapper to design works not intended for occupation by troops, but to act solely as screens and masks. Such works have not yet been included in the courses of fieldwork instruction, but in the early future, when views on masking have become more convinced, this omission will be removed under pressure of necessity.

Adaptation of Works to Match the Configuration of the Ground.—Abundant experience was obtained, during the war, in various methods of preparing the outer slopes of earthworks; some were left rough, others were neatly trimmed, and others were coloured; but it was found that nothing exposed a work to view so much as straightness and regularity in its outline. This fact can be verified from many photographs of works taken at the time.

Hitherto, in teaching the siting of works and trenches, we have limited ourselves entirely to studying the requirements of view and fire, but now this instruction is further complicated by the new and essential requirement of concealment—that a work shall harmonize in outline with the character of the surrounding country.

We will now enumerate a few examples of how works may be "made up" to match the surrounding features of the ground:—

(1). In the firing line the surfaces and slopes of works should not be regularly aligned, but on the contrary the shape of the neighbouring ground should be copied in the studiously uneven surface of the earthworks; if a trench be dug in a ploughed field the line of the trench should conform with the direction of the furrows, or if it crosses the

furrows, the latter should be copied in grooves made over the parapet of the trench. In other cases parapets may be decorated with piles of stones, hedges, or groups of bushes, or they may be given the appearance of lengths of country lanes.

(2). Works in course of construction should be studied from the enemy's point of view, for the purpose of ascertaining how they may best be made to agree both in form and colouring with their surroundings.

(3). The salient angles of works may be finished off with shields coloured to match the general tone; the shadows may be relieved by bright colouring or hidden by screens.

(4). The outside ditches of works and even the trenches themselves, especially those without parapets, appear on level ground as dark lines, and on exposed slopes as dark stripes clearly showing the disposition of the troops, and consequently their masking is extremely important. Blinded saps have long been well known to us, and, in the Hsipingai position, it was not uncommon to see parts of communication trenches masked by light roofs of any available material painted to match the prevailing colour of the ground.

There is no reason why the ditches of fieldworks should not be similarly concealed. Such a form of light roof of brushwood need not lessen the value of the ditch as an obstacle, while it would effectively conceal it from view.

Screens.—The darkness of night is the best screen for concealing military operations. It has been widely used as such in the past, while in future wars it is probable that night operations will become the rule, and those by day the exception. Other natural masks are fog, smoke, bright light, etc.

In 1410 the badly-armed Lithuanians defeated the German knights at Grünwald by aid of a dust storm, and, similarly in Manchuria, dust played no small part in the operations.

In 1700 Charles XII. pushed his forces across to Dwina under a screen of smoke, and at Port Arthur the Japanese made a limited use of the same method.

It would probably be possible to cover an attack by throwing progressive lines of small smoke bombs.

The use made by the Japanese of screens formed of the rays of their search lights is worth recording. By placing projectors on both flanks of a working party, with their beams meeting at a point in front, a screen was formed through which the Russian lights were not strong enough to pierce.

Masks.—As the depth of excavations is increased and the height of parapets reduced, the question arises of what to do with the spare earth. The erection of dummy parapets to divert the enemy's attention and draw his fire is not new, indeed it is known to have been used successfully by the Russians against the Turks in 1828–9, and will always be popular with the troops. But masks can be made of other materials besides earth, just as they can imitate other things besides parapets. A very simple form of mask used by the Japanese was a brushwood screen shaped like a portion of a glacis, and coloured to match the surrounding

ground. It was intended to hide from view men lying behind it, and is interesting as being the prototype of the up-to-date parapet.

Another example is the observing station made in the form of a Chinese tomb. Chinese tombs, as is well known, abounded everywhere in Manchuria, and the appearance of a few new ones in the landscape was hardly noticeable, to which fact these stations owed their immunity from destruction, though sited in most exposed places. This example is instructive, and might well be followed up by designing other forms of cover to resemble familiar local objects. The observatory resembling a tree already exists.

The Japanese made considerable use of screens built up of poles, brushwood, branches, grass, etc., or painted like the scenes of a theatre. Some they used with their artillery; but the most prominent example is the arrangement for the concealment of the approach of their troops at the Yalu, down the steep slope facing the Russian position. These huge screens were so skilfully disguised that from a distance they became completely merged in the general colouring of the landscape, and successfully concealed the troops passing behind them; in fact, the trick was not discovered until the Japanese had reached the river and begun crossing it.

To such an extent is scenic effect carried in modern war that it adds a fresh meaning to the expression "The theatre of war," and only dummy figures are required to complete the resemblance. But examples even of these are not wanting. They were used by General Jourdan when crossing the Rhine at Dusseldorf in 1795, and frequent cases of their use are said to have occurred during the Boer Campaign.

Among examples of military cunning, it is mentioned that the Japanese are credited with having placed sappers to fire powder charges and throw dust into the air, so as to mislead the Russians as to the fall of their ranging shells; to have put up and subsequently moved prominent objects which might be used as orienting points by the Russians; and to have simulated a charge, lying on their backs stamping and shouting, in the dark, during the close fighting on the Shaho in October, 1904, in order to draw a disorderly fire from the Russian outposts.

As the subject may be extended to include the wearing of foreign uniform as a disguise, giving false orders in a foreign tongue, copying foreign signals, and such like, it is plain that it permeates all branches of military science. Although the instances quoted form by no means a complete list of all methods of masking, yet it is claimed that enough has been said to convince the reader of its importance, and the necessity of its further study and of the development of a thorough system in its instruction.

F. E. G. SKEY.

DECIMAL MONEY.

By COLONEL SIR C. M. WATSON, K.C.M.G., C.B.

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WE frequently hear it remarked that it would be very advantageous if Great Britain were to adopt a decimal system of money instead of the present system of keeping accounts in pounds, shillings, and pence. There can be no question but that a decimal system is convenient and simple for monetary calculations, and the fact that a considerable number of nations have adopted it shows that there is a good deal to be said in favour of it.

In all decimal systems amounts of money are represented in the following manner:—

a b c
l· l l

The figure "a" to the left of the decimal point is the unit of the system; the figure "b" to the right of the decimal point is the first subsidiary unit, and is equal to one-tenth of the principal unit; while the figure "c" to the right of the "b" is the second subsidiary unit, and is equal to one-hundredth part of the unit. In most foreign decimal systems the principal unit and the second subsidiary unit have definite names, but the first subsidiary unit has frequently no independent name given to it. In the French system, for example, the unit "a" is called "franc," and the unit "c" "centime," but the unit "b" is known as 10 centimes, the original name, "decime," for this unit having fallen into disuse. In the United States the unit "a" is called "dollar," and the unit "c" "cent"; the term "dime" is sometimes used for unit "b," but it is not official. In Russia unit "a" is called "rouble," and unit "c" "copeck"; while in Scandinavia unit "a" is "krone," and unit "c" is "ore."

It is evident that in any decimal system each unit must be exactly equal to the unit standing to the right of it multiplied by 10, and it is this fact that makes it difficult to apply the decimal system to British money of account.

In our present system of money of account there are two units, the pound and the penny, both of which have descended to us from remote antiquity. Not to go further back than the Norman Conquest, we find that, at that time, the unit of value was the pound weight of silver, and this was also used as the unit of account, although there was no actual coin to represent it. The pound was the old pound of 5,400 grains, which was divided into 240 pennies, these being actual silver coins, each weighing 22½ grains. There was also an intermediate unit of account

called the shilling, which had the value of 12 pence, but was not represented by an actual coin.

The distinction between coins and units of money of account is very important, as there may be units in money of account which are not represented by coins, and, on the other hand, there may be coins which are not units of money of account. The half-crown is an instance of this, as, though it is a coin, it is not a unit of account, and has to be written in terms of two units, *i.e.*, two shillings and six pence.

The British system of money of account has remained unaltered for many centuries, whereas coins and their values have been frequently changed, and the question of introducing a decimal system of money into this country is not a matter concerning coins so much as concerning an alteration in the method of money of account, which is a much more difficult problem.

It is easy to see that it is not possible to use both the present penny and the present pound in a decimal system of money, as the latter contains 240 of the former, and there is no decimal relationship between them. One or other of them must be altered as a unit of account, but it does not follow that it must cease to exist as a coin. In this country the most important coin is the pound or sovereign, which, in its present form, was introduced in 1817, and has since then been the standard of value. The second coin of importance is the penny, which has a much longer history than the sovereign, and is so bound up with trade that any change in its value, however small, is a very serious matter. The intermediate British unit of account, the shilling, is not so important as the pound or the penny, and it may be regarded as a subdivision of the former or a multiple of the latter.

In considering any system of decimal money for Great Britain two points must be observed :—

1st. That the gold coinage must remain absolutely unaltered in standard of fineness, weight, and value relative to weight.

2nd. That the penny must be retained both as a coin and as a unit of account, and that its value must be altered as little as possible, consistently with the first principle.

But when the Parliamentary Committee of 1853 considered how a system of decimal money could be introduced, while adhering to the principle of keeping the sovereign unaltered, they abandoned the penny altogether, and proposed a system based on the pound as the unit. The pound was to be divided into 10 florins, the florin into 10 cents, and the cent into 10 mils. As there are 960 farthings in a pound, and as it was proposed to divide the pound into 1,000 mils, the latter coin would have had a value a little less than a present farthing. The system proposed by the Committee may be represented thus :—

£1.	Florin.	Cent.	Mil.
1·	1	1	1

This proposal had many serious disadvantages. It gave up the penny and introduced three new units, neither of which corresponded to existing

units. It is not matter of surprise that it met with little approval, and that no serious attempt was made to introduce it, although the florin ($\frac{1}{10}$th of a pound) had been in circulation as a coin (though not a unit) before the Committee was appointed, and has been in constant use ever since. We may take it as fairly certain that this system of decimal money will never be adopted, and perhaps the fact that it was the best that could be proposed by an important Parliamentary Committee has had a considerable effect in checking the introduction of any decimal system into this country.

It would appear however that the conclusion that the pound-mil system is the only feasible one is hardly tenable, and that it would be possible to devise a decimal system, under which the sovereign could be retained unaltered; while at the same time the penny could also be retained both as a coin and as money of account, subject to a small alteration in its value, which would not seriously affect its general use. Such a system might be formed by the introduction of a new unit of account, of which the value, as a gold coin, would be exactly $\frac{2}{5}$ths of a sovereign, and by dividing this coin into 100 pennies. As in our present monetary system $\frac{2}{5}$ths of a sovereign is equivalent to 96 pennies, the value of the penny would be reduced by $\frac{1}{25}$th part, or rather less than $\frac{1}{3}$th of a farthing. This is a small amount, and perhaps such a change in the value of the penny might be feasible without great injury to trade.

Before describing the proposed new system in detail it is desirable to consider what the new gold unit should be called, and in order to do this it is necessary to give a short *résumé* of the history of British coinage.

At the time of the Norman Conquest accounts of money were kept, as at present, in pounds, shillings, and pence, but, as I have already shown, the two former were units of account only, and were not represented by coins, the only coin being the silver penny of $22\frac{1}{2}$ grains in weight. This was the $\frac{1}{240}$th part of a pound of silver of standard fineness, as the pound was at that time equal to 5,400 grains. The standard of fineness was 37 parts of pure silver to 3 parts of alloy, a standard which was maintained for many years, except for a short period during the reigns of Henry VII. and Edward VI., and is still maintained at the present day. The shilling was an imaginary coin, equal in value to 12 silver pennies.

There was no British gold coin until the time of Henry III., who, in 1257, introduced a gold penny, equal in weight to two silver pennies, and in value to 20 silver pennies. This coin does not appear to have been a success, and no further attempt was made to establish a gold coinage until the reign of Edward III., who issued a gold florin, which was shortly superseded by the noble, a gold coin having a weight of 138·46 grains, and the value of 6s. 8d. in money of account. The standard of the noble was 19 parts of pure gold and 1 part alloy, and this was afterwards known as the old standard. The weight of the noble was reduced by subsequent kings, but the standard of fineness was maintained. The noble continued to be issued until the reign of Edward IV., when it was replaced by the rial, which weighed 120 grains and was valued at 10s., and the angel, which weighed 80 grains, and was valued at 6s. 8d. These

were both made of the old standard, which was afterwards sometimes called angel gold.

Henry VII. continued the issue of rials and angels, to which he added a new gold coin, the sovereign, 240 grains in weight and valued at £1. The silver penny had been gradually diminished in weight, and in the reign of Henry VII. was of 12 grains instead of 22½ grains. Henry VII. also introduced a silver shilling, and the reign of this king is noteworthy in the history of our coinage, as then for the first time the pound and the shilling became real instead of imaginary coins.

His successor, Henry VIII., also issued sovereigns, rials, and angels, to which, in 1526, a new coin was added, the gold crown, which was made of a new standard of fineness, and contained 22 parts of pure gold and 2 parts of alloy. This was known as crown gold or the new standard, in order to distinguish it from angel gold or the old standard. Crown gold, or, as it is sometimes called, 22-carat gold, is the standard of fineness used for British gold coins at the present time.

The first gold crown pieces issued weighed 57·36 grains, but this was considered too heavy, and, in 1544, the weight was reduced to 48 grains. In the latter part of the reign of Henry VIII. both the gold and silver coins were much depreciated in value, but they were restored to a satisfactory condition by Edward VI. and Queen Elizabeth. Edward VI. issued a silver crown for the first time, as previous to this the shilling had been the largest silver coin.

The coinage of rials ceased in the reign of James I., and of angels in the reign of Charles I., the last issue of the angel being in 1634; after this time the gold coins were sovereigns and crowns, both made of the new standard, or crown gold. By this time the sovereign had been reduced to a weight of 140·5 grains, and the crown to a weight of 35·12 grains of standard gold. Similar coins were issued by Charles II. on his succession, but in 1662, as the value of gold had risen considerably, they were both given up and replaced by a new coin, the guinea, which weighed 129·438 grains.

At its first issue the value of the guinea was fixed at £1 0s. 0d., but it rose in a short time to £1 1s. 0d., and frequently varied in value up to 1717, when it was definitely fixed at £1 1s. 0d.; the guinea remained of this value until 1817, when it was superseded by the new sovereign.

The value of the sovereign was fixed at £1 0s. 0d., and its weight at 123·274 grains, exactly $\frac{20}{21}$th parts of the value and weight of the guinea. It has never since been altered, and, having regard to the history of the subject, it would be most undesirable to make any change in British gold coinage in the future, either in standard of fineness or in weight relative to value.

As the value of the new gold unit, which it is proposed should be the unit of a decimal system of money, would be two-fifths the value of the present sovereign, its weight, as a coin, should be 123·27447 grains multiplied by two-fifths, or 49·30978 grains. This would be nearly the same as the weight of the gold crown of 1544, and having regard to the fact that the gold crown of Henry VIII. was the first coin for which the present standard of fineness was used, it would appear that the most

suitable name for the new unit would be "crown." To adopt this name would be following the same course as was taken in the case of the sovereign; that coin was introduced by Henry VII., replaced by the guinea in the reign of Charles II., and re-introduced by George III. Similarly, it would not be unreasonable that the gold crown, first issued in the reign of Henry VIII., and given up in the reign of Charles II., should be re-introduced by His Majesty King Edward VII. This coin would also recall another interesting historical fact. As the sovereign weighs 123·27447 grains and is made of 22 carat gold, it contains 113·0016 grains of pure gold. The proposed crown would therefore contain 45·2 grains of pure gold, which is the amount of gold that was contained in the gold penny of Henry I. The coin which, it is suggested, should be the principal unit of a decimal system of money, would thus be equal in weight of pure gold to the penny of 1257, and of the same standard of fineness, and almost of the same weight as the gold crown of 1544.

Adopting the gold crown as the unit of money of account, and dividing it into 100 pennies, the proposed decimal system may be represented as follows:—

This would be in accord with the usual system of decimal money, and would be much simpler than the system of pounds, florins, cents, and mils proposed by the Parliamentary Committee of 1853.

Although the unit of money account would be the gold crown, sovereigns would continue to be used without any difficulty, as one sovereign would be equal to two crowns and a-half, two sovereigns to five crowns, and so on. But it would be advisable to coin no more half-sovereigns, as the gold crown would be too nearly the same size; for this reason, too, the crown should have its value, "One Crown," clearly stamped upon it, so as to prevent the possibility of mistakes. It might be advantageous to issue notes of five and ten crowns, making these of smaller size than the £5 note.

All existing silver coins could continue to be used under the proposed decimal system, but it would be necessary to issue a tenpenny piece and a fivepenny piece. As the shilling is $\frac{1}{60}$th part of a troy pound of standard silver, the tenpenny piece should weigh, if made exactly in accordance with the present silver coinage, 69·818 grains. This is very nearly 70 grains, and it might be better to make the coin of the latter weight, as it would then be exactly $\frac{1}{100}$th of an avoirdupois pound, and could be used as a weight. This would appear reasonable, especially as the troy pound is no longer a legal weight. If the tenpenny piece were made 70 grains in weight, the fivepenny piece should be 35 grains, or $\frac{1}{200}$th of a pound.

No change would be required in bronze coinage, as the penny, half-penny, and farthing would continue in circulation.

The following Table shows the value of existing coins in the proposed decimal system, and the manner in which they would be written:—

Coins of Present System.	Value in Decimal System.	Written in Decimal System.
Sovereign	2½ crowns	C. 2·50
Half-sovereign	1¼ „	C. 1·25
Five Shilling Piece	60 pence	C. 0·60
Double Florin	50 „	C. 0·50
Half-crown	30 „	C. 0·30
Florin	25 „	C. 0·25
Shilling	12 „	C. 0·12
Sixpence	6 „	C. 0·06
Threepenny Piece	3 „	C. 0·03
Penny	1 penny	C. 0·01
Half-penny	½ „	C. 0·005 or 0·00½
Farthing	¼ „	C. 0·0025 or 0·00¼

It is proposed that the florin should be valued at 25 pence, so that it should be exactly equal to one quarter of a gold crown, and the double florin at 50 pence, so as to be equal to the half of a gold crown. The present weight of the florin is 174·545 grains. It would be desirable in future issues to increase this to 175 grains, so that the florin might be equal in weight to 2½ tenpenny pieces, or $\frac{1}{40}$th of a pound weight of silver.

No change would be required in bankers' weights for gold, as the 10-sovereign weight would be the weight of 25 crowns, the 20-sovereign weight that of 50 crowns, and so on.

Although the pound would no longer be used as the ordinary unit of money of account, it could still be used, if desired, in the statement of large sums, and, as I have explained, the sovereign, as a coin, would remain unaltered. The process of conversion from pounds to crowns, and *vice versâ*, would be very simple. To convert a sum of money expressed in pounds to the corresponding amount expressed in crowns, all that is necessary is to add an 0 and divide by 4; and to convert crowns to pounds it is only required to multiply by 4 and strike off the last figure. For example, £82,492 is equivalent in value to C.206,230.

The proposed unit would be convenient for the conversion of British money into the monetary systems of other nations. Taking, for example, some of the more important of these, we have the following equivalents:—

France	10 francs	equal to	1·00 crown
Germany	8 marks	„	0·99 „
India	6 rupees	„	1·00 „
Holland	5 florins	„	1·04 „
Russia	4 roubles	„	1·04 „
Japan	4 yen	„	1·00 „
United States	2 dollars	„	1·03 „
Portugal	2 milreis	„	1·00 „

Of course, the relative value of the different coins vary slightly as the rate of exchange alters, but the above Table will show that the proposed gold crown would be a very convenient unit for comparison with the monetary systems of other nations.

The principal objection to the proposed decimal system is that the value of the penny relatively to the gold unit is reduced by $\frac{1}{25}$th part, and this is undoubtedly a serious one, but it is, perhaps, not insuperable, and to introduce a decimal system without this small change would be very difficult. If, for example, the penny was maintained at its present value, and was taken as the lower unit of account, then the higher unit, equal to 100 pennies, would be $\frac{5}{12}$ths of £1, and would have no satisfactory relationship to the sovereign, as five units would be equal to £2 1s. 8d., and ten units to £4 3s. 4d. With such a system the sovereign would practically have to be given up, and this is inadmissible. The objections to such an arrangement would be far greater than to making the new unit equal to $\frac{4}{5}$ths of a sovereign, and dividing this into 100 pennies.

But if the very small reduction of the value of the penny which I have proposed is regarded as too serious to contemplate, then the only alternative that remains is to abandon the idea of introducing a decimal system of money into this country, and to adhere to the time-honoured British system of pounds, shillings, and pence. That this would be the course preferred by many people is probable, but it would be difficult to say whether they are in a majority. One thing is certain, and that is that a system of decimal money should not be introduced without a most careful consideration of the effect it would have on the commercial transactions of all classes of the nation.

NOTICES OF MAGAZINES.

BULLETIN DE LA PRESSE.

September 15th, 1908.

THE PRESENT STATE OF AERONAUTICS (*continued*).—The author discusses flying machines under the following heads:—(*c*). Helicopters *v.* Ornithopters. The conclusion arrived at is that the former offers great possibilities, and that the aeroplane of the future may consist of a combination of lifting screws and planes, such as has already been attempted by M. Bréquet. No solution of flying problems is to be looked for from a slavish imitation of bird flight, and the author draws attention to the fact that nature has provided no instance of rapid linear motion derived from a rotary impulse. It is by this means however that man has achieved such wonderful success.

Under (*d*), Gliding Balloons, the author describes in detail two types, viz., (1), the machines of Capazza—depending on the irregular lenselike shape of its envelope for gliding action, and (2), that of Malécot, who has combined a cylindrical balloon with an arrangement of planes inclined at will by means of a movable ballast car suspended below them. A feature of this type is the scope it provides for dropping explosives, etc., from the ballast car, without altering the stability of the machine.

INTERNATIONAL LAW.—From the Japanese of Professor Nagao Aviga.—An interesting and detailed study of the special phases of international law, which affected the Japanese in their recent campaign with Russia. The author points out the excellent opportunity Japan had of studying such questions, from her system of attaching "legal advisors" to the field armies. The chief points touched on are:—

(*a*). The status of non-combatant belligerents, especially with reference to the auxiliary transport corps, which was organized by Japan after the China war, so as to do away with the drawbacks of hired coolie transport. This corps was formed of conscripts who fell short of the physical standard required of the combatant troops, and consequently included all classes of society. The numbers employed in the war amounted to 110,000, and, although classed as non-combatants, they were armed with a short sword for purposes of defence.

(*b*). The right of non-combatants and auxiliaries to take up arms to defend a territory or post on the approach of the enemy. This is fully discussed and conclusions given.

(*c*). The treatment of prisoners of war. Their capture, removal from the theatre of war, and subsequent disposal and administration are fully treated.

The article ends by an interesting note illustrating the difficulties met with through the lack of any recognized manner of surrendering—a question it is naturally impossible to formally legislate for. The need of a system for dealing with large numbers of prisoners was also felt by the Japanese, and clearing units were formed after Mukden and the fall of Port Arthur to relieve the field armies of their care.

September 30th, 1908.

INTERNATIONAL LAW (*continued*).—Deals with the internment of prisoners of war in Japan; treatment of foreign officers, correspondents, etc., attached to the hostile army when captured; the Sanitary and Medical Services; the custody and burial of the dead (the Japanese dead were invariably cremated); and liberation on parole. Cases of the latter only occurred twice—the privilege being extended to the survivors of the *Varyag* and the officers of the Port Arthur garrison.

FRENCH GRAND MANŒUVRES, 1907 (with Plan of Manœuvre Area).—The manœuvres described took place between the XIIth and XVIIIth Army Corps in the department of Charente from 12th—14th September; Northern Sector, XIIth Corps; Southern Sector, XVIIIth Corps; each of two divisions and corps troops.

As an experiment the XVIIIth Corps was fed from a base at Bordeaux (100 kilomètres from manœuvre area) by means of two motor lorry convoys working on alternate days. Neither field bakeries nor supply columns accompanied the troops. Distribution was made to the regimental transport at specified "points of contact" in the manœuvre zone. Rest camps were established for footsore soldiers. Civil telegraphs only were used.

Directions to the umpires laid stress on the invisibility required of modern artillery, and also on the skirmishing formations for infantry at effective ranges. The functions of the cavalry seemed to be restricted to the *rôle* of covering the march of the army, no mention being made of their strategic use.—*To be continued.*

E.R.

JOURNAL DES SCIENCES MILITAIRES.

October 1st, 1908.

The article on machine guns is continued. During the last 25 years many attempts have been made to design a satisfactory weapon, but all designs of machine guns, having more than one barrel, failed both on account of their excessive weight and their complicated nature. First Maxim, and then Hotchkiss, invented single barrel guns, making use of the force of recoil and of the gas after explosion respectively. They also designed carriages which were not only steady, but light enough to go wherever a fully-equipped man could go.

The Maxim has been adopted by England, Germany, and Switzerland, but, as it does not work well with the French '86 rifle cartridge, the latter country has adopted the Hotchkiss. These two guns are described in detail.

The French experiences of "The use of automobiles from a military point of view" date from 1897, when a "Permanent Automobile Commission" was formed of officers of all arms. Automobiles were first used on manœuvres in 1900, when a Scott train and a number of wagons were used by the commissariat, and also a large number of light cars were experimented with for the rapid movements of generals. Both innovations proved very successful. In 1905 there appeared (1) a motor ambulance fitted for X-ray work; (2), a light high-powered car for accompanying cavalry reconnaissances; (3), a petrol-electric wagon with a two-wheel trailer attached carrying a search light. In 1906 motor wagons were used both for carrying drinking water and for dragging 4·7 guns. Experiments were also made with cars iron-clad all round.

In the 1907 manœuvres of the 18th Army Corps 40 motor wagons were successfully used to carry provisions every day from Bordeaux to the regimental transport wagons, but in this case the manœuvres were short, the motors new and in good repair, while the drivers were picked men, and the roads were good. In the same year three Renard trains were used in the 7th Corps manœuvres with satisfactory results.

In the 1908 trials of industrial vehicles, made in bad weather, 36 entered and 24 were placed—the failures being due to axles or wheels. The War Minister has decided not to buy wagons unless they have iron back wheels.

Several motor wagons have been sent to Morocco.

In the "Military Month" the manœuvres of 1908 are considered. An occasional lack of reality is excused on the plea that they are primarily intended as a school for the high command. Also the men lose interest unless they are allowed to fire some blank occasionally, and the public expects to see something; and as it is necessary to execute movements in a few hours, which in war would take days or weeks, it is impossible to carry out such instructions as entrenching every position occupied. In war this would only mean one or two positions a day at the outside, while on manœuvres ten or a dozen might have to be occupied.

October 15th, 1908.

The article on "The Use of Automobiles from the Military Point of View" is continued. The trials made by several Powers are summarized. Italy is specially interested on account of her lack of horses, and the first trials were made in 1876 with some English-built wagons, which were used for moving the heavy guns mounted at Spezzia. Further experiments were made from 1898—1901, but without much success. They were continued however, and in 1905, 30 light cars were successfully used at the manœuvres. Two 24-h.p. wagons tried the same year were not so satisfactory. Their speed and carrying capacity fell off very rapidly on steep slopes, and nothing definite has been decided about their use. Experiments were made in 1906 with a train something like

the Renard train, but driven by electricity, and according to the Press they were more than satisfactory.

In spite of her roads, which are few and bad, Japan has tried British, French, and American motors, and now wishes to build them herself. It is said that mechanical traction is to be installed in all the supply services.

Roumania and Russia used traction engines in 1877–8, and the latter Power used a Panhard train on the Renard system in Manchuria. Some Hanoverian motors sent out in 1905, were however of little use on account of the unfavourable country and roads.

Switzerland used motor wagons in the 1907 manœuvres, and Norway has also tried motor traction for guns.

In a further instalment of "Considerations on the Russo-Japanese War" the infantry tactics are considered. The continuous Japanese success is ascribed to the way in which the infantry advanced, never yielding an inch of ground once gained, and intent only on achieving its object.

The infantry weapons of both armies are described. The moral effect of the machine gun is said to be due to its even, steady rattle in the midst of the uneven roar of the fight.

The Japanese carried from 170 to 200 cartridges on going into action, although as early as the summer of 1904 both sides were trying to design equipment for carrying 200–250 cartridges.

The Russians generally fired volleys, which suited their national character better than the individual fire practised by the Japanese. The fire of the latter became much fiercer when the objective could be clearly seen.

The Russians opened fire at 1,500 to 2,000 mètres range when on the defensive, but occasionally would allow the enemy to come within 400—500 yards before firing on him.

A description of the attack of the Japanese 3rd and 5th Divisions at Liao-yang is given.

The typical Russian attack was in a very deep column, so that very few of the men could use their rifles. The Russians also kept far larger reserves than the Japanese.

Other articles appear on the "Marriage of Officers," urging the removal of the present restrictions; "The Commissariat in the Field"; and "Corollaries essential to the Two Years' Law."

H. L. WOODHOUSE.

RIVISTA DI ARTIGLIERIA E GENIO.

July—August, 1908.

PERMANENT MODERN FORTIFICATION, by V. Deguise, Major of Engineers, Professor of Fortification at the School of Artillery and Engineers. Brussels. 8vo. 238 pages with 14 plates.—This volume of

more than 200 pages, with its elegant style, neatness of type, and fine atlas, is the work of a clear and lucid writer, and omits nothing that relates to the construction of modern permanent fortification. The author begins by examining scientifically the conditions requiring such obstacles as the typical and traditional ditches, and the particulars of structure of the escarp and counterscarp, and ends by a criticism on such accessories as barbed-wire entanglements and the like.

The tracing of both works and flanking defences, and the fundamental elements of fortification, are considered with complete and minute analysis, clearly showing the enormous difficulties to be overcome and the great expense attending the concealment of the caponiers—isolated or joined, of cement or metal—which, in the evolution of the art of defence, have taken the place of the retired flanks of the Italian system.

The author lays stress on the fundamental elements of the principal lines of defence, especially on the distance of the lines from the inhabited nucleus, and, by a reasonable analysis of the range of modern siege guns, he places this distance at about 7 kilomètres.

He condemns the system of frontal armoured forts, and pronounces in favour of a system which consists in separating the works to which the distant defences are entrusted, from those required for the near defences. With this idea he attributes to the surrounding forts the exclusive character of points of assistance to the lines of defence, arranging behind these lines the armoured batteries for distant action.

After noticing the quick-firing weapons of the present day, as constituting the effective means possessed by the defenders for repelling the enemy's attacks, he condemns the exclusive reliance on mechanical forts, and disagrees with those who, relying upon the deadly effect of quick-firing guns, believe that the action of the infantry can be disregarded.

All the more vital questions reflecting on the arrangement of the surrounding forts are treated in a wide and comprehensive manner, and with careful study of technical particulars. The tracing and the development of the lines of fire; the profiles, obstacles, and flanking defences; frontal action at great distances; the action of small arms in the middle and near zone; the action on the intervals of ground in front of the collateral forts; the concealment of observations; the illumination of the ground; the arrangements for the recruiting of the garrison and the artillery magazines; the galleries of communication,—all these details are specially examined, and light is thrown on many controversial questions.

In fortification nothing is absolute, this essentially practical art being, as Vauban said, "*founded exclusively on common sense and experience.*" No regular law can be laid down to assure the flanking of the intervals. Without excluding the employment of protected artillery for this purpose, it would seem that by entrusting the defence of the intervals to guns installed in pits (which may at the same time constitute the principal armament of the works), the character of simplicity is often better maintained, and this is in many ways advantageous.

These guns, placed in gunpits, have a field of fire horizontally in every

direction, and have all the advantages of securing frontal and lateral action, that is to say they meet all the requirements of the defence without having recourse to the complicated flanking defences.

For the illumination of the ground, the author prefers movable apparatus placed outside the forts, to fixed apparatus posted at the culminating points of the forts and protected by rotating shields, his preference being due to the result of experiments.

While attributing the greatest importance to the illumination of the ground both in the intervals and in front of the forts, the author insists on the employment of flanking search lights which should be entirely concealed from view and protected from the enemy's fire. The observatories placed in selected positions should serve to direct the luminous rays of the search lights on the spots where fire should be concentrated. The zone of clearance should be designated, not from the search-light stations, but from the observatories, which, by means of optical signalling concealed from the enemy by an ingenious apparatus, maintain constant communication with these stations.

The places of recovery for the troops should, according to the author, be sufficiently numerous to locate all those constituting the garrison of the fort. The places allotted for the artillery service should comprise the magazines for loose powder, as well as those for charged cartridges and those for empty projectiles. In addition there should be laboratories, artificers' workshops, etc.

The considerations for and against the use of various kinds of magazines for black powder, powerful explosives, charged shells, etc., are fully treated.

With regard to the storing of prepared ammunition, there seems to be no doubt that the cartridges should be stored in imperviable magazines similar to those used for loose powder. The projectiles charged with black powder should however be distinguished from those containing high explosives. The former cannot be kept for very long owing to waste, and the absorption of moisture; the latter should be kept in proper laboratories specially devised in accordance with the latest methods, and by this means they can be kept in good condition for years.

In addition to the above, two further points are worthy of note, viz., the question of transportable shields for the guns and the organization of a second line, behind the principal lines of defence.

The military engineer in studying a defensive problem should have the feelings of the artist in making his plans to conform with the nature of the ground. Also the ground suitable for fortifications and the defensive dispositions of the military engineer, should always be considered with reference to the defensive requirements. This work by Major Deguise represents the scientific conditions and the best theories of modern fortification, and there can be no doubt that the same spirit of progress and the same precepts of modern requirements, should act as a guide to the studies and works of the future.

FIRING AGAINST BALLOONS.—The *France Militaire* of the 25th July states that as the natural consequence of the recent progress in aerostatics

much attention is being paid in the German polygonal areas to the exercise of firing against balloons. It would seem that the results obtained from the fire are satisfactory both by day and by night.

The spherical balloons are towed in pairs, and can vary continually their height and velocity. At 2,000 or 3,000 mètres an aeronaut can clearly discern a column on the march or the interior of an encampment, and he would possibly be able to approach an enemy secure from artillery fire, which could not be opened without danger to its own troops.

The Germans have experimented against balloons with fire from mitrailleuses, but the adjustment of the fire so as to cause damage to the aerostat would require the expenditure of an enormous number of cartridges. Moreover a slight change of position of the balloon would require a new adjustment and a new waste of ammunition, so that it is found that the fire from mitrailleuses is only efficacious when the distance is absolutely exact.

Its use has certain advantages, as the mitrailleuse can be carried in an automobile and can assume almost any inclination. However, owing to its insufficient range, the fire of artillery against balloons will always be preferred, as the projectiles leave a visible trace which allows for the regulation and correction of the fire.

TRIALS WITH AEROSTATS.—The same journal states that during the autumn manœuvres this year several trials will be made in Germany with free balloons, and with the new military dirigible. The latter is considered of special importance. It is intended to prove that these balloons are useful not only for exploration purposes, but also offensively for observations of long duration. In the coming year the strength of the balloon battalion will be augmented.

At the next great manœuvres experiments will also be made with telephotography, radiotelegraphy, and electric search lights. Automobiles will be used on a large scale.

JAPANESE ARTILLERY IN 1908.—*Factories.*—The most important factories are the arsenals of Tokio and Osaka. The former arsenal manufactures rifles, bayonets, cartridges (10,000 a day), bicycles, tools, etc. The powder manufactories at Itabashi and Meguro manufacture cordite, and also an explosive powder similar to that used by the French. The arsenal at Osaka constructs cannon, artillery ammunition, and gun carriages.

Hand Grenades.—The Japanese have perfected this weapon which was found so useful in the last campaign. The last model is formed of an iron tube about 15 cm. in length containing 90 g. of explosive. It is joined to a wooden handle and can easily be thrown.

EDWARD T. THACKERAY.

CORRESPONDENCE.

TERRITORIAL FIELD COMPANIES, R.E.

DEAR SIR,

The command of the 2nd (Field) Company, R.E. (Territorials), 1st London Division, has recently been given to me, and I am beginning to keenly appreciate some of the many difficulties which confront the commanding officer of a Territorial field company.

There is first of all the difficulty in getting adequate training oneself owing to the many business matters one has to attend to daily. The same difficulty also applies to the other officers of the company, and, perhaps, to a lesser extent to the men.

Another great difficulty is to attract officers and men to the company who, in their civil life, have the right sort of experience.

Then there is the question of how to make the best use of the limited time at our disposal, for both the training of ourselves and of the men, and it has occurred to me that you might be willing to encourage correspondence on some of these subjects in your *Journal*, and can, perhaps, obtain articles from regular R.E. officers as to how they would deal with the various problems which confront us.

Under the scheme for the training of the Territorial Force we are supposed to obtain perhaps six months' training after mobilization before taking part in any actual fighting. Probably some of the R.E. officers could give us some very useful hints as to the best method of using such time, and I think it would prove very useful if some outline scheme could be prepared beforehand, with the object of making the best possible use of whatever time really proved available for training after mobilization.

One thing is almost self-evident, and that is that the Territorial Engineers can never even nearly approach to the ideal as suggested in the article by Capt. E. E. B. Wilson, D.S.O., R.E., in the "Field Engineers of Our Next War," published in the August *Journal* of 1907. For this reason the commanding officers of all other units should be very strongly encouraged to train their men in elementary engineering of field-works, bridging, water supply, and field kitchens, etc.

We have recently completed our first training under the new scheme, and in my experience with the Engineers, dating back to 1900, I have never known the men work as willingly or as well as they did this year during our camp. We had every N.C.O. of the company at the training, and most of them for the fortnight, and, altogether, nearly 190 officers, N.C.O.'s, and men.

Suggestions by experienced officers as to the number of skilled men required in a field company would be very useful, as, I take it, the problem we have to face is not quite the same as in a regular field company, where men are required to do a lot of maintenance works to barracks, etc. For instance, how many carpenters, blacksmiths, bricklayers, masons, fitters, engine drivers, electricians, etc., etc., ought we to endeavour to get in each company?

As a subscriber of some years standing to the *R.E. Journal*, I shall feel deeply obliged for any assistance given through its medium, and I have very little doubt that my gratitude will be shared by every commanding officer of a Territorial field company.

Yours truly,

JOHN H. ROBINSON,

Capt., R.E. (T.).

The Editor, *R.E. Journal*.

RECENT PUBLICATIONS OF MILITARY INTEREST.

OCTOBER, 1908.

(*Published Quarterly*).

THE following extracts from the list compiled by the General Staff, War Office, are published in the *R.E. Journal* by permission of the Army Council.

HISTORICAL.

DUPLEIX AND THE DEFENCE OF PONDICHERRY (1748) (Dupleix et la défense de Pondichéry (1748)). By Marquis de Nazelle. 470 pp. 8vo. Paris, 1908. Librairie Honoré Champion, 5 Quai Malaquais. 6s. 8d.

This work, compiled to a great extent from hitherto unpublished documents, and from the archives of the Dupleix family, gives us a clear picture of the energy and ability of our great opponent in India, showing the difficulties with which he had to deal and the apathy of the French Government at that time. In the middle of the 18th century, of course, the struggle between French and English in India was in full swing, and victory seemed likely to incline to the side of our opponents.

THE SEVEN YEARS' WAR; A DIPLOMATIC AND MILITARY HISTORY. VOLUMES II., III., and IV. (La guerre de sept ans; histoire diplomatique et militaire. Tomes II., III., et IV.). By M. Richard Waddington. Volume II., 500 pp., with 7 maps. Volume III., 550 pp., with 6 maps. Volume IV., 640 pp., with 8 maps. 8vo. Paris, 1908. Firmin-Didot. 6s. per volume.

This is an admirable history of an interesting and engrossing war, which owes its great hold on our imagination to the brilliant exploits in which it abounds, as well as to the immense importance of the issues which were at stake. Simultaneously with the great war being waged in Central Europe, Great Britain and France were fighting for the sovereignty of two vast continents, India and North America. The prize of the struggle was a great Colonial Empire, which fell to the lot of Great Britain, whose success was, as Englishmen believe, in a very considerable measure due to the genius of one man, William Pitt.

M. Waddington does not altogether agree with this opinion. He considers it difficult for a foreigner to understand Pitt's extraordinary renown, which existed during his lifetime and has not been dimmed in the course of a century and a-half. Whilst acknowledging that he was gifted with foresight, clearness of vision, and firmness, M. Waddington goes on to enumerate various defects in his character, which appear to deprive him of the right to lay claim to a place among the great statesmen of history. M. Waddington, in fact, looks upon Pitt as a typical Englishman of the period, possessing indeed the virtues of his countrymen in a high degree, but also, to an equally great extent, their faults and shortcomings.

BONAPARTE AND THE CONSULATE. By A. C. Thibaudeau. Translated and edited by G. K. Fortescue, LL.D. 314 pp. 8vo. London, 1908. Methuen. 10s. 6d.

Thibaudeau's "Mémoires sur le Consulat," of which this is an excellent translation, has become so rare that this interesting work will be of special value to the student of Napoleon as a statesman. It gives a chronological table of events from November, 1799, to May, 1804, and deals fully with the period between February, 1800, when Bonaparte, as first Consul, took up his residence in the Tuileries, and 1804, when the Empire was founded.

The work consists largely of records of discussions in the Council of State, and of private conversations between the first Consul and various Councillors, all of which show clearly the foresight and genius of Napoleon in the compilation of the Code Napoleon and Consular Constitution. The Editor, in a preliminary note, gives a clear and full outline of the Constitution of 1799, and the ample notes throughout the book give useful and interesting information.

An index makes reference easy.

This work does not however contain much of interest to the student in search of military information alone.

MEMOIRS OF THE WARS OF NAPOLEON, 1806–1813 (Mémoires sur les guerres de Napoléon, 1806–1813). By General Désiré Chlapowski, Baron of the Empire (published by his sons). 370 pp. 8vo. Paris, 1908. Librairie Plon. 2s. 6d.

General Chlapowski was a Polish officer who served with considerable distinction under Napoleon, and became A.D.C. to the Emperor.

These memoirs acquire additional interest from the fact that the author was not a Frenchman, nor even very friendly to France; he served in the French Army merely because he hoped that Napoleon would effect the liberation of Poland from foreign domination. When the Emperor showed his readiness to abandon the cause of Poland, Chlapowski at once sent in his resignation and left the army. The memoirs, though written by an officer of the French Army, do not therefore show the extreme bias and partiality which so often detract from the value of such writings.

MEMOIRS OF GENERAL BENNIGSEN. VOLUME III. (Mémoires du général Bennigsen, Tome III.). By Capt. E. Cazalas, French General Staff, under the auspices of the historical section of the French General Staff. 470 pp., with 4 maps. 8vo. Paris, 1908. Lavauzelle. 8s.

The first two volumes of General Bennigsen's memoirs, translated and published by Capt. Cazalas, were highly appreciated. The value of the third volume is perhaps even greater owing to the fact that it deals with the important campaigns of 1812 and 1813.

General Bennigsen does not, in his letters, confine himself to a mere narrative of events; he indulges in frequent and able criticisms, and his remarks on the campaign of 1812 are of particular value and importance, as he does not spare either Napoleon, Alexander I., or the Russian leaders.

Among the appendices is an account of the assassination of the Czar Paul, and a biography of a number of Russian generals, containing most interesting details.

The maps accompanying the volume are good and accurate.

THE LEIPZIG CAMPAIGN, 1813. (Special Campaign Series). By Colonel F. N. Maude, C.B. 270 pp., with maps. 8vo. London, 1908. Swan Sonnenschein. 5s.

This volume, which is No. 7 of the Special Campaign Series, opens with an account of the condition and evolution of the Prussian and French Armies respectively, in which

Colonel Maude traces the causes of the decline of the Prussian Army from the model of Frederick the Great. His chapter on the French Army is more a review of the Napoleonic methods than of the French Army as such.

Two chapters are then devoted to the prologue of the war and to the operations up to, and including, the Battle of Lützen. The next chapter deals with the operations up to the armistice, including the Battle of Bautzen. The author, in common with many authorities, blames Ney largely for the indecisive result of that battle.

The remainder of the book deals with the operations of the Autumn Campaign, culminating in the Battle of Leipzig.

The book is a strategical study only, for within the limits of 270 pages of tolerably large print it would be impossible to deal with the tactical side of a campaign which included so many engagements and battles.

Colonel Maude's conclusions, and the arguments which lead to those conclusions, can by no means always be accepted, but if the reader is content to study the account of the operations and deduce therefrom his own lessons, then the book can be thoroughly recommended, for the account of the operations is clear and the maps fairly good, though a certain number of places mentioned in the narrative cannot be found on them.

Colonel Maude uses the book as a vehicle to expound some of his pet theories, especially those of psychic force and of will power, with which readers of *War and the World's Life* will be familiar.

THE CAMPAIGN OF 1815, CHIEFLY IN FLANDERS. By Lieut.-Colonel W. H. James. 331 pp., with maps. 8vo. London, 1908. Blackwood. 16s.

Colonel James in the preface gives as the object of his book "to investigate these charges (*i.e.*, those made by German writers against the Duke and in depreciation of the part taken by the British troops), and to determine certain other questions, such as the reasons for the delay in issuing the orders for the concentration of the Anglo-Allied army, the instructions given by Napoleon to Ney on the 15th June, the cause of the Prussian hesitation on the 18th, and the formation of the Imperial Guard in its last attack."

Regarding the first point, Colonel James blames the Prussians, and especially Gneisenau, for failing to give Wellington any information as to the results of the French advance against them on the 15th. Wellington, we believe, did not blame anybody, but says "that there was certainly something out of order in the communication between the two armies in the middle of June." Colonel James also blames Dörnberg, but praises Constant and Perponcher for their action.

Colonel James also blames Gneisenau for the events of the 16th. It is stated that Gneisenau selected the ground for the Battle of Ligny himself, and that consequently he is to blame for the Prussian defeat; also that it was owing to bad staff arrangements that Bülow did not reach the battlefield.

Gneisenau again is called to task for the staff arrangements on the 18th, when the author considers that he committed an error in sending Bülow to lead the advance against the French right flank, and also in the general arrangements for the marches of the various corps. Colonel James is convinced that Blücher, thoroughly loyal to the Duke, was ignorant of the details of the arrangements made by the chief of his staff.

The account of Waterloo itself is very clear, and the comments and arguments at the end of the account are worth reading. In these Colonel James blames Napoleon and Ney for their inactivity on the 17th, and Napoleon for not using his cavalry sufficiently, while he comments on the bad staff arrangements of all three armies.

Generally the book has much to recommend it. It is written in a clear straightforward style and the operations can therefore be easily understood. It cannot be said that Colonel James brings out very much new about a campaign respecting which so much has already been written, but he would seem to have attained the object set forth in his preface. The maps are excellent. It is to be wished that the price had not been so excessive.

THE CANADIAN MILITIA. By Capt. E. J. Chambers. 125 pp., illustrated. 4to. Montreal, 1907. L. M. Fresco. 20s.

The book traces the development of the military forces of Canada from their earliest days, and records the successive changes which have taken place from time to time in their organization and administration; at the same time the different campaigns in which the forces have taken part are briefly referred to. The author commences by describing the Militia system under the French *régime*, and then goes on to show how it was reconstituted under British rule, which dates from the capitulation of Montreal in September, 1760. The various changes in the constitution and organization of the Militia in the succeeding years are then recorded, and it is shown how the confederation of the different provinces, the grant of self-government, the Trent affair, and the part taken in different campaigns have gradually raised the Canadian forces from the level of a mere auxiliary to the regular army to the status of a powerful unit of the Imperial forces. The book concludes by giving a short account of recent developments in the Canadian Militia, and a brief description of the Department of Public Works, in so far as it is responsible for the provision of magazines, armouries, etc., for the military forces.

THE FIRST ENGLISH CONQUEST OF CANADA. By Henry Kirke, M.A., B.C.L., F.R.G.S. 224 pp., illustrated. 8vo. 2nd edition. London, 1908. Sampson Low, Marston. 3s. 6d.

The author commences with an account of the causes which led up to the war with France of 1626–29, and then goes on to describe the growth of the commercial spirit in England and the various expeditions to North America by merchant adventurers. The capture of Quebec by Sir David Kirke and his brothers in 1629, as well as the circumstances under which it was handed back to the French in 1632, is then recorded. The author at this point describes the discovery of Newfoundland and the various attempts to establish a settlement there. He concludes with a short account of the first settlement in Nova Scotia, and shows how the interests of the early settlers were entirely ignored in the treaties contracted between England and France.

MONOGRAPHS IN MILITARY HISTORY (Kriegsgeschichtliche Einzelschriften). Issued by the Historical Section of the Great General Staff. Series 41/42. Experiences of Modern Wars outside Europe. The Russo-Japanese War, 1904–5. Wa-fang-kou and preliminaries to Liao-yang. With 5 panorama sketches and 2 appendices; 11 lithographed maps in separate case. 8vo. Berlin, 1908. Mittler. 5s. 2d. with maps.

This is the third series of monographs on the Manchurian War issued by the Great General Staff in Berlin.

The first section deals with the movements of the opposing forces in June, 1904, and contains descriptions of the Battle of Wa-fang-kou and the action of Hsiu-yen (German rendering is Siu-yang).

The second section deals with the operations of the IInd and IVth Armies up to the end of July, 1904.

The third section treats of the events in the eastern portion of the theatre of war up to the beginning of August, 1904.

Section IV. contains a brief survey of the situation at the commencement of the fighting round Liao-yang.

Section V. deals with the fighting on the east of Liao-yang, August 26th to 28th.

Section VI. deals with the operations on the south side during the same period.

The narrative throughout is most clear and the maps are excellent. English students will however be puzzled by the different transliterations. The use of maps issued with reports of British attachés will consequently be found of great assistance.

The comments of the German General Staff on the operations under review are as follows :—

The Russians during the period succeeding the fighting at the Yalu and at Nanshan were reaping the fruits of their previous omissions. They had neglected to oppose the Japanese landings, had faced Kuroki with insufficient forces, and had allowed Port Arthur to be cut off. The necessity of attempting to raise the siege of this fortress from the land side placed them in a difficult position. Every advance southward from Ta-shih-chiao exposed their communications to interruption by Kuroki or by further Japanese landings on the shores of Liao-tung, thus proving the influence that sea-power exercises on military operations near a coast line. As things stood, Kuroki must be crushed before Stakelberg's southward move could have any decisive results. An offensive movement eastward had, at that time, every prospect of success. In hill warfare the offensive has many advantages, as was shown by the advance of the Ist Japanese Army in July and August. The Russian forces available in May were however somewhat inadequate for such an enterprise. In the absence of a move against Kuroki, Stakelberg's advance must either be a half measure or if made in strength a great piece of temerity.

The operations under consideration illustrate the dependence of strategy upon the configuration of the theatre of operations. Acting on interior lines according to approved principles was impossible for the Russians, whose rear was never free. The above must be taken into account in order rightly to appreciate the Russian conduct of the war.

Nevertheless, the movement on Wa-fang-kou had some prospect of success. Approximately equal forces contended for victory which for some time hung in the balance. Better tactical training on the Russian side and the timely arrival of the fresh troops *en route* might have given them the victory. Stakelberg was justified in waiting for reinforcements before pushing forward, but the disastrous effect of the half measures which Kuropatkin and his subordinates favoured is clearly demonstrated.

The Russians covered their retreats with praiseworthy skill, and the practicability of such operations in present-day warfare as demonstrated in this campaign deserves to be noted. Adopted by them with a purely defensive purpose, manœuvres of this nature may become necessary even though an offensive strategy be contemplated.

If Kuropatkin's intention was not to accept a serious battle except at Liao-yang, maintenance of touch with the enemy on both fronts (south and east) was imperative, and such touch could only be maintained by some offensive movements in the mountainous eastern region. No necessity existed however for exposing the advanced detachments to defeat in detail in prepared positions. The independent larger cavalry units, reinforced by cavalry with army corps and by some of the numerous (regimental) mounted scout detachments, should have formed the foremost line, supported by infantry bodies thrown forward.

The attraction of the prepared position of Liao-yang appears to have dominated the strategy of the Russian generalissimo. In August several opportunities for successful strokes—especially against Kuroki—presented themselves.

The exggerated idea of the Japanese strength which prevailed at Russian headquarters, which had its origin in the division of the Japanese forces into "armies," had some influence on Kuropatkin's attitude.

The Japanese had to secure what was already gained. Safe bases on the Manchurian mainland were indispensable, and considerations of foreign loans imposed additional caution. Moreover, the rains, which principally affected offensive operations, greatly retarded their movements.

The IInd and IVth Armies showed more energy than did the Ist Army. Transport and supply difficulties delayed the mobilization of the active troops remaining in Japan, and as the passive attitude of the Russians could not be foreseen, the Japanese position during this period was actually one of great risk.

MONOGRAPHS IN MILITARY HISTORY (Kriegsgeschichtliche Einzelschriften). Issued by the Historical Section of the Great General Staff. Series 43/44. Experiences of Modern Wars outside Europe. The Russo-Japanese War, 1904-05.—BATTLE OF LIAO-YANG. 127 pp.,

10 appendices. Separate case containing 10 lithographed maps. 8vo. Berlin, 1908. Mittler. 4s. 6d. with maps.

This work is divided into six sections.

Section 1 deals with the preparations for the battle. The Russian position and the distribution of troops along it are described in detail. The Japanese dispositions are also given.

Section 2 deals with the fighting on the Russian right, August 30th—31st.

Section 3 deals with the fighting around the position Tsao-fan-tun (German rendering Zo-Fan-Tun), Ku-cheng-tzu (German rendering Kau-Tschin-Tsy), which was attacked by the Japanese Guard and 10th Divisions on August 30th—31st.

In Section 4 the fighting of the 1st Japanese Army on the right bank of the Tai-tzu-Ho on September 1st is described.

Section 5 deals with the Japanese attacks on the Liao-yang defences, September 1st—3rd.

The 6th Section is devoted to a description of the Russian retreat.

In conclusion, criticisms on the strategy and tactics of both sides are offered, the gist of which is as follows:—

The decision of Kuropatkin to accept battle was justified, but not so his dispositions. His position was liable to be turned on both flanks. Infinitely greater liberty of action would have been gained by transporting the extensive war material which was stored at Liao-yang to the north betimes, thus rendering the possession of Liao-yang city a matter of minor importance. Colonel Gädke, the well-known war correspondent of the *Berliner Tageblatt*, disagrees with this criticism on the ground that the moral effect of abandoning a carefully prepared position without fighting would have been as bad as that of a lost battle. The authors proceed to point out that the holding of Liao-yang position was an evil, in that it enabled the Japanese to concentrate their main forces against Liao-yang itself, leaving only detachments to watch the Tai-tzu-Ho, since a formidable counter-attack across that river was not to be apprehended. Such a movement was indeed impossible for the Russians; if made in considerable force below (west of) Liao-yang it exposed their army to disaster in case of failure; if made with small numbers it would have produced little effect. Upstream of Liao-yang great difficulties of ground presented themselves. Considering the above factors, it would have been better to concentrate the main force around Lotatai (some 8 miles N.E. of Liao-yang) in readiness to attack the enemy when he crossed the Tai-tzu. A measured resistance on this river would have exhausted the assailants prematurely. Here, again, Colonel Gädke joins issue with the Great General Staff. The cautious Japanese, says he, would in such a case have merely pushed a weak advanced guard across the Tai-tzu to construct a bridge-head at Hsin-cheng (N.E. of Liao-yang), the rest of the army remaining south of the Tai-tzu, whilst a renewed forward movement was being planned. The Lotatai position, too, would have been susceptible to a turning movement, as are, in fact, all positions. In the opinion of the authors, Kuropatkin should, assuming the necessity of defending the position actually chosen, have provided for an active defensive instead of guarding his flanks and rear with disproportionately large forces. The reserves were frittered away in reinforcing his passively defensive line of battle by driblets, instead of acting offensively against the enemy's flanks. The absence of offensive spirit was likewise noticeable amongst subordinate Russian commanders. When Kuropatkin finally decided upon attacking, two courses are considered to have been open to him—

1. To attack the exhausted enemy on the South bank of the Tai-tzu with his main force whilst warding off attacks from the North bank.
2. To fall with all available forces upon that portion of Kuroki's army which had crossed the Tai-tzu whilst holding the bridge-head at Liao-yang.

(1) Promised the greater results in case of success, but failure would have meant disaster. The plan adopted was akin to (2), and whilst promising less decisive results, kept a secure line of retreat open. In executing his plans Kuropatkin is held to have handicapped himself by opposing to Kuroki's force troops exhausted by previous fighting

The authors declare that on September 3rd there was still a chance of success for the Russians—a firm will was however required. The dispositions for retreat are praised, but their successful execution is ascribed largely to the exhaustion of the Japanese. The latter are considered to have entered upon the battle in an unfavourable position owing to the concentric movements by which their armies had pursued the retreating Russian detachments, whom they vainly endeavoured to destroy piecemeal. Nothing except a frontal attack remained, since extensive movements to a flank were impossible so close to the hostile positions. It is questioned whether attempts at strategical outflanking movements would have been feasible or advisable before the commencement of the advance on Liao-yang. Such manœuvres would have entailed changes of communications which were more or less precluded by the mountains, and by the fact that their adoption would have debarred the Japanese from utilizing the Ying-kou branch railway. Regarding the battle, Nozu's failure to force the hostile centre is held to illustrate the difficulties of "wedge" attacks under modern conditions. Kuroki's employment of the Guard is criticized, but the tenacity with which he maintained the fight north of the Tai-tzu is appreciated.

Oyama's decision to keep back one and a-half divisions of the 1st Army when this army attacked the south bank of the Tai-tzu with the idea of using them to molest the Russian retreat is found fault with. In view of his numerical inferiority, all available forces should have been employed. The zone of the 1st Army should have been prolonged westward, and other portions of the Japanese line correspondingly altered, the 4th Division attempting to envelop the Russian right.

The necessity of an attack against the south of Liao-yang after the 1st Army had fought in vain for two days is doubted. A concentric attack from both banks of the Tai-tzu by the 1st and IVth Armies would have obliged the Russians to face Kuroki with weaker forces. Meanwhile the IInd Army should have guarded against a Russian eruption southward from the Liao-yang defences and secured the flank of the IVth Army.

Officers studying these maps will find British official maps of great use in helping to identify places, since the German spelling of Chinese names differs greatly from ours.

POLITICAL.

INDIA. PARLIAMENTARY BLUE BOOK, CD. 4201. Papers regarding:—I. Orakzais. II. Zakka Khel Afridis. III. Mohmands. 1908. 168 pp. 4to. 1s. 6d.

Part I. deals with the request of certain Orakzai clans to be taken under British administration. A despatch from the Government of India sets forth the reasons for and against such an extension of our responsibilities as would be involved. A similar case in 1894 is quoted; and in conclusion the Secretary of State declares that H.M. Government adhere to the policy of non-interference laid down in 1898, and therefore decline to accede to this request.

Part II. begins with the settlement effected with the Khyber Pass Afridis in 1898: relates the various offences committed by the Zakka Khel. The Government of India advocate permanent occupation of the Bazar Valley, and ask sanction for an expedition for the purpose. The Secretary of State objects to a policy of occupation, and only sanctions the expedition, subject to a time limitation, and no occupation or annexation. Then follows the correspondence regarding the formation of the force, and the operations, and the Political Report on the expedition.

Part III. begins with the relations entered into with the Mohmands in 1896, as a result of the Durand Agreement. Then follow the events of April, 1908, which led up to the recent expedition; the serious situation in the Khyber at the beginning of May, the incursion by Afghans, and their dispersal; the formation of the Mohmand Field Force, its operations, and their successful conclusion.

NAVAL.

THE NAVAL ANNUAL, 1908. By T. Brassey, A.I.N.A. 437 pp., with numerous plates and diagrams. 8vo. Portsmouth, 1908. Griffin. 10s. 6d.

This year the *Naval Annual* is divided into four parts.

Part I. contains a review of last year's work in British and Foreign Navies, with comparative strength and tables; and chapters on Foreign Naval Manœuvres, the armoured cruiser question, Marine Turbines, the *personnel* of the French Navy, the second Peace Conference and Naval Interests, the share of the Fleet in the defence of the Empire, and the Naval and Maritime Industries of Italy.

Part II., as before, contains lists of British and foreign ships, with plans.

Part III. contains Armour and Ordnance Tables.

Part IV. contains the First Lord's Statement, the Navy Estimates, programme of ship building, and returns of gunlayers' tests and battle practice; the Navy Estimates of Austria-Hungary, France, Germany, Italy, Russia, and the United States; and Sir E. Gray's Instructions with Sir E. Fry's Report on the Hague Conference.

Among the contributors are Admiral Sir Cyprian Bridge, Sir F. Pollock, and Mr. J. Leyland, and among these the attention of soldiers is specially drawn to Admiral Bridge's article on the share of the Fleet in the Defence of the Empire.

The volume fully sustains the high standard of its predecessors.

STRATEGICAL AND TACTICAL.

TACTICS (Taktik). Vol. I. By von Balck. 4th edition. 420 pp., with numerous plates and diagrams, and an index. 8vo. Berlin, 1908. Eisenschmidt. 8s. 6d.

The author's views are founded avowedly on the German regulations, but the latter are compared at every step with those of other countries, especially of Russia and Japan.

The first chapters deal with minor tactics, equipment, and the effect of firearms, with comparative tables from various countries. The remainder consists of tactical treatises, similar to those in von Löbell's Jahresberichte for 1907, the resemblance of language in many cases suggesting a common authorship.

The following is a summary of the author's views on some of the points touched upon.

The moral endurance of troops has diminished. Losses of one-third, or even one-fourth, will no longer be endured. The close fighting, which formerly resulted in such heavy losses, has grown rarer. But individual units may be exposed to losses quite as severe as in former wars.

Formation in depth is still indispensable, and increases in proportion with the numbers engaged.

The average number of rifles required per 1,100 yards of front are estimated at:—For passive defence, 820 rifles, or ·8 rifle per mètre. For active defence, allowing for 20 per cent. casualties and a reserve of one-third, 2,400 rifles, or 2·4 rifles per mètre. For the attack, allowing for 50 per cent. casualties and a reserve of 2,000, 4,200 rifles, or 4·2 rifles per mètre (pp. 203, 204).

Close reconnaissance on the battlefield is indispensable to avoid the danger of surprise by fire at close ranges; reconnaissance in force will often be necessary. The formation of special units for the work of reconnaissance is suggested.

Machine guns are essentially a reserve of fire; it is a waste of their mobility to commit them to prolonged fire fighting. In the attack they may be pushed forward at the outset, and subsequently withdrawn. In the defence their normal position is with the reserve, whence they may be detached to threatened points. The fire of a machine gun is equal to 50—60 rifles.

The advance of infantry through their own artillery should take place at successive points, so as not to interrupt the fire too long in any one portion. Infantry must study the formations which make ranging most difficult for the enemy's guns. Small columns,

on a narrow front, with wide intervals, are the best. (Diagrams pp. 275, 277). The attack of shielded artillery by infantry fire will seldom be worth attempting.

The battle of encounter being in the nature of a surprise, the commander must at once seek to gain the initiative by offensive action. *In every battle of encounter* after the first contact a pause ensues; it is then that the commander must decide whether he will pursue the initiative he has gained or break off the attack.

The Japanese attacks up to the Battle of Wa-fang-kou were on the approved German model, but after that battle the superiority of the Russian artillery led to modifications in form, especially as regards depth and extension. The first step in the attack must be to feel the enemy's front all along with advanced troops, supported by artillery. Meanwhile the army moves up to a preparatory position; with large forces this period may extend over several days. The infantry can no longer await the issue of the artillery duel; the danger, indeed, arises that the infantry may push home the attack before superiority of fire is gained.

Flank attacks are preferable to frontal, but some element of surprise is almost essential for their success, and this can only be obtained if the holding attack is energetic. Envelopment is easier when it follows naturally from the converging advance of two separate forces, than when it is developed from a formation in depth. The necessity for the assault is insisted on; a position can never be won by fire alone; but fire superiority must be gained before the assault is delivered.

Entrenching in the attack is viewed with disfavour by the author, as tending to diminish the offensive ardour of the troops.

The Russians in Manchuria used advanced positions, defending them obstinately against superior numbers, with the result that the main position had often to be abandoned without fighting. In France and England advanced positions are much favoured, but rather to mislead the enemy, and to afford opportunities for counterstrokes.

The difficulty of executing the counterstroke lies in the choice of the moment for launching it; it *cannot* be foretold how long the enemy will take to get within striking distance. The reserve can however be moved gradually towards the position as the enemy gets nearer. The commander will need great strength of character to refuse appeals for reinforcements as the crisis of the battle approaches. As regards *direction*, frontal counter-attacks appear hopeless in theory, but the experience of war shows that they are often successful.

The following tables, etc., are of interest:—pp. 51—63, infantry formations in various countries; pp. 68, 106, 113, 147, 232, tables showing effect of fire; p. 159, trajectories and shape of ground; p. 162, casualties; pp. 184—189, deployment of infantry; pp. 236—246, machine-gun equipment and formations; pp. 362—3, trenches and profiles; p. 410, ammunition supply.

THE DECISIVE BLOW (Le coup de massue). By Dr. J. Auboeuf, with a preface by Paul Déroulède. 192 pp., with 4 diagrams. 8vo. Paris, 1907. Lavauzelle. 2s. 6d.

This is an interesting discussion of the prospects of a war between France and Germany, which the author seems to regard as inevitable. He believes that the two nations will be left to fight out the campaign by themselves; though he has a high opinion of the fighting value of the British troops, he considers their numbers to be too insignificant and their organization too defective for them to be capable of exercising any real influence on the great struggle between France and Germany. He looks upon the violation of Belgian territory as highly probable, almost certain, in fact, but does not think that the Belgian Army will be able or willing to offer any serious resistance.

The book is carefully and ably written and is worth reading. The comparison between the French and German Armies shows a partiality to the former, and the author's conclusions may therefore be somewhat optimistic. At the end of the volume however Dr. Auboeuf confesses that the question of *moral* is all-important, and that without confidence and self-reliance France will again be crushed. His object is to show Frenchmen that their prospects of defeating Germany are extremely hopeful, and that, provided their *moral* is equal or superior to that of their enemies, they should now be in a position to avenge Sedan and march to a new Jena.

TRAINING AND EDUCATION.

FIELD TELEPHONES FOR ARMY USE, WITH AN ELEMENTARY COURSE IN ELECTRICITY AND MAGNETISM. By Lieut. E. J. Stevens, R.A. 110 pp., with illustrations. 8vo. London, 1908. Crosby Lockwood. 12s.

The explanation of the principles of electricity and magnetism is simple, though not always quite accurate. No explanation is given of the method of testing a battery with detector.

Little detail is given about line work. Three of the Service field telephones are fully described—the new C Mk. II. is not described at all. The action of the vibrator call (called a buzzer) is very inadequately explained.

No mention is made of the necessity for separating earths at a point where several telephones are in use to avoid cross-talk.

On the whole, a useful little book, though the system of stringing hints together in the "Summaries" is confusing. The index is somewhat inadequate.

FORTIFICATION AND MILITARY ENGINEERING.

TECHNICAL INSTRUCTION FOR THE AUSTRO-HUNGARIAN PIONEER TROOPS. PART 8. BRIDGING MATERIAL AND BRIDGING TRAIN (Technischer Unterricht für die k. u. k. Pioniertruppe. 8. Teil. Kriegsbrückenmaterial und Train). Official publication. 84 pp., with 13 plates bound up separately. 8vo. Vienna, 1908. k. k. Hof und Staatsdruckerei. 2s. 6d., including plates.

This book contains a detailed description of the Austro-Hungarian pontoon equipment and of the vehicles of the pontoon train. The excellent diagrams add much to its value.

PERMANENT FORTIFICATION AT THE PRESENT DAY (La fortification permanente contemporaine). By Major V. Deguise, Professor of Fortification at the Belgian School of Artillery and Engineering. 250 pp., with an atlas containing numerous plates and diagrams. 8vo. Brussels, 1908. Joseph Polleunis. 16s.

This volume deals with the progress realized and the improvements attained in the art of permanent fortification in recent years, especially since the Siege of Port Arthur. The author has the advantage of considerable experience, and this, together with the great pains which he has taken, has resulted in the production of a most useful work—clear, thorough, and complete. The book is highly valued in France, and has been well reviewed by French military journals.

AERIAL NAVIGATION.

THE EMPLOYMENT OF CAPTIVE AND FREE BALLOONS AND AIRSHIPS FOR MILITARY PURPOSES (Fesselballon, Freiballon und Motorluftschiff in ihrer militärischen Verwendung). From the "Vierteljahrshefte für Trüppenführung und Heereskunde, 1908, Volume III." By Major Sperling, attached to the Prussian Balloon Battalion. 24 pp., with 2 diagrams in text and 5 maps. 8vo. Berlin, 1908. Mittler.

The author gives a general sketch as to the employment of the three forms of aerial conveyance in war. He holds that the experience gained in the use of captive and free balloons at manœuvres is, for all practical purposes, equal to that to be gained under

Service conditions, but he admits that his ideas as to the employment of airships are drawn from mere conjecture.

The *rôle* of captive balloons is reconnaissance both near and tactical; free balloons and airships can combine the maintenance of communication with reconnaissance duty, which, in their case, will be distant and strategical.

The height to which a captive balloon can rise depends on the atmospheric conditions and the weight of the rope. The kite-shaped balloon, as used on the Continent, is more easily manipulated and is steadier in a high wind than its spherical British prototype; reconnaissance therefro n is consequently facilitated. The higher the captive balloon rises the less the eye of the observer has to penetrate the vapour, which clings to the earth's surface to a height of 500 mètres. A diagram is given to demonstrate this.

Except in cases of urgency, captive balloons must never ascend within range of artillery fire; there is no danger, in the author's opinion, from rifle fire. Information is easily and rapidly transmitted by telephone from the balloon to the ground.

The control of free balloons is only possible, so long as the ballast carried lasts, by ascending or descending so as to catch favourable currents of air. The airship is capable of absolutely controlled movement by reason of its motor power and steering planes. Communication from these types of aerial conveyance can only be satisfactorily carried out with wireless installations, or, in the case of airships, by returning to earth.

The writer goes on to say that the use of airships by two opposing forces must result in an engagement between the dirigibles in the air. The victory will remain with the airship which can ascend to the greatest height, and so destroy the other by showering explosives upon it.

He paints a picture of how airships may be employed in naval warfare. In reconnaissance they will precede the cruiser scouts, in the fight they can assist by destroying the enemy's ships with explosives, and could be used to tow heavily-charged torpedoes through the water, in order to make more sure of hitting the objective. Their assistance in helping to raise the blockade of a port will be valuable.

Four examples of the use of captive balloons at different manœuvres, with details of information supplied by them, are given.

The article is instructive and worthy of study.

MEDICAL.

THE HYGIENE OF FRENCH BARRACKS. AN HISTORICAL STUDY (L'Hygiène du Casernement Français. Étude historique). By J. Lambert des Cilleuls. 88 pp. 4to. Lyons, 1907. Rey. 1s. 6d.

This pamphlet is a thesis written by a student at the Army Medical School, Lyons, for his doctorate in medicine. It is of interest in giving details and facts connected with the general development of hygiene in the French Army from the earliest days to the present time. The author considers that there were three periods in the evolution of hygienic principles in barrack construction. The first period was the 17th century, when soldiers were first placed in barracks instead of being billeted on the people. The illustrious engineer, Vauban, was concerned then in the construction of barracks, and appears to have effected several reforms by his criticisms of the manner in which soldiers were housed. Amongst some of the provisions laid down at that time was the necessity of having beds large enough for two soldiers to sleep in. The second period was the 18th century and first quarter of the 19th century. It is a period in which military hygienists began to make their voice heard with sufficient authority to influence the acts of government. In the third period, which followed, the general sanitary condition and construction of barracks were reorganized in accordance with more modern scientific knowledge of the causes and prevention of disease, and by the persistent efforts of military and civil medical men and engineers. The pamphlet is useful, as a work of reference, to those interested in the history of barrack construction in France.

ORGANIZATION AND ADMINISTRATION.

MODERN ARMIES AND THEIR STAFFS (L'armée moderne et les états-majors). By Pierre Baudin. 270 pp. 8vo. Paris, 1905. Chapelot. 3s.

This book deals mainly with the question of national defence, with special reference to that of France.

In connection with the two-years law in France, the author points out the tendency of every democracy to endeavour to lighten its burdens; at the same time he emphasizes the vital necessity for a nation to secure its national safety from invasion by another Power. Two things must therefore be considered—the demands of peace and the necessities of war. It is the task of the Government to make these harmonize, and to obtain a solution which guarantees the safety of the nation whilst ensuring the prosperity of the community.

The author deals with the staffs of the different Continental armies, comparing them, and showing the great value of a competent General Staff. He is inclined to consider the German General Staff as the most efficient and the one most adapted to the national character.

In a final chapter he discusses the growth of the German Navy and the naval programme of Germany.

A TERRITORIAL ARMY IN BEING. By Lieut.-Colonel C. Delmé Radcliffe and J. W. Lewis. 132 pp. 8vo. London, 1908. Murray. 1s.

Beginning with a preface by Lord Roberts on the subject of National Service, this book gives interesting details of the training and conditions of service in Switzerland and Norway.

The systems of universal training in these two countries appear, according to statistics furnished by large employers of labour, to be carried out with very little interference with trade and commerce.

REGULATIONS FOR TRANSPORT SERVICES BY RAIL AND SEA. PART II.—TRANSPORT BY SEA IN PEACE TIME (Regolamento sul servizio dei trasporti per ferrovia e per mare. Parte II.—Trasporti per mare in tempo di pace). Official. 77 pp. 13 plates under separate cover. 8vo. Rome, 1908. Voghera Enrico. 1s. 3d.

These Italian regulations deal very fully with all details regarding the movement by sea of troops and stores, including the duties of the embarkation staff, the vessels best suited for transport services, and the preparations required to adapt them for the work, embarkation, interior economy on board, and disembarkation.

The plates illustrate the manner in which the accommodation on transport vessels is to be utilized, the arrangement of horse stalls, and the method of slinging horses and vehicles.

BOOKS OF REFERENCE.

THE IMPERIAL GAZETTEER OF INDIA. 3rd edition. Official. Published under the authority of His Majesty's Secretary of State for India in Council. Twenty-six volumes of 400 to 570 pp. each, with numerous maps. 8vo. Oxford, 1908. Clarendon Press. £5.

As an authoritative standard work of reference for general information about India, the *Gazetteer* is of considerable military value.

This third edition was taken in hand in connection with the census of 1901, and the changes that have been introduced make it practically a new work.

The first four volumes give general information about the Indian Empire under the headings :—

1. Descriptive.
2. Historical.
3. Economic.
4. Administrative.

Every volume is prefixed by introductory notes on Transliteration, Money, Prices, Weights and Measures. Each of the first four volumes ends with an index.

The parts of the first four volumes which are of special military interest are as follows :—

Volume I.—Descriptive.

The chapter on "Physical Aspects" by Sir Thos. Holdich, beginning with a description of the physical characteristics of the Indian borderlands.

The chapters on Ethnology, Religion, and Population, supplementing one another, give general information about the peoples of India, and to some extent supply a want that will be felt by military readers of special *Gazetteer* articles on the fighting races. The *Alphabetical Gazetteer*, for instance, has only three or four lines on "Afridis," and no articles on "Dogras," "Gurkhas," "Jats," "Marathas," etc. Further accounts of several of the fighting races are found in Chapter XIV. of this volume, and in the chapter on the "Army" in Volume IV.

Volume II.—Historical.

The latter part is more particularly of military interest. It deals with the Muhammadan invasions of India and the story of the Mughal Empire in Chapter X., and the Maratha Wars in Chapter XII. Chapter XIII. gives the history of European rivalries in India from the advent of the Portuguese up to the consolidation of the British East India Companies at the beginning of the 18th century, and Chapter XIV., the history of British rule from the struggle with the French for supremacy up to the succession of Lord Minto to the Viceroyalty in 1905.

Volume III.—Economical.

Chapter VII. deals with the development of the Indian Railway System from the purely economic point of view, and the latter part with the development of a system of roads from the time (1833) when the main roads were in the charge of Military Boards in each Presidency. Chapter VIII. traces the development of Posts and Telegraphs, and refers to their use for military purposes, and mentions the installation of wireless telegraphy between Burma and the Andamans.

Volume IV.—Administrative.

The first chapter, on "The Government of India," gives a short history of the gradual extension of British rule over India, and traces the development of the present system of the Government of India in all its branches, including the Army Department and Military Supply Department. It is to be regretted that the account of Army Organization stops short at the formation of the three commands, Northern, Eastern, and Western, in 1904, and neither here nor in the chapter on the Army has it been brought up to date so as to show the present organization in two armies, the Northern and the Southern.

The chapter upon Native States traces British relations with the Native States from the first alliances made with them by the East India Company against the French, recounts the changes in British policy with regard to them, and explains their present status.

The chapter on Foreign Relations relates how the sphere of the Foreign policy of the Indian Government has gradually been regulated with regard to that of the Home Government ; and describes relations with Southern Arabia, the Persian Gulf, Turkish Arabia, Persia, Afghanistan, Kashgaria, Tibet, China, and Siam.

The chapter on "The Army," from material contributed by General Sir Edwin Collen, is divided into (i.) the Presidency Armies under the Company, (ii.) the Armies of India under the Crown, and (iii.) Unification of the Armies and present Military Organization.

It traces the rise of the Presidency Armies from their origin as guards for the East India Company's early settlements up to the Mutiny of 1857, the causes of which are well explained. The history of the New Army up to its reorganization by Lord Kitchener is

then told. A description of auxiliary forces is added, Volunteers, Imperial Service Troops, Frontier Militia, Levies, and Military Police, and some account is given of the Armies of Native States, including those of Nepal and Afghanistan. An appendix gives an account of the Royal Indian Marine.

The chapters on Medical Administration and on Surveys are both of military interest.

In the volumes of *Alphabetical Gazetteer* the full articles upon the different Presidencies and Provinces are worthy of notice. Each contains a paragraph upon the Army.

TRAVEL AND TOPOGRAPHICAL.

PERU. By C. Reginald Enock, F.R.G.S., with an introduction by Martin Hume. 350 pp., with a map and 72 illustrations. 8vo. London, 1908. T. Fisher Unwin. 10s. 6d.

This is a most interesting and excellent volume, practically the standard work on Peru. The author first reviews the past history of the country, and then proceeds to discuss its present condition and prospects. There are valuable chapters on the political and social systems of Peru, her climate and geology, means of communication, agriculture and natural products, mineral wealth, financial, industrial, and commercial conditions; the whole work is elaborated with considerable care, the result of some years of travel and research.

Special interest attaches to the author's remarks on the influence and prosperity of the European colonies in Peru; it would appear that German merchants and German shipping are making rapid progress, and that our own countrymen find considerable difficulty in keeping their lead.

KELANTAN; A STATE OF THE MALAY PENINSULA. By W. A. Graham. 140 pp., with maps and numerous illustrations. 8vo. Glasgow, 1908. James Maclehose & Sons, Publishers to the University. 5s.

This is an interesting handbook, well compiled and admirably illustrated. As its author holds office as Resident representing the King of Siam at the Kelantan Court, the contents of the booklet should be accurate and reliable.

In view of the negotiations now being carried on between Great Britain and Siam, the geography of the Malay Peninsula has assumed an increased importance. The author gives us a great deal of general information, especially with regard to the trade and resources of the State; its mineral wealth would appear to be considerable, whilst its capacity for rubber production is believed to be very great. The Rajah of Kelantan has already made large concessions of his territory to speculative syndicates, chiefly for rubber production.

MISCELLANEOUS.

HOW FAR HAVE THE CONDITIONS FOR SUCCESS IN WAR CHANGED SINCE 1871 (Inwiefern haben sich die Bedingungen des Erfolges im Kriege seit 1871 verändert), from the "Vierteljahrshefte für Truppenführung und Heereskunde," 1908. Vol. III. By General of Infantry von Blume. 51 pp. 8vo. Berlin, 1908. Mittler.

Changes in everything appertaining to war, during the 37 years in which Germany has enjoyed peace since 1871, have done much to alter the conditions for the tactical handling of troops in future battles. The author points, in the first instance, to the enormous growth of armies of various States since the year in question, and shows, for example, that whereas in 1871 supplies had only to be provided for a total German armed strength of 1,183,389, at the present day they would have to be arranged for a force of over 4¾ millions, and for other Powers in proportion.

Apart from the question of supply, the mobility of such enormous forces, as compared with the smaller armies of the past, will be much affected; greater space will be occupied; and the development of war material and the increased destructive power of explosives become influential factors. All these things have tended to alter the conditions of fighting.

The increase in accuracy, range, and rapidity of loading of firearms, and the use of smokeless powder, have produced entirely new tactical methods. Each side now seeks to conceal itself from the opponent before and during a fight, and the battlefield itself presents a barren aspect, which only tends to increase the difficulties of the leaders as regards appreciating the situation, making their decisions, and handling their troops. The battle commences with the opposing forces widely separated, and deployment takes place earlier than heretofore; an action is consequently of longer duration.

In discussing the tactical values of the combatant arms the writer lays stress on the fact that infantry is still the arm *par excellence*, which now prepares success in open daylight by its fire effect, and secures victory by the use of the bayonet at the moment of assault only.

He enters at length into the influence on the combat of the higher leaders, of entrenching in the field, of the constant use of night operations, of modern artillery fire effect, and of the increased independence of the cavalry. He shows how, in spite of the deadly effect of modern firearms, casualties in war have decreased instead of increased. For although in the four great battles of the Russo-Japanese War the Russians lost 16·7 per cent. in killed and wounded, and the Japanese 20·4 per cent., and although the Germans in 1871, in the 18 great battles of the campaign, lost only 7 per cent. of the forces engaged, still the four battles alluded to above lasted 40 days, whilst the 18 battles in 1871 lasted only 27 days; thus, calculating on an average for one day of battle only, the losses to the Russians, Japanese, and Germans may be said to have been 1·7, 2, and 4·7 per cent. respectively.

Again, in the 14 days' fighting at Mukden, the Russians only lost 19·3 per cent., whilst in the one day at Mars la Tour the Germans gained their victory with a loss of 22 per cent.

Special mention is made of the use of balloons for reconnaissance purposes. These will be of use more particularly to the defence, which will thus be able to counteract the value of surprise to the superior forces of the attack. This advantage will be greatly enhanced, the writer says, when it is possible to destroy the approaching enemy with explosives hurled from above.

General von Blume concludes his article with an estimation of the cost of modern campaigns. From the fact that the Manchurian War cost Russia £230,250,000 and Japan £121,200,000, he calculates that a year's war will cost Germany £300,000,000.