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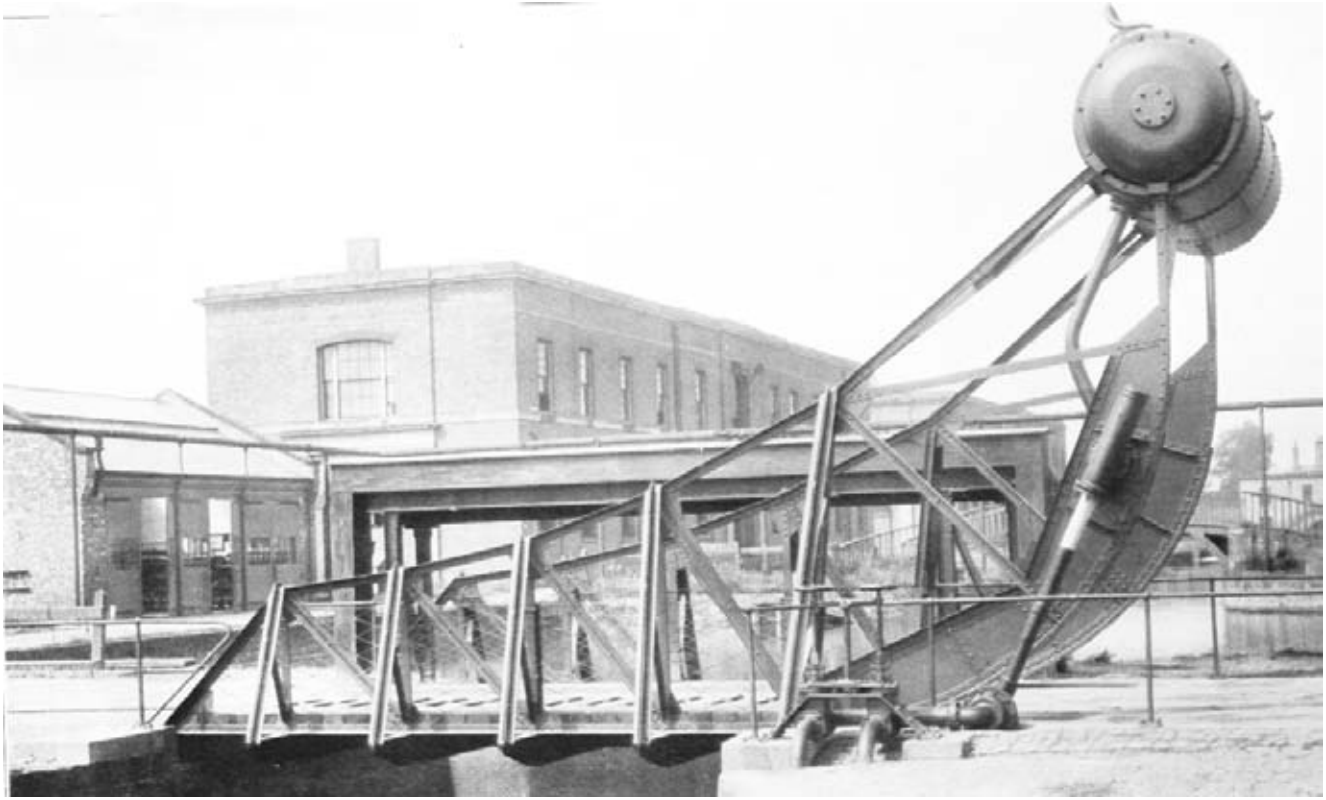
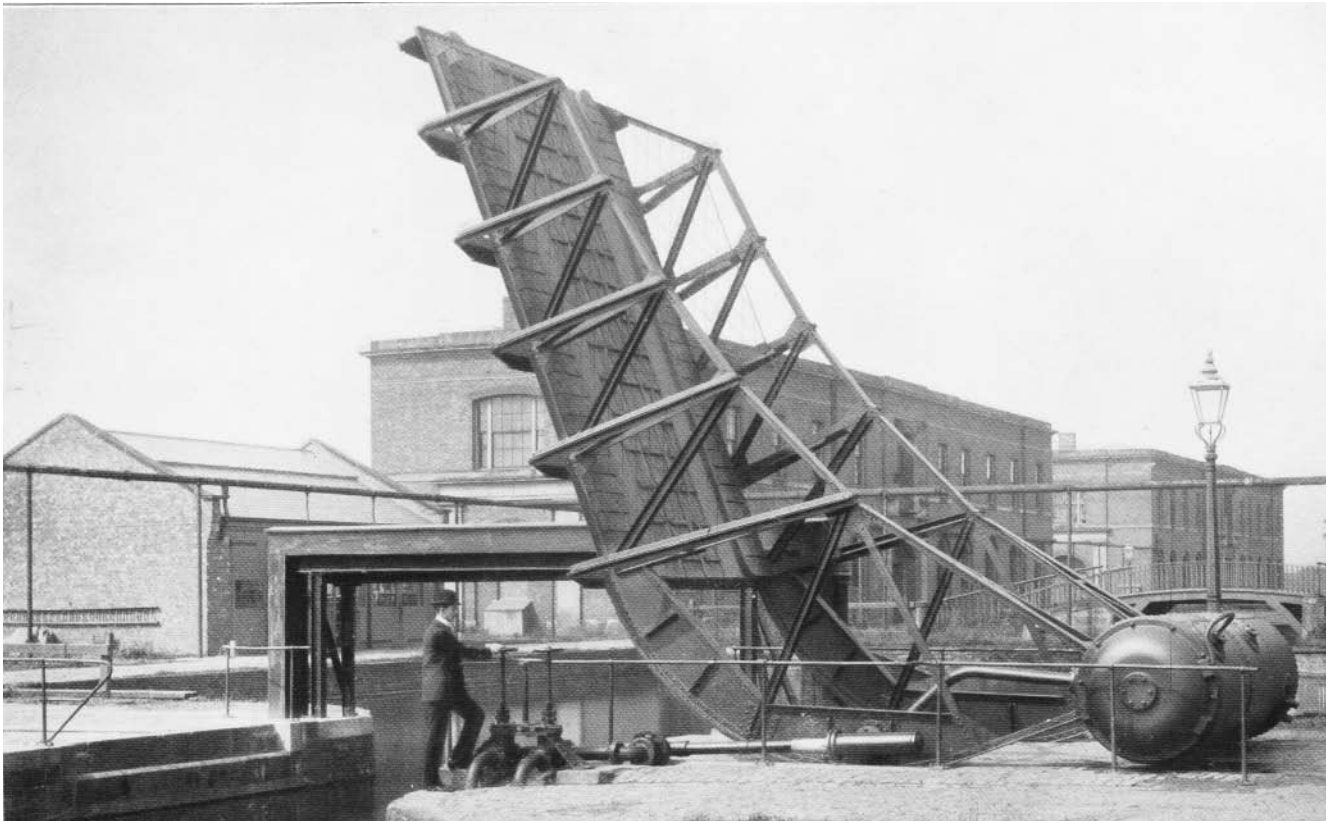


SCHERZER ROLLING BRIDGE



SCHERZER ROLLING BRIDGE

A SCHERZER ROLLING BRIDGE OVER CANAL AT WEEDON.

By COLONEL A. H. BAGNOLD, C.B., R.E.

THE Ordnance Store Depôt at Weedon is well situated as regards means of communication. The main road between London and Birmingham, the main line of the L. & N.W. Railway, and the Grand Junction Canal, all pass close by the main gates of the Depôt. A private siding is led into the Depôt, as is also a short branch from the Canal.

This branch canal, however, practically cuts the Depôt into two portions, access between which is somewhat limited, and in providing for the increased storage accommodation—found necessary by the experience of the South African War—a new movable bridge, to take heavy van traffic and an 18-inch gauge tramway, was rightly considered an essential.

An old and troublesome roller bridge existed, but it was in a decayed and dangerous condition, and as its design necessitated steep movable ramps at either end, it was not practicable to take a tramway across it satisfactorily.

The masonry abutments were in good order, but it was desired to avoid, if possible, the necessity of putting in such additional foundations as would be required for a swing bridge.

The descriptions, published in *Engineering* in 1904–5, of the new Scherzer railway bridge over the Swale—carried out from the designs and under the directions of the late Sir Benjamin Baker, K.C.B.—indicated the system there adopted as possessing considerable advantages, and as being peculiarly adapted to the requirements at Weedon. The similarity between this system and the Moncrieff gun-carriage is very noticeable.

The bridge shown in the photographs was designed, under my direction, in the Building Works Department of the Ordnance Factories, by my then chief mechanical draughtsman, Mr. E. D. McQueen, A.M.I.C.E.

The water supply of the Depôt, though not remarkable for its purity, is cheap and plentiful, as it is pumped up by the War Department, from the little river Neen, to a reservoir in the barracks, about 90 feet above the canal level. For this reason it was decided to

effect the counterbalancing of the bridge by the filling and emptying of a cylindrical tank, as shown in the photographs.

The bridge was constructed in the Arsenal by directly-employed labour, the only manufactured parts supplied by contract being the balance tank and the controlling valves. It was temporarily erected in the Arsenal and worked almost perfectly, the only adjustment found necessary being the addition of a certain amount of kentledge, which took the form of lead run into the cast-iron caps fastened to the ends of the balance tank.

The bridge was then taken to pieces, the main girders were cut each into two pieces, and the whole was sent to Weedon by rail. It was there erected without difficulty by the local staff, and, with one exception, has worked most satisfactorily since its completion in October, 1906.

The original design provided for the connection between the fire main and the tank, by means of a short length of 4-inch galvanized flexible steel tube. The fixed end of this tube was located very close to the position of the controlling valves, as shown in the photographs, this point having been determined as giving the most suitable approximation to the mean position of the centres of curvature of the trachoid (or prolate cycloid) described by the moving end of the flexible tube, together with the least variation in radii of curvature. Although due allowance was made in the length of the tube for flexure and for variation of radii, the tube only withstood a limited number of operations, and eventually gave way.

To overcome this difficulty, the articulated and telescopic connection—clearly shown in the photographs—was designed, made in the Arsenal, sent up to Weedon, and fixed. This connection has worked now for nearly a year without any hitch whatever.

The opening and closing of this bridge is effected without any risk or liability to accident. To open the bridge it is simply necessary to open the filling valve. As the tank fills, so the bridge rolls back, and when the tank is full the water overflows from a pipe at the top. The filling valve is then closed, but if left open the result is simply a waste of water. To close the bridge, the emptying valve is opened, and the bridge rolls gently forward into its normal position without shock.

During the late frost—which was very severe at Weedon—the valves and the articulated connection froze up once, but were easily thawed, and no damage resulted. This would not have occurred had the valves been properly covered up and treated as if they were hydrants. It would, perhaps, be an improvement to place these valves underground. One necessary precaution must, however, be taken in frosty weather, and that is, that the tank must not be filled if the toe of the bridge be frozen down to its seating, for if this be done, then, when the ice gives way, the bridge will roll back suddenly,

and the tank may strike the ground and buckle the tension members of the girders. To prevent the possibility of such an accident, "jack-screws" are being provided to enable the toe of the bridge to be freed when necessary.

The total weight of the bridge, with tank empty, is 9 tons. The capacity of the tank is 800 gallons, and the weight of the empty tank, with caps and kentledge, is 2 tons.

The opening is effected in about 1½ minutes, and the closing in about 2 minutes. The clear span is 18 feet; the clear width between girders is 10 feet, and the clear headway beneath balance tank is 12 feet.

The bridge is designed to carry a crowd of soldiers, either with or without a two-horse railway van loaded up to 4 tons. The resultant bending moment, for purposes of calculation, was found to approximate to a single rolling load of 8 tons on two co-axial wheels. Stress diagrams were plotted for numerous positions of the bridge, and each member was carefully designed to resist the maximum load which could possibly come upon it.

The stability of the bridge and the total kentledge and tank capacity were determined by taking moments about the lines of rolling contact in various positions, thus :—

Angles of Elevation.	Total Moments in ft.-lbs.		Differences.	Differences Divided by Distances of Axis of Tank from Lines of Rolling Contact.
	Bridge Side.	Tank Side.		
Horizontal	97990	44371	53619	6100 lbs. = 2 tons + *723 tons water
25°	134023	45486	88537	8568 ,, = 2 ,, + 1·826 ,, ,,
46°	145598	39146	106452	10645 ,, = 2 ,, + 2·753 ,, ,,
67°	139594	31597	107997	12832 ,, = 2 ,, + 3·730 ,, ,,

The normal preponderance of about *three-quarters of a ton was considered sufficient to counteract wind pressure tending to open the bridge.

The only foundations required were the two track girders, which were set in concrete slabs. These girders each consist of a pair of $10'' \times 3\frac{1}{2}''$ steel channels, spaced 1 inch apart, with the teeth set in between them, and bolted together. The teeth of the rack are of annealed cast steel, and are 1 inch high, 6 inches long, and $2\frac{3}{8}$ inches wide on the top. The pitch of the teeth is 12 inches. The corresponding recesses, on the curved rolling segment of the lower members of the main girders, are formed by crosspieces, or teeth, of mild steel, 6 inches long, $6\frac{3}{8}$ inches wide, and $1\frac{1}{8}$ inches deep, riveted on to and across the $3'' \times 3''$ angles of the lower member, with side-filling pieces, $6'' \times 1\frac{1}{8}''$, riveted on to the angles between the teeth.

This type of opening bridge is, I think, superior in every respect to a swing bridge. It is simple to construct, easy to work, requires the minimum by way of foundation, and there is little or nothing to get out of order. Where water supply is available, and when the span admits, the balance tank arrangement appears to be the most stable and, therefore, the safest possible. It should make an excellent drawbridge.

For large spans, and where water supply is either not available or is expensive, these bridges must, of course, be pulled over either by hand, hydraulic, steam, or electric power, but by a suitable disposition of the kentledge the amount of energy required need not be great.

The writer would be happy to furnish any reader with further details if required.

GOVERNMENT TELEGRAPH OFFICE, CANTONMENTS, QUETTA.

THE new Government Telegraph Office, Quetta, constructed between November, 1903, and August, 1905, at a cost of nearly Rs. 47,000, is of the bungalow type, cruciform in plan. The roof of the buildings which contain the offices proper is at a higher level than those of the two wings, and is perpendicular to the front.

One wing contains quarters for the telegraph master and his two assistants; in the other wing are housed the telegraphists. Directly in rear are the cookhouses for the different quarters, and further back blocks of servants' quarters.

The building faces south-west, and stands diagonally across a corner where two main roads intersect.

Verandahs are given all round the building, but in rear of the wings; these are enclosed, to form small bedrooms and bathrooms to the various quarters. The office verandahs are quite open, while in front of the wings, and at either end, they are screened in by close trellis work, to give privacy to the quarters.

Additional light and ventilation are provided by ridge skylights, in addition to clerestory windows in main rooms.

Two porches in each wing help to break the long line of verandah roofing, and gables that of the main roof.

The construction adopted is as under:—

Foundations.—One foot of lime concrete, with burnt brick in lime above, to plinth level.

Plinth.—Three (3) feet high, reached by steps of Kolepore stone at intervals, those in front of the central offices extending the full width of the verandah.

Superstructure.—Sun-dried brick in mud, with mud plaster and leeping,* but 1 foot in depth at top of walls is laid in burnt brick in lime.

Archwork.—Burnt brick in mud.

Roofing.—Galvanized corrugated-iron sheeting (Naini Tal pattern), with mud and puttal† ceiling, fixed to purlins.

* A kind of clay wash.
† A kind of reed.

Roof Trusses.—Kingpost, supporting purlins, all of wood.

Woodwork.—All scantlings of roof, and in chowkuts (door and window frames) and verandahs, of deodar.

Joinery.—(i.), Teak in office rooms; (ii.), deodar in quarters and outbuildings.

Floors.—(i.), Of rooms, burnt brick on edge, in lime, cement pointed, over 3 inches of lime concrete; (ii.), of verandahs, Kolepore stone, laid in cement, over 3 inches of lime concrete.

Ceilings.—Five-eighths ($\frac{5}{8}$) inch pine planking, fixed to tie beams in main rooms, and to rafters under verandah roofs.

Water Supply.—By pipe throughout the building.

COAST DEFENCE.

By Major F. Moloney, R.E.

Since Colonel Hickson has done so much to encourage us to enunciate our views on Coast Defence, no apology is needed for definite proposals on this subject. Many of our best officers probably feel themselves debarred from writing, owing to their having had access to confidential mobilization documents. The opinions which follow are in no way officially inspired.

My first proposal is that our present "Coast Defence" sections be renamed "Harbour Defence" sections. The present name is misleading.

Colonel Hickson having proposed that fixed guns should be provided for the defence of certain landing beaches, "Forts" has raised the objection that these will need guarding by infantry. For this and other reasons, the whole question of the distribution of our defensive forces is involved, and, as Capt. Walker concludes, "The first step in these matters is the evolution of a well-balanced scheme of defence."

The Volunteers and Yeomanry are to be made more efficient under the title of Territorial Army, but how is it proposed to use them to resist invasion and raids?

Influence of Railway Considerations on Defensive Strategy.

Against an invasion threatening from Dunkirk, Queen Elizabeth concentrated at Tilbury, the lowest point where the Thames could conveniently be crossed. This allowed of her army attacking within four days any enemy who had landed between Portsmouth and Harwich. Our railway system has rendered such a concentration as she made at Tilbury unnecessary and undesirable.

From the fact that the managers of our great lines have been made lieut.-colonels in the Railway Volunteer Staff Corps, I gather that the accepted plan is as follows:—When an invader lands we propose to forward troops by rail to concentrate about two days' march inland of him (so as to be able to detrain without hindrance from his mounted troops). We then hope to crush him before he can be reinforced. The neglect of our true coast defences during the last

50 years justifies the assumption that there is no intention of siting troops close to the coast, even if invasion be threatened. For the sake of clearness, let us call this the orthodox plan.

Now if the troops are échelonned over a reasonable area to start with, the factor limiting the working speed of the above plan will not be the entraining, but either the detraining facilities or the carrying capacity of the lines near the detraining points. Suppose there are two such, as would usually be the case, and that trains can follow each other every eight minutes and carry half a battalion each. Then the infantry of 10 divisions would be arriving at the detraining points for 16 hours. If the other arms be railed also, the time is immensely increased. Thus a delay of eight hours in entraining some of the troops need make no difference to their time of detraining; and hence, for such a railway concentration, the question where the bulk of the troops start from is not of importance, so long as some are ready to get away promptly, and take the detraining points into use.

If the crushing of an invader be the primary object of the territorial army, gaining time for completing the defences of our arsenals should surely be the secondary object, for it is notorious that even our best fortresses have large gaps in their defensive circuits. I have shown that for railway transport reasons the attainment of the primary object is scarcely affected by the placing of the troops, but the case is far otherwise with regard to the secondary object. If we can prevent a landing near our capital or arsenals, we may delay an attack upon them for several days, time which should be invaluable if good plans are ready for the completing of their defences.

PROPOSED GENERAL DISTRIBUTION.

Assuming only the 14 divisions of the territorial army available, I should propose, in a war with a Southern Power (which we will call Case I.), to allot 11 divisions to the defence of London, one to Devonshire, and two to Ireland; or in a war with an Eastern Power (Case II.), 11 divisions to London, one to the Humber, one to Newcastle, and one to the Forth, using the mounted brigades to watch such coast lines as the divisions do not guard. This disposition would not mean that an enemy landing in Norfolk or Dorset would be only opposed by the mounted brigades. If there were reason to believe that the invader had put his whole expeditionary force ashore, the 12 or 14 divisions might be moved against him, just as readily as if they had not at first been told off for the protection of vulnerable points.

The 11 divisions for the defence of London could, in Case I., guard the coast from Portsmouth to Harwich, or in Case II., from Rye to Yarmouth, but it will be found that they can only advantageously put one-third of their infantry at the railway junctions behind the coast.

The infantry of a division whose brigades are at Eastbourne, Lewes, and Brighton can be concentrated by rail at either Eastbourne or Brighton quicker than if the whole division be at Lewes; because the far brigade will begin arriving at Lewes before the whole Lewes brigade can be got away. Similarly it will be found that 11 brigades placed at railway junctions between Portsmouth and Harwich can start the railways working to their fullest capacity, and no useful purpose is served by having more troops waiting at the junctions.

To ease the strain on our railways we should, of course, provide as much of our infantry as possible with road conveyance. With motors, bicycles, and buses we might be able to mount another third of them, which we will call the mounted infantry. As our own coast near London generally consists of long stretches of beach, interspersed with stretches of shore rendered unsuitable for landing by cliffs, rocks, or shoals, I should propose to allot one or more of these mounted infantry brigades to each stretch of beach.

Now the point is what we ought to do with the remaining third of the infantry.

I have long been convinced that they ought to be entrenched within rifle shot of the beach, for I reckon that this would give about 360 men per mile of fair landing beach in Case I. and 420 in Case II. By lessening the number where there are difficulties from shoals and rocks, we could get up to 1,000 men per mile on the Eastbourne, Brighton, or other good beaches. None of these troops on the south coast would be more than five miles from a railway, nor on the east coast more than eight. Hence, with good telegraphic and signal communication, they could be withdrawn in plenty of time to take their place in a general concentration. Behind these troops are the mounted infantry and railway reserves, by means of which we could, within four hours of issuing orders, raise the force holding any 10-mile stretch of beach up to 3,000 infantry per mile. In the light of South African experience, these numbers seem ample. The above is calculated on the assumption that no animals accompany the infantry, so that they may be able to detrain anywhere, and that at critical times, such as high water during darkness or fog, every reserve brigade keeps a train ready to start, and others nearly so.

And it must be remembered that 14 divisions, full as regards infantry, is a moderate estimate of what would be available for the defence of the British Isles. It assumes that all the Regulars and Militia are out of the country, and that none have come forward for the defence of their fatherland except those on whom the State has a lien.

Personally I think it most probable that sufficient trained men would come forward to take up the defence of the whole south coast to the Lizard, as Colonel Hickson suggests, but I should not

propose to do much work west of the Needles till these had been organized.

Artillery.

So far we have dealt with the infantry only; the guns are a more complex problem.

I should propose to distribute such field artillery as would be available on much the same principles as the infantry, entrenching the heavy artillery on the coast, and of course putting horse artillery with the mounted infantry. But the field artillery with the railway reserves must follow and not precede them, as it takes so long to detrain, and platforms are essential to it.

To replace these early in the fight, we need badly railway guns as advocated by Sir Percy Girouard and several other writers, and practically used in several wars. Surely "Forts'" remark that "as a matter of fact at most places where the line runs near the shore the deep water is some distance out" does not apply to Kent and Sussex?

But there can be no doubt that, for these railway guns, a special system of indirect laying is necessitated by the fact that the railways rarely get a clear view of the sea.

The guns must also be able to fire broadside on without overturning the trucks. Hence special trucks, of the low type used for transporting boilers, are essential. Here is a case where experiments should certainly be made in peace time, and patterns of trucks and instruments sealed, and drawings and contracts held ready, so that a number could be ordered directly money is available. I should propose to post these railway guns at the minor junctions not suitable for brigades of infantry, and at certain points, such as Hythe, where the conditions are favourable.

ORGANIZATION.

This amended system of defence will undoubtedly mean a lot of planning and organizing. I think the railway reserves would be best worked by a chief in London, and the coast troops by sections.

Each section commander must be in telegraphic communication with all his troops, and must remember that his most important function is to advise his chief in London, especially when to stop forwarding reserves.

His next most important duty will be to see that troops arriving by rail get orders, and he must put third the locating his road reserves, as they will be numerically small compared to the railway reserves.

Sufficient senior officers must arrive on the coast before nightfall to allow of the force opposing the invader being then roughly organized. Till then everyone should act under the section commander.

INFORMATION.

Of course, we agree with Capt. Walker that everything possible should be done to gain early information of the probable locality of a hostile landing. But his proposals, so far as I can follow them, seem to rely too much on getting this information early. Briefly, he proposes to use this information to *man* the threatened coast, and I would use it to partially *reinforce* it.

ADVANTAGES.

The advantages claimed for the above-described scheme of true coast defence over the generally accepted scheme of a concentration two marches inland, briefly, are :—

1. That it may result in the invader meeting with a bloody repulse on the coast.

2. That, by rendering a landing at the convenient beaches impossible, it would probably double the length of his march on London, and give us time to fortify the capital.

3. That it puts the advantages of entrenching on our side. The coast troops will, of course, prepare trenches for the reserves as well as for themselves.

4. Minor raids on the defended coast would be hopeless. Even heavy attacks would only have a chance if pushed at a pace which usually involves mistakes being made, and which would give little time for the naval guns to act.

5. The enemy can only make feint attacks by incurring heavy loss. We shall be better informed of what is going on upon the coast than if we follow the orthodox scheme. A concentration two marches inland might be preliminary to a blow in the air.

6. It will prevent many of our richest coast towns paying a ransom to hostile cruisers to escape bombardment.

7. Even if a landing be forced, the invader would find great difficulty in getting his guns into action ashore, and would meet with most opposition at that critical time when the control of his operations must be partly naval and partly military.

8. If he got his whole force ashore, he should still be confined within a very small area, probably affording him no good defensive positions.

9. His mounted troops and cyclists should be stopped from getting inland before the defenders have time to withdraw all cattle and transport, and most of the provisions, from the neighbourhood. As regards the first opposition to the invader's mounted troops, I hold to the principle of defending every hedge and ditch. Only thus can we prevent our big railway concentration from being hindered by broken bridges.

10. If the invader lands near London, the amended system involves less reliance on railways than the orthodox system, and consequently would be less interfered with by the blowing up of a bridge by a spy.

11. The amended scheme secures us great liberty of action. Putting some troops on the coast does not *necessarily* mean reinforcing them there. In certain cases, as at Dungeness (the only point where a landing can be openly forced), it may be best to instruct the coast troops to retire before an invader, driving the cattle before them. On the east coast there are places where the best stand can be made a few miles back from the shore. And we have proposed nothing to render the orthodox scheme any more difficult of execution.

12. It is well to adopt from the first the policy which public opinion is likely to compel us to adopt in the end.

DISADVANTAGES.

The disadvantages of putting troops on the coast seem to me to be three.

1. The invader may use his naval guns on our troops. But his ammunition is not likely to be suitable, and any considerable expenditure will weaken his fleet, to do which is one of our primary objects.

It is not proposed that our firing line shall always be entrenched near high-water line. In some places, as Pevensey, it might be a mile back, and in any case a shelter trench is an unusual target for naval gunners.

2. The units of our divisions would be more likely to get mixed than by the orthodox scheme. This objection would be largely met by sending a very senior officer to the coast to re-allot units to divisions after the first day's fighting.

If it be evident that the invader cannot be crushed or even hemmed in, I believe our soundest policy would be to fall back to the neighbourhood of London. This retirement would give plenty of time for a re-sorting of units.

3. The amended scheme may not allow of so much being done to complete the training of the territorial army in combined manœuvres as the orthodox scheme. But it must be remembered that every fine morning, after the sea has been reported clear, the reserves can be safely marched away some miles for training, as our artillery arrangements can then hardly fail to greatly delay a landing.

I should not propose to put troops on the coast till an invasion is actually threatened. The entrenchments there can be begun by civilian labour if the plans be ready.

It must be allowed that the balance of advantages is decidedly in favour of the amended scheme over what I have called the orthodox scheme. The question is, what proportion of the troops should be

entrenched near the coast, and what coasts they should hold? I hope to see my solution of these questions criticized.

I should propose to apply the above principles to the divisions defending the provincial arsenals. The Forth Division to hold the coast from Tayport to Dunbar; the Newcastle Division from Newbiggan to Seaham; the Plymouth Division from Teignmouth to Par; the two Irish divisions from Waterford to Skull Harbour (if Haulbowline Dockyard is being used). In each case the line to be strongest nearest the centre, so as to make it practically impossible that the wings can be cut off from the arsenal by a landing near the centre. Similarly, in Case II., the defence of Essex should be much stronger than Suffolk. And I need hardly say that I agree with Colonel Hickson that the part of our fortress garrisons allotted to inland forts should be used to defend the coast near those fortresses.

Why do we never discuss what we ought to do in case of a serious disaster to our battle fleet? Some bar any such discussion by saying that we must then treat for peace at once, forgetting that the terms we should obtain would vary with our power of offering further resistance. Such discussion can do no harm provided we preface it by agreeing that it must not lead us into any such large expenditure as might withdraw money from the Navy.

Any serious disaster happening to our fleet threatens us with two great dangers—invasion and scarcity. High prices might mean insurrection, if we do not find employment for those thrown out of work by that dislocation of our industrial system which even a partial blockade of Great Britain would entail. The preparation of complete plans for the fortification of our capital, arsenals, and coast would provide means of putting a large number of civilians to work at very short notice, and thus go far to meet both these great dangers.

With the above proposals I daresay that most of my brother officers will agree, but the question of how much money should be spent on coast defence is more open to question.

One hundred years ago our ancestors erected martello towers from Newhaven to the Suffolk coast east of Ipswich. Fifty years ago they strengthened the line in places, and prolonged it by erecting forts at certain small harbours. Are we wise to spend nothing on improving the defence of these coasts, seeing that the works erected by our ancestors are out of date, and that the development of railways and artillery has made the work easier? Personally, I believe that an expenditure of a quarter of a million a year on true coast defence would not prejudice naval interests, and would go far to completing our defensive system.

1st. The plans will cost little.

2nd. It is necessary that cross-over roads should be put in at about 12 places where we are likely to want to derail troops; otherwise the empty trains may find it hard to get back without delaying full ones.

3rd. A few plantations are desirable, to screen the railways at certain points.

The above proposals would cost very little; and the following could be treated as arising out of the question of re-arming the territorial artillery, which question is pressing for settlement just now.

4th. We must evolve a good type of railway gun of about 5-inch calibre, and a system of indirect laying suitable to it.

5th. We should press for a much larger proportion of horsed 4·7-inch guns with the territorial artillery; it will be far more useful for both coast defence and fortress defence than field artillery. There is no need for the large number (9) of field batteries allotted to the territorial divisions. Owing to the custom of planting trees in our hedgerows, good artillery positions for a long line of batteries are seldom to be found in England.

6th. The volunteer garrison artillery of Kent and Essex should remain garrison artillery, and about 10 permanent batteries should be built for them and armed with two 6-inch guns each, at a cost of about £200,000. These are the coasts where Case I. and Case II. overlap, and which we should certainly have to hold if an invasion be threatened at all. The same number of 4·7-inch guns, with their necessary vehicles, harness, etc., would only cost about a fifth of the above to provide, though more to maintain. But still I agree with Colonel Hickson in thinking the fixed gun the better bargain for certain coasts, because of its remarkable superiority in range, accuracy, rapidity, hard hitting, readiness, and facility of ammunition supply. But I do not agree with him in thinking 9·2-inch guns necessary for true coast defence, for our object should simply be to keep the enemy's transports at a distance. The 6-inch gun will suffice for this, and if the enemy does force a landing, all the guns except those close to the landing place can be got away and re-used in the defence of London.

Let us discuss these questions in public, and then finish or prepare the needful plans in secret.

COMMUNICATION IN THE FIELD.

By Capt. R. C. Hammond, R.E.

Thorough co-operation between all units of an army is essential for success in the field of battle, and it can only be possible when all the units are connected by a reliable and simple system of intercommunication.

Now that our army has been reorganized, and the division selected as the tactical unit, it should be of general interest to ascertain how far the organization of our communication units has been adjusted to suit the new conditions, and also to what extent their further reorganization may be desirable.

It will probably be conceded that a good system of communication must provide for the following requirements :—

(1). Maintenance of communication from the base to army headquarters, and from army headquarters to the component parts of the force.

(2). Lateral communications, where necessary, between different units.

(3). Internal communications within units.

Also that it must fulfil certain conditions, viz. :—It must be in harmony with the new divisional organization; it must be sufficiently elastic, so as to permit in any situation of the employment of that method of communication which will give the quickest results, combined with accuracy. For experience teaches us that no method is sufficient in itself, and, as occasions arise, one method may have to be replaced or assisted by another.

It is proposed first of all to describe the various means of communication available for military purposes and to consider the defects of our existing system of communication, and then to submit reorganization proposals for overcoming these defects.

I. Means of Communication Available for Military Purposes.

The following methods are available :—

(1). *Electrical*, including telegraphs and telephones.

(2). *Visual*, including flag signalling by semaphore, flag signalling by Morse code, lamp signalling, and heliographs.

(3). *Manual*, including foot orderlies, mounted orderlies, cyclists, and motor cars.

To enable us to correctly appreciate the relative merits of the above methods, perhaps it would be well to give here a short description of each.

(1). *Electrical.*

There are two kinds of lines used in military telegraphy:—First, a conductor of bare wire supported on ebonite or porcelain insulators fixed to poles, buildings, or trees; and second, a wire conductor enclosed entirely within a non-conducting sheath of gutta-percha or india rubber. The former is called "airline" and the latter "cable." "Airline" takes considerably longer to construct than cable, but it is more reliable, and should always be employed where speed in construction is not of the first importance, and where a sufficiently permanent character is required to be given to the line. An "airline" wagon carries one complete office and five miles of wire, with the necessary poles and stores. The line can be built at an average rate of one mile an hour; this, however, will vary very much with the nature of the route. Twenty miles is a good day's work for four detachments, each detachment consisting of a commander and 11 working numbers, with three drivers and one wagon. The Morse alphabet is used with the short and long signals, commonly known as dots and dashes; and by this method a skilled operator will send and receive 25 to 30 words a minute. The usual custom is to work D.C. (double current) simplex, using a sounder and relay; when, however, this is not sufficient for carrying on the work, the carrying capacity of the line can be increased by fitting the offices for duplex or Wheatstone automatic, thus permitting the simultaneous transmission on the line of two or more messages. Another method of increasing the working capacity of the line is to make provision on the same wire for both Morse and vibration circuits, which can work independently of each other. This arrangement permits, if desired, the simultaneous use of telephone and Morse instruments.

"Cable" has simply to be paid out, and is allowed to rest on the ground. It is less reliable than "airline," as its position on the ground renders it particularly susceptible to faults and accidental breakages. It is only suitable where communication is quickly required for a short time, and if used in the first instance to save time in unsuitable positions, it should be replaced as quickly as possible by "airline." "Cable" should also be used for tactical purposes when the line has to be laid down and picked up again with rapidity. A cable wagon, with its attendant light spring wagon, carries 10 miles of cable, which can be laid at from four to six miles an hour; the process of laying the cable does not interrupt communication, as the operator seated on the wagon can send and receive messages whilst on the move. The instrument generally used with "cable" is the

"telegraph set vibrating." This is portable, and can work efficiently through a cable which has but poor insulating covering. Telephone instruments are provided on both airline and cable circuits, and are useful for conversation between officers, or for persons not conversant with Morse code. "Airline" and "cable" are, of course, equally liable to be cut or tapped by the enemy, but faults can always be located and repaired very quickly.

Telegraphy, as a means of communication in the field, possesses several distinctive merits, in that it combines great speed and reliability with considerable rapidity of construction.

Permanent (P.O.) Lines.—In addition to constructing field lines, as above, the Telegraph Companies are prepared to take over and maintain all civil lines and offices in the theatre of war; and this necessitates a high technical knowledge of the instruments and systems employed in post office telegraphy.

Wireless Telegraphy is still in its infancy, and cannot yet compare in speed or accuracy with airline or cable; and as in addition it cannot be worked "duplex," its capacity for work is somewhat limited. It is very variable, and greatly affected by the constantly changing conditions of the atmosphere; also, from its nature, it is impossible to obtain the same security and secrecy as with wire conductors. We have every reason, however, to expect that in time many, if not all, of these defects will be removed, and that "wireless" will become of great practical value for military purposes. It will probably be found most useful in maintaining communication between ships and shore, between headquarters and advanced cavalry, or in similar situations, where topographical or tactical considerations would forbid the use of wire. Our military installations are now worked on a modified "Lodge Muirhead" system; one complete station is carried in a limber wagon, and can, under normal conditions, communicate with a similar station at a distance of 50 miles.

Telephones, for communication purposes, possess neither the speed, accuracy, nor reliability of the telegraph, and from their nature are unsuitable for the transmission of secret or code messages; they are very suitable, however, for use over short distances and by persons not conversant with Morse code.

Wireless Telephony is of still more recent origin than wireless telegraphy, and as our military authorities have apparently not yet taken official cognizance of it, it hardly comes within the scope of consideration in this article. Suffice it to say that the American Navy have recently carried out some very successful experiments in this direction. On one occasion constant communication by wireless telephony was maintained between the Navy Yard at Washington and the cruiser *Tennessee* at a distance of 12 miles. As a result the U.S. Pacific fleet have now been equipped with wireless telephone outfits.

(2). *Visual Methods.*

Flag Signalling by Semaphore is an excellent quick method up to 1,000 yards, but if employed in the firing line, the sending operator must of necessity be more exposed than the Morse signaller, who uses a small flag whilst lying flat on his back.

Flag Signalling by Morse Code is practicable up to three or four miles with the small flag, and five to seven miles with the large flag. Both these methods involve a certain amount of manual labour.

Lamps.—The ordinary Begbie oil lamp can be used up to a distance of seven miles, the small limelight up to 12 miles, and the large limelight up to 22 miles; the two latter, however, are somewhat cumbersome, and all three have a wide cone of dispersion, and are liable to disclose one's position to the enemy.

Helios can be read at a great distance. The cone of dispersion is only 1 in 107, so they are not easily intercepted. They are, of course, entirely dependent on sunshine. An efficient signaller will read or send eight words a minute on the lamp or flag; where, however, the distance is so great as to necessitate transmitting stations, some corresponding delay is unavoidable. The chief points to be noted about visual signalling are that very little apparatus is necessary, no great technical skill is required, and there are no wires to be cut by the enemy; on the other hand, its efficient working is entirely dependent on the state of the atmosphere and the configuration of the ground, and it cannot compare in speed with the telegraph, especially over long distances. It has been found impracticable to maintain communication by visual signalling whilst on the move.

(3). *Manual Methods.*

Manual methods, such as foot orderlies, mounted orderlies, cyclists, and motor cars, will be most usefully employed over short distances, for conveyance of maps, photos, etc., and to carry to and from telegraph and signalling stations; also, in the event of failure of other methods, they may be temporarily resorted to for the whole duty of transmission.

Finally, in considering the merits of the above methods of communication, the arguments in favour of telegraphy appear to be overwhelming, and we may assume that it will be employed wherever possible. Still, it must always be remembered that each of the above methods may be of use under certain conditions. During the recent war in Korea the Japanese entirely depended on their field telegraph and telephones for conveyance of information; but when those broke down they had no alternative to fall back upon, and, as a result, communication was at times rendered extremely difficult or even impossible, and the execution of their operations rendered unnecessarily difficult.

At the Battle of Yoshirei the wires of the Japanese field telephone broke, and having no visual arrangements for signalling, and the country being too broken for the movement of mounted orderlies, General Kuroki lost one of his most needed columns during the whole of that day's fight.

Again, at Phœnix Mountain, overlooking Feng-huang-cheng, General Fujii said to Sir Ian Hamilton "The signalling certainly seems to be a weak spot. I can quite understand how useful it would be to have a heliograph on the top of Ho-o-san (Phœnix Mountain) communicating with Antung and Wiju, but continental armies have also neglected visual signalling, and that is the reason our attention has not been sufficiently turned to the subject. No nation has practised this as much as you British, and, now that we have come to a country like Manchuria we see the reason why."

II. DEFECTS OF OUR EXISTING SYSTEM OF COMMUNICATION.

The composition of the field army for service abroad is to be—

1 Cavalry Division,
6 Divisions,
Army Troops,
Line of Communication,

as laid down in War Establishments for 1907—1908.

Let us now examine the system for communication duties in such a force, so as to see whether the distribution and organization is what it should be.

In the first place there is the telegraph system under the R.E., with its Director of Army Telegraphs at Army Headquarters.

Two telegraph companies on lines of communication are responsible for maintaining communication from the base to the advanced base. They utilize the permanent airlines as far as possible. Each company can erect and maintain 100 miles airline, with 10 offices.

Similarly two airline telegraph companies connect the advance base with army headquarters. Each company can erect 80 miles airline. There are also instruments and operators for 16 offices, and linemen for the maintenance of 160 miles of airline, including the 80 miles erected.

Two cable telegraph companies connect army headquarters with headquarters of divisions. Each company can lay down and work eight lines of cable 10 miles long, and three offices are carried for each line.

Two wireless telegraph companies connect army headquarters with cavalry headquarters, and also establish communication over country which is inaccessible to troops. Each company can erect and maintain four wireless stations.

Six divisional telegraph companies connect divisional headquarters as far as possible with infantry brigades, and each company can lay and work two cables 10 miles long.

Regarding the above as a system for field telegraphy pure and simple, the organization seems excellent, and needs no further comment except as regards two points.

First, the establishment of the divisional telegraph company appears inadequate for the work which will be required of it. It will often happen that four lines will be wanted to maintain communication from divisional headquarters to the three infantry brigades and the divisional artillery respectively; and even granted that at times all four lines may not be simultaneously required, the great advantage of having an extra line ready to be laid out to meet new requirements will be quite sufficient to justify an increase of establishment. In this connection it must always be remembered that time must be occupied in reeling up a cable before it can be relaid in a different situation; and the human element must also be considered. Divisional telegraph companies are accustomed to work day and night when necessary, picking up and laying down their cables and working their offices, and often for days at a time men and horses get little opportunity for rest; but there is always a physical limit to the possibilities of endurance, and by cutting down the establishment of such a unit the capacity for work is seriously restricted.

The second point I would draw attention to is that there are no satisfactory means of conveying the messages, when received at an office, to the persons for whom they are intended. This duty is usually carried out by means of orderlies furnished haphazard from the nearest units. These men are not trained for the duty, and are under no immediate authority; the results, as may well be imagined, are most unsatisfactory. Messages do not reach their destination, and, in his anxiety to maintain touch with his brigade, the commander of a cable wagon is often induced to push too far forward into unnecessarily dangerous positions.

In connection with this it might be pointed out that the necessity for providing suitable escort or protection for cable wagons in advanced situations is too often overlooked; and they are thus exposed to great risk of capture by the enemy, when their services can ill be dispensed with.

This lesson was brought home to us during the last Irish manœuvres, when on more than one occasion the enemy's cavalry broke through our advanced posts and captured a cable wagon.

As regards training of *personnel*, the rank and file of the telegraph units may be roughly divided into three classes:—Office telegraphists (operators), who are in charge of offices and instruments; line telegraphists (linemen), who patrol and repair the lines; and drivers, who look after the horses.

Both operators and linemen work together in constructing a line. The operators and linemen receive their training as follows :—

They first do a recruits' course of drill, musketry, and fieldworks at Chatham. They are then sent to one of the field telegraph companies, where for one year they learn construction of field lines (airline and cable) and the principles of working ordinary telegraph instruments. They are then attached to K Telegraph Company for practical instruction in the working of permanent (P.O.) lines. They then return to a field telegraph company for duty during the next training season and for manœuvres. After this, men who are sufficiently qualified and recommended are instructed at the S.M.E. in the more advanced knowledge required by permanent linemen, and in the use, adjustment, and maintenance of the more complicated telegraph and telephone instruments. The result is that all R.E. telegraph units have a very highly trained and efficient *personnel.*

The drivers are enlisted at Aldershot, where they undergo some preliminary instruction ; they then join their field unit, where their training is completed.

It is found a good plan to teach the sappers to ride, and to give the drivers a slight knowledge of line work, as the men are thus more generally useful and available to replace casualties. The men are encouraged in this respect by being granted extra pay according to their qualifications.

Next as regards *matériel.* The new cable wagon is, except for its weight, a great improvement on the old cart. The only adverse points to note are :—There is no automatic arrangement on the airline wagon for winding up airline ; there are not sufficient P.O. instruments provided for instructional purposes ; there is no money grant to assist officers who may wish to investigate and experiment with new instruments and appliances.

The next point to consider is the visual signalling.

The signalling system of the field army is under the Director of Army Signalling at army headquarters.

Divisional signallers are intended to supplement the cable lines laid by R.E. to brigade headquarters, should the latter fail : and brigade signallers to communicate from brigade headquarters to battalion headquarters, and to supplement the infantry telephone lines from brigade headquarters to battalion headquarters.

The establishments of signallers are laid down in *War Establishments,* but it is difficult to see how they will prove sufficient to provide terminal stations at brigade and divisional headquarters. Two examples are taken at haphazard to exemplify this. Turning to page 27, *War Establishments,* we find the signallers allowed for headquarters, cavalry division, are 1 officer, 3 operators, and 1 man, to hold five horses. Now a cavalry division has four cavalry brigades, each of which in the field may, and at the same

time, require to communicate day or night with divisional headquarters. Again, on page 34 we find the establishment allotted to headquarters, divisional artillery, is three signallers and one horse-holder for communication with three R.F.A. brigades, a howitzer brigade, and a heavy artillery battery. It would seem difficult, with this establishment, for a C.R.A. to maintain communication in battle with his brigades; and yet the lessons of the last war show us the great importance of artillery control. The same applies to the establishments of signallers for infantry brigades and divisions (p. 29.—Infantry division: 1 officer, 1 sergeant, 5 operators, 1 horse-holder; p. 32.—Infantry brigade: 1 officer, 4 signallers).

Signalling stations are under the same disadvantages as telegraph stations, in that orderlies for the conveyance of messages are only provided haphazard from any troops which may happen to be handy, without any reference to their fitness for the duty.

In referring to the establishments of brigade and divisional signallers the writer has used the term inadequate, but he might almost have said non-existent, for there is no such thing as a permanent body of brigade or divisional signallers, and they are only brought into existence when required by collecting them from different regiments. The result of thus extemporizing a signalling staff for brigade and divisional services is that the men are not fitted to work together, and that units are depleted of a proportion of their men at a time when they can least spare them—a most faulty and pernicious system, which leads to considerable friction.

The Training of Signallers, like their organization, is entirely regimental, a number of men in each unit being instructed by the regimental instructor and assistant instructor.

Certain officers and N.C.O.'s are sent from all units for a course of instruction at one of the army signalling schools, so as to qualify as instructors and assistant instructors of signalling for their units. The length of each course is about two months, during which time they are instructed in telephony and all the methods of visual and manual signalling. The central school is at Aldershot, and is supplemented by six temporary schools in various parts of Great Britain, South Africa, and India.

The efficiency of the regimental training within units is greatly prejudiced by the difficulties under which it is carried out. There is, in the first place, a difficulty in getting volunteers, owing to the attractions of regimental employment carrying better pay, and to the fact that signallers are not excused general duties. Then, in consequence of the limited time available, the instruction is often necessarily restricted to visual signalling, when it might otherwise be made more varied and interesting by the addition of some map-reading, and messenger and telephone work.

Telephones are now much employed on field operations, but this is

in many cases owing to the initiative and generosity of individual officers. There is not, to the writer's knowledge, any generally recognized system for their employment, nor are any telephonists mentioned in *War Establishments*. Sometimes telephones are worked by the R.E., and sometimes regimentally.

At the commencement of the Russo-Japanese War, as is the case with us now, a very large proportion of the telephones used in the Japanese army had been provided by individuals; afterwards, when their extreme usefulness had been sufficiently demonstrated, the Japanese Government took them over and reimbursed the money that had been expended. Possibly our Government may see its way to improving on the example set by our allies, by providing the necessary telephonic equipment before our next war proves it to be necessary.

It should be particularly noted that the telegraph and signalling systems are quite separate, and that it is a most difficult matter to ensure any co-operation between them. Consequently, they are not always worked to the best advantage; and when it becomes necessary to send a message by the quickest possible way, it is sometimes very difficult to know which will be the best method to employ.

The following "concluding remarks" from a memorandum on this subject, lately issued by the General Staff, Aldershot, will bear repetition:—"One thing cannot be too strongly impressed on commanders and their staffs; and that is the great importance of organizing all services for the transmission of orders and information, *i.e.*, telegraphs, telephones, visual signalling, and orderlies, under one authority within each unit of command; and the necessity for the employment of specially selected and highly trained *personnel* for the service. The economical use, under varying circumstances, of the means of transmission provided, requires a close study and thorough grasp of the subject. If the subject is not thoroughly understood; and if, in the field, the various commands and arms of the service are not linked up scientifically and economically by means of the telegraphs, telephones, etc.; then it would be far wiser to return the *personnel* to the ranks, to handle a rifle, and to save the expense of the equipment."

The question also of intercommunication between the naval and land forces appears to have been lost sight of, though on occasions it might be required. It would usually be effected by visual signalling or wireless telegraphy. The former would present no special difficulties under favourable conditions of atmosphere, etc.; but, with regard to the latter, there is at present a regrettable absence of co-operation and interchange of ideas between the two services. This may, possibly, be due to the fact that, whereas the Navy

employ Marconi's system, the Army favour the Lodge Muirhead system. The importance, however, of being able at any time to establish wireless communication between ships and shore is such as to warrant every endeavour being made to overcome the above difficulties, and to afford opportunities of practising this form of communication.

In conclusion, therefore, some grounds seem to exist for the following criticisms on the present system of communication, viz. :—

(1). Establishment of divisional telegraph company insufficient.

(2). (*a*). Training of signallers not sufficiently comprehensive.

(*b*). Establishment of signallers for brigade and divisional services inadequate.

(*c*). Brigade and divisional signallers, not being a permanent body, have to be found from regimental signallers; and the consequence is that they are unfitted to work together: also, that units are depleted of men at the time when they are most required.

(3). No trained orderlies available for employment at telegraph and signalling stations.

(4). No organization for telephone lines has yet been adopted for the whole army.

(5). No co-operation between telegraphs and signallers; nor are either of these systems of communication sufficiently assisted by manual methods.

(6). Insufficient co-operation between naval and military forces.

III. PROPOSALS FOR REORGANIZATION.

Such being the defects of our existing system, it becomes advisable at this stage to consider the best means of amending them, and the following scheme is put forward as offering a satisfactory solution of the difficulties that have been pointed out.

First of all, it is suggested that the whole problem of communication be entrusted to one communication* corps, so as to combine all the methods available to the best advantage. This corps to be under the direction of a permanent chief, a general officer on the headquarter staff, who would be responsible for all communication work throughout the Army, including telegraphs and signalling.

* It is admitted that the term "communication" may be somewhat inappropriate and almost misleading, but the writer has failed to discover a word which can be more suitably applied to the transmission of messages by telegraphs, signalling, and messenger work.

On the headquarter staff of an army in the field there would be a Director of Communication Units, who would combine the authority and duties of the present Director of Army Telegraphs and Director of Army Signalling.

The units composing this corps would be the R.E. telegraph units as at present organized, but with the addition to each of a signalling and messenger detachment, with the necessary equipment. This would greatly increase the sphere of usefulness of each unit, and make it more self-dependent. This corps would have the entire responsibility for the maintenance of communication from the base to army headquarters, from army headquarters to headquarters divisions, from divisions to brigades, from brigades to battalions, from division headquarters to divisional artillery; also, where necessary, laterally between divisions and between brigades.

But it would have nothing to do with the *internal* communications of infantry battalions, or of artillery or cavalry organizations, which for tactical and disciplinary reasons would be best worked by the units themselves, under arrangements made by their own C.O.'s. Similarly, in the important subject of communication between infantry in the last phase of an attack and its supporting artillery, the C.R.A. ought to be entirely responsible for its maintenance. At this period of the fight, when the opposing infantry come to close quarters, it is necessary to supplement the regular channel through the divisional headquarters by a direct line of communication between the infantry and artillery. This could usually be effected by sending forward, from each field artillery brigade, an observation post of five men, under an officer. This patrol would take up a position, either with the brigadier or in advance of him near the firing line, and would communicate with the guns by telephone, supplemented by visual signalling and orderlies. This and similar questions of internal communications within units demand the earnest consideration of the C.O.'s concerned, but they hardly come within the scope of this paper.

The composition and scope of responsibility of this proposed communication corps having been generally indicated, a detailed description of the communications of a division organized according to the proposed plan is given by way of further illustration.

In place of the present divisional telegraph company, and divisional and brigade signallers, with their inadequate establishments and lack of cohesion, there would be one divisional communication company completely equipped with every available means for maintaining communication, electrical, visual, and manual. Each company to be under one controlling head, viz., the divisional communication officer, who should be a major on the divisional staff, and in the confidence of the general.

The establishment suggested would be a major in command, assisted

by a captain, four subaltern officers, and 236 rank and file, destributed as under :—

	Rank & File.
1 Headquarter section (pay-sergeant, C.S.M., C.Q.M.S., clerks, farriers, collarmakers)	12
4 Field sections, *each* under a subaltern and composed as under :—	
1 Field telegraph detachment (cable and light wagon, two buzzer offices, 10 miles line) ...	12
1 Signalling and orderly detachment (four signalling squads and 20 orderlies)	44
	56
Total—four field sections	224

The equipment required in each section of the above company, for the use of the signalling and orderly detachment, would be eight sets signalling equipment (helio, lamp, flag, telescope) and eight portable telephones (like Medhurst pattern), which could be used on specially laid telephone lines, or for tapping in on the telegraph cables ; also light telephone wire (about 12 lbs. to the mile), which could be simply cut and left behind if necessary.

Each man would have to be provided with some means of locomotion, bicycle, motor-bicycle, or horse.

As regards the training of the signalling and orderly detachment, it is only necessary to note that, being freed from general duties, the men would have a much better chance of becoming proficient, and, in addition to being signallers, would be taught map reading, and be practised as cyclist orderlies, despatch riders, and telephonists. This would make them more generally useful and the instruction more interesting.

The divisional communication officer, after receiving his instructions from the general, would dispose his company to the best advantage. Assuming that the cable company had succeeded in connecting up divisional headquarters with army headquarters, the correct procedure for the divisional communication officer to follow would be to establish, by means of his telegraph detachments, three "communication posts" as near as possible to the larger units of the division ; and, by means of his signallers and orderlies from these communication posts, to maintain constant touch with each unit. The commander of each communication post would keep him constantly informed as to what units he was in touch with. The distribution of these communication posts would be made known to the troops as early as possible, so that each unit would know the distance and position of each communication post, which distance would rarely be more than a mile. Three communication posts only are suggested ; because

usually this number would suffice, and the communication officer would often find it useful to keep one cable wagon in reserve, to maintain touch with the general, should the latter change his position, or to establish lateral communication with another division, or to meet any other contingency.

Exactly the same procedure would be carried out while on the march. The cable wagons would keep as near as possible to the headquarters of their respective brigades, messages would be received and despatched on the move, and the cyclists and mounted orderlies of each section would be available to instantly convey messages, thus received, to their actual destination.

From this it will be seen that the divisional communication officer can remain at the headquarters of the division, and yet maintain absolute control over his unit. He can distribute his unit according to the situation, he can make full use of each means of communication, and, whenever necessary, he can, without reference to anyone, duplicate or replace one method by any other.

Similar but less extensive changes would be required in the cable and airline telegraph company. Their chief aim and object will always be to work their cables, airline, and permanent (P.O.) lines to the utmost, and in that respect their present organization is wholly admirable, and cannot be improved on. But the addition of a signalling and orderly detachment to each company would increase its range of power, facilitate the rapid and reliable delivery of messages, and afford an alternative method of transmission in case of a temporary interruption of the telegraph.

It will constantly happen that one communication unit may be able to help another, or that a transfer of *personnel* or *matériel* from one unit to another will become desirable. With all these units under the control of one head, the director of communications, these changes could be expeditiously and smoothly carried out under his orders, and perfect co-operation throughout the whole system would be ensured.

To be in accordance with the rest of the scheme, it is suggested that the signalling schools should be taken over by the R.E., so as to be under the same control and in harmony with the communication units. They would still be required as schools of instruction for regimental instructors and assistant instructors: the system of instruction in vogue is excellent, and the only alteration proposed would be to increase its scope by giving classes an insight into telegraph work, which they cannot at present receive.

It can hardly be fairly urged against these proposals that they are too destructive, for the abolition of the present system of borrowing signallers from regiments for brigade and divisional duties would certainly be welcomed by C.O.'s, and would be entirely in the interests of the individual units.

Before concluding, notice should be taken of a suggestion which has been made that the signallers should take over the telegraphs and the whole duty of communication from the R.E. Extraordinary as this proposal may at first sight appear, it may possibly be accounted for as follows:—Officers of other branches of the service, constantly seeing our cable wagons at work with troops in the field, are, not unnaturally, apt to get the impression that cable work is the sum total of telegraph work in the field; whereas, in reality, it is but a small and the most elementary portion of it. The objections to the proposal are very strong. They are these:—That the signallers have never been organized in a permanent body for other than regimental work, and do not possess the technical knowledge and experience necessary for conducting a telegraph system; that the R.E. telegraphs, on the other hand, have for long existed as a permanent body, well organized for its work, and capable of fulfilling the demands made on it. This in itself would appear to be sufficient reason for entrusting to them the whole duty of communication; but, in addition to this, since the telegraph is the most efficient means of communication at our disposal, and would, whenever possible, be used in preference to any other alternative, it is only natural to suppose that any combined system of communication would be best conducted by men practised in telegraphy.

It is encouraging to note that the authorities in the Irish command have clearly indicated their determination to grapple with this problem of communication. It is not a year since the telegraph companies were first sent there, yet they have already, during the summer training, been afforded many opportunities of doing useful work; and classes have now been started at Limerick, during the winter months, to enable officers of other branches of the Service to obtain an insight into the methods of telegraph work.

In conclusion, it is only to be hoped that some of the proposals put forward may be given a trial. If on any divisional manœuvres a signalling and orderly detachment were placed at the disposal of the O.C. Telegraphs, it would be quite possible to extemporize some such divisional communication company as above advocated, and to test its value for work. The practical lessons thus gained could not fail to be of incalculable value, and would materially contribute towards the object we have in view—the perfect efficiency of our communication units.

THE FOUNDATION OF THE ROYAL ENGINEER ESTABLISHMENT AT CHATHAM.

By Lieut.-Colonel B. R. Ward, R.E.

II.

Pasley's Methods of Instruction and First Text Books.

"It has been my object," writes Pasley in the preface to the first edition of his *Essays on the Military Policy and Institutions of the British Empire*, "to endeavour to analyze the spirit of military policy and institutions in general, so that if I have succeeded in the enquiry something may be found applicable to all times and circumstances"; and this generalizing tendency of Pasley's mind, so remarkably displayed in the essay as a preliminary to sound practical deductions, is equally exhibited in his educational ideas.

Personal experience and conversation with brother officers in the Corps had strongly impressed the fact upon him that well-instructed and intelligent sappers were the greatest need of the R.E. Department. Well-educated foremen were at that time not uncommon in civil life, and he saw no reason why they should not be trained up to a similar standard in the army.

His ideas on the subject may be deduced from the "General Observations" in the first text book which he published for the use of the S.M.E. in 1814.

He begins by pointing out that whilst everyone who has given any attention to the subject realizes that foremen and overseers in civil life have some knowledge of practical geometry and can understand plans, sections, and models, officers of Engineers must own that such a standard is seldom found in the army. It is true that during peace time the disadvantage of this want of knowledge is not very evident, as there are always several civilian overseers and foremen whose assistance can be readily obtained. But in war time the case is very different, and Engineer officers have "scarcely any resource but their own individual exertions." Even when military artificers, drawn from the Line, are put under the Engineer officers' orders they are less skilled than the men of the R.E. Department.

He next analyzes the reason for the civilian's superiority in skill, and finds it due either to better education at the start or to diligence and ability of the men themselves, but he points out that both these

classes would object to enlist in the Department even if the pay was doubled or even trebled. Artificers who enter H.M. Service are imperfectly instructed, and their pay being fixed and their life unsettled, they have not the same mental stimulus as the civilian, who may either "rise to affluence or sink to poverty or distress *in proportion* as he cultivates or neglects his abilities."

Some superficial observers suppose that this comparative ignorance is due to incapacity, but Pasley lays down as a maxim that in any body of men, however collected, there is always a latent fund of superior talent, which if properly trained may be used to the advantage of the State. In the case of military men, although they have less stimulus than civilians to strive for individual improvement, their habits of discipline and the emulation which can be so easily roused make it easier to improve them as a body, if only their instruction is carried out under the eye of a zealous superior.

Pasley ends his "observations" by saying: "If the remarks upon the causes of the comparative ignorance and consequent inefficiency of the R.E. Department are allowed to be just, it must also be admitted as a natural inference that there is no possible mode of collecting, forming, and keeping up a body of well-educated and efficient military artificers, except by instructing them according to some properly digested system after they enter His Majesty's Service."*

From the above it is evident that Pasley thoroughly realized how the military habits of discipline and obedience, combined with soldierly pride and emulation, formed the psychological basis upon which a zealous commanding officer might erect a solid educational structure, and he cast about accordingly for some well-digested system of education by means of which such training could be carried out. The system which he ultimately decided to adopt was one initiated by Dr. Andrew Bell, a clergyman of the Church of England, and at the time one of the most prominent educational authorities. This divine, in 1789, whilst chaplain at Fort St. George, Madras, had interested himself in instructing the orphan children of the Military Asylum, and in order to counteract the lack of teachers, had hit upon the expedient of making the older pupils help to instruct the younger. So pronounced was the success of this idea that, on his return to England in 1797, he published a pamphlet on the subject, and in the following year a school, conducted on his principles, was started at Southwark. The success of the experiment ultimately attracted so much attention that Dr. Bell was called upon to organize a school system based on "monitorial" lines. Pasley, in 1811, visited one of the schools so organized, and resolved at once to apply the system to the training of his N.C.O.'s and men.

* Pasley's *Course of Instruction, originally composed for the Use of the Royal Engineer Department.* John Murray, 1814, Vol. I., p. 215.

The experiment proved so successful with his Plymouth Company of Artificers, that he submitted proposals to a committee of R.E. officers for carrying it out on a larger scale, and had the satisfaction of finding them officially approved by the issue of the Royal Warrant of the 23rd April, 1812, authorizing the Establishment at Chatham. He first turned his attention to instructing the N.C.O.'s and men in practical geometry, so as to enable them to understand a rough sketch plan or section, and, as he himself says, his method of teaching the subject was similar in principle to the methods laid down by Dr. Bell.

Pasley has embodied, in his first text book written for the S.M.E., the methods he employed for teaching practical geometry and fortification, and his "Directions and Observations respecting the Best Mode of Instruction" are considered of sufficient interest to quote *in extenso*.

"In carrying on the course," he writes, "the learners should be placed in rows, upon forms or benches, with narrow tables before them, and a stage or platform should be raised at one end of the room for the teacher to stand upon whilst he delivers his instructions, in order that the whole class may be able to see distinctly everything which he writes or draws upon the board.

"The teacher must always give the word '*attention*' previously to reading any definition, order, or remark from the book, and ought to take particular care to see that this caution is obeyed. He should read everything in a loud voice, and in a slow, clear, and distinct manner. It is also often proper to read the same definition, caution, or title of a problem twice over.

"When it is proposed to commence teaching a set of men totally uninstructed, they must be divided, either by sitting on distinct seats or otherwise, into parties of not more than six or eight men each. In a very short time, three or four days for instance, the teacher will be able to distinguish the difference of talent in the learners, and will accordingly place those men who show most ability and attention at the head of their seat or class, who will from that time be called monitors. Until he ascertains who are the most fit for monitors he must inspect the performance of every man himself. Afterwards he will inspect only the performances of these monitors. If he finds that they have understood his directions and executed them correctly, he will order them each to inspect their seat, which will be done accordingly; but if any monitor should be wrong he will go on inspecting the performance of the second, third, or fourth man of the same seat, and whoever is right must be immediately promoted to the head of the seat, in place of the former monitor.

"In this manner one teacher may instruct 30 men at the same time with great facility. For if we suppose these men to be placed in five seats or rows, or otherwise to be divided into five parties of six men each, then there will of course be five heads of seats or

monitors. The teacher will consequently have to examine the performances of five monitors, and each monitor will have to examine five learners."*

Later on Pasley gives directions as to how *vivâ voce* examinations of the class should be periodically carried out, explaining the necessity for such examinations in the following words :—

"If the teacher were to go on, according to the method which is most proper at the commencement of the course, reading and exemplifying everything, without requiring explanations, and examining the learners from time to time, although it would be impossible for any of them to be idle, as far as regards the practical operations, yet some of them would, in all probability, content themselves with copying the figures drawn upon the board step by step, without endeavouring to understand the whole chain of operations in the problems they performed, and without attempting to remember, or perhaps even without listening to, the various definitions and remarks read by the teacher.

"The consequence of this is that at the first examination those who have not paid proper attention are sure to expose their ignorance in an unpleasant manner, whilst the more diligent men distinguish themselves by the ability and readiness of their answers and the accuracy of their operations. In order to avoid a similar mortification, every man who has failed once will exert himself to the utmost before a new examination takes place.

"Although a body of men may have commenced at the same time, it may be proper after a certain period to divide them into two classes, placing those who are most perfect in the first class and allowing them to go on regularly with some new portion of the course, whilst the others may be made to do the whole or some part of what they have already performed over again.

"Whenever a body of men are under instruction, if they are allowed to change their seats at will or to sit in the same order in which they placed themselves at the commencement of the course, it will often happen that four or five men of very superior abilities may all be seated together, whilst in some other seat most part of the men may be below par in point of capacity. If they remain in this confused state it will be difficult or impossible to judge truly of the comparative ability of the learners, which, in the R.E. Department, it is very important to ascertain. The teacher must therefore endeavour to put all the seats on a par by dividing the men of abilities as equally as possible amongst them. This may easily be done in the course of a few days, or at least after the first examination, and is an object which should be kept in view throughout the whole course. After any arrangement has once been made for this purpose,

* Pasley's *Course of Instruction*, Vol. I., p. 198.

the teacher should not allow the men to change seats without his order or permission."*

The efficacy of this method of training N.C.O.'s and men was thoroughly proved by the experience of war, and in the preface to the second volume of his *Course of Instruction* (viz., a treatise on fortification) Pasley refers to its success. He writes that the men thus instructed have been found of the greatest service owing to the knowledge they had acquired. They were not only able to execute fieldworks with greater skill and despatch, but also assisted the officers of Engineers in superintending working parties. "Indeed," he adds, "on all occasions in which works are carried on upon an extensive scale the latter is by far the most important and useful manner in which the men can be employed. For example, no less than about 18,000 peasants and 2,000 horses worked, by order of the Duke of Wellington, under the direction of officers of the Royal Engineers, in improving the defences of the frontier of the Netherlands, for some months together, immediately before the great victory of Waterloo; and, by all accounts, the extensive works then in hand were conducted with the greatest regularity and despatch. Now, it may easily be conceived that to have directed such a great body of workmen to proper advantage, by means of a few officers of Engineers, would have been utterly impossible but for the system adopted, of subdividing the various work amongst the non-commissioned officers and privates, each of whom was made responsible for laying out the details of his own portion, and for the direction of a party of from 20 to 100 men, or even more, according to circumstances. During the last year of the Peninsular War, and in the various recent operations in Canada, the same system had been constantly practised with equal advantage, the non-commissioned officers and men of the R.E. Department, who were employed as overseers of military working parties, having on all occasions given the highest satisfaction. Nor has their superior knowledge rendered them presumptuous or intractable; on the contrary, it has evidently produced the most favourable effect upon their character and conduct, and as far as regards personal exertion, it is generally allowed that these men, although mostly composed of artificers, will, with equal ease to themselves, perform nearly twice as much work as any common working party of the same numbers, furnished by other troops, who have not been previously habituated to the construction of fieldworks.†

"Owing to the very recent introduction of the system described, the trained Sappers and Miners were not brought forward in sufficient numbers in any enterprise of importance before the siege of St.

* Pasley's *Course of Instruction*, Vol. I., p. 213.

† Pasley's *Course of Instruction, originally composed for the Use of the Royal Engineer Department*, Vol. II., p. vi.

Sebastian, in which they distinguished themselves. At the assault of Bergen-op-Zoom, in March, 1814, the Royal Sappers and Miners, headed by a lieutenant of Engineers, cut down the palisades, crossed the ditches, planted the ladders, and were the first troops that mounted the enemy's ramparts. At Peronne, a place taken by storm after the Battle of Waterloo, they also had the honour of leading the assault. But the most remarkable instance of the advantages arising from having men of this description was in the siege of Fort Boyer, on the coast of America, which was attacked by the British troops after their failure before New Orleans. The first night of the operations soldiers of the line only were employed. From a want of skill and experience in the nature of the duties required of them, and there being very few Engineer officers to direct, they collected in groups instead of being spread out, as they ought to have been. Consequently, out of one small party of 20 men, 14 were killed and wounded by a single discharge of grape shot, and such confusion ensued that very little progress was made in the course of that night. On the second night of the siege nine men of the Royal Sappers and Miners were employed in addition to the troops of the line. By the assistance of these few individuals the officers of Engineers were enabled to regulate their working party to so much advantage that before morning they had completed a parallel of 200 yards in extent, within 50 yards of the enemy's works, besides approaches in advance, which being filled with sharpshooters, the Americans were unable to show themselves at their guns, and the fort surrendered. It is proper to explain that, as the army sailed from the Mississippi in divisions, the main body of officers and men of the Royal Engineer Department had not arrived at the period of the above attack. The nine men who so particularly distinguished themselves happened to be on the spot before the others, because, being all carpenters by trade, they had been lent to the admiral for the purpose of repairing the boats of the fleet."*

Nor is it only from Pasley himself that we learn the enhanced value of the Royal Military Artificers, whose name was changed to "the more martial appellation of Royal Sappers and Miners"† simultaneously with the move to Chatham in 1812.

Sir John Jones, in his *Journals of Sieges in Spain*, writes: "This change of name operated like magic. Everyone in an instant saw the propriety, nay, the absolute necessity, of the whole body being instructed in sapping and mining, and an institution was created by Lord Mulgrave for that purpose at Chatham.

"The formation of the institution at Chatham was followed by another simple change of equal or even paramount utility, viz.,

* Pasley's *Course of Instruction*, Vol. II., p. ix.
† Pasley's *Course of Instruction*, Vol. II., p. v.

obliging the officers of Engineers, whilst amongst a stated number of the junior of the several ranks of 2nd captain, 1st lieutenant, and 2nd lieutenant, to be for that period actually the regimental officers of the companies of Sappers.

"This measure, by linking together the officers and men, and closely connecting their mutual interests, gave discipline and pride to the soldier, whilst it conferred the utmost benefit on the Engineers, by obliging each officer, during three periods of his military service, to perform regimental duty and to acquire due experience in the drill, discipline, and interior economy of troops. On the strict and impartial observance of this rule, and making every officer take his chance of the station and service on which his company may be employed during the whole period of his being on the list for regimental duty, the efficiency of the Corps of Sappers and Miners, and the zeal and assiduity of the officers, will ever mainly depend. Neither commanding influence nor petty favouritism should be allowed to interfere with this regulation.

"The company at St. Sebastian was the first which entered the field after these great changes, and the men were found useful and intelligent. Since that time each company has been instructed in succession, and a detachment of greater or less strength has borne a useful part in all the military operations of the empire. * * * Indeed justice requires it to be said that these men, whether employed on brilliant martial services or engaged in the more humble duties of their calling, either under the vertical sun of the tropics or in the frozen regions of the north, invariably conduct themselves as good soldiers, and by their bravery, their industry, or their acquirements, amply repay the trouble and expense of their formation and instruction."

So much for the system. Speaking of its originator, Sir John Jones adds:—"On this point it may be observed that a most happy selection was made of an officer as Director of the Institution at Chatham in Lieut.-Colonel Pasley, who, uniting great zeal and unwearied perseverance to good talents, has succeeded in extending the course of instruction far beyond the original objects of the institution, and has filled the ranks of the Sappers with good scholars, good surveyors, and good draughtsmen"; * and such words, penned as they are by so keen and able a critic, plainly show how Pasley's worth and ability were recognized even in those days, before the final test of time had shown the lasting excellence of his system.

* *Journal of Sieges in Spain*, by Major-General Sir John T. Jones, Bart., R.E., 3rd Ed., 1846, Vol. II., p. 347.

TRANSCRIPT.

THE SERVICE OF AERONAUTS IN WAR.

From an article by A. Vegener in the January, 1907, number of the *Eenzhenernee Zhoornal*).

This article is compiled from notes made by the author when serving with the 1st East Siberian Field Aeronaut Battalion and in the Instructional Aeronaut Park, and, after having been passed for revision to the Commandant of the Instructional Park, it is now published, in hopes that it will provoke useful criticism from those interested in ballooning matters.

Organization.

At present there exist in the Russian Army the following aeronaut units:—The Instructional Park, 3 East Siberian Field Battalions (Omsk, Irkutsk, Nikolsk-Ussurisk); 2 Fortress Companies (Yablonna, Vladivostok) and 6 Fortress Detachments (Varshava, Novo-Giorgievsk, Ivangorod, Kovna, Ossovets, and Brest-Litovsk).

The objects of the Instructional Park are laid down officially as follows:—(1), Theoretical and practical instruction of officers temporarily attached, and of rank and file permanently attached to aeronaut units; (2), for carrying out experiments and testing inventions in ballooning; (3), preparation and safe custody of equipment; and (4) the forming in war time of new field units and completing the *personnel* and *matériel* of all existing units.

An aeronaut battalion consists of 19 officers, 673 rank and file, 333 horses, and 250 carriages, and is formed of a headquarters and two companies.

Each company is equipped to send up simultaneously one captive and one signalling aerostat; in exceptional circumstances, however, a single company can supply two separate captive aerostats, with separate forces.

A company with filled balloon is divided into two échelons. The first échelon includes the balloon, one or two gas-holders, with spare gas, a winch wagon, one or two wagons containing accessories for use during ascents, and the travelling kitchen. The second échelon contains the gas-generating apparatus, wagons containing materials (aluminium and caustic soda) for three fillings, various other balloon equipment, and the supply wagons.

The battalion headquarter detachment includes the commandant and his staff, the medical carts and ambulances, tools, armourer's wagon, a travelling kitchen, and the second line transport.

In addition to the above a battalion takes on service a supply of spare equipment and materials for 60 fillings. This is generally left at the base, and drawn on as required. For transport the chemicals alone

require about 450 two-horsed, four-wheeled wagons, or 1,000 single-horsed, two-wheeled carts, or 19 railway trucks.

On service it is intended that a battalion shall be posted to each army corps, and the companies can be detailed to divisions or other detached forces, as required.

The duties of the senior officers in a battalion are as follows:—

The Commandant is immediately subordinate to the Chief of Staff of the Army Corps. Besides his disciplinary duties, he must look to the maintenance of the stores and equipment of detailed companies, but must not interfere with their work. He is included in (and can be the chief of) the reconnaissance section of the army corps staff, by whom all the reports and information sent from the balloons are collected. He must keep the companies posted in the latest information concerning the progress of the campaign, and must supply them with the latest maps and plans. If the army corps staff requires any special observations to be made by a detached company, the order for such work must be sent by the Commandant through the staff of the force with which the company is detached. He will also help the company commanders with his advice and occasionally call meetings of his officers, to consider any technical questions which may arise.

Immediately under the Commandant are the second in command and the quartermaster, the former of whom superintends the technical training of the companies, and the latter looks after their supply and equipment.

The company commander, on detachment, is immediately subordinate to the Chief of Staff of the force to which he is attached. Besides the ordinary command and instruction of his company, he must keep the battalion headquarters informed of his requirements for replenishing his store of materials and equipment. He must ascertain the latest information about the progress of the campaign, and should keep his officers and some non-commissioned officers informed of it; and he must also obtain the latest maps. He details a substitute to act in his absence.

The four company officers should be detailed as follows:—No. 1, in charge of the gas-generating apparatus; No. 2, in charge of the balloon equipment; No. 3 is transport officer, and looks after the horses and wagons; and No. 4 acts as his assistant. When the balloon is in use these officers should form two reliefs, Nos. 1 and 3 working together, and Nos. 2 and 4 forming second relief. But this arrangement can be varied at the discretion of the company commander.

The duties of the officers of fortress units are similar to the above; but the Commandant has himself to perform the duties which devolve on the second in command and quartermaster of the field units, and the company commanders are in this case replaced by station commanders.

WORK IN THE FIELD.

Reconnaissance from aerostats depends mainly on the state of the weather; strong or gusty winds lessen the height of the ascent, render observation difficult, and can even make the ascent of the aerostat quite impossible.

Observing is possible from balloons when the force of the wind does not exceed 6 to 7 mètres per second, and from kites when it does not exceed 15 mètres per second. When the strain on the anchoring rope of a kite aerostat exceeds 1,500 kilograms, ascents cannot be carried out.

With winds of greater strength, and in gusty weather, the aerostat oscillates to such an extent that observing becomes impossible. Fog, snow, rain, or low clouds limit the field of view, and may render observing impossible. In thunderstorms ascents are dangerous.

It is only in exceptional circumstances that observing can be successfully carried out at distances exceeding 4½ miles; but white tents can be seen up to 6 or 7 miles, and camp fires by night up to 10 or 12 miles. Local objects, such as woods, and also steep slopes, impede the survey of ground, the more so the higher they are, the greater the distance, and the less the height of the balloon ascent.

A captive balloon in exceptionally favourable circumstances, and in a dead calm, can ascend to the height of 800 to 1,000 mètres, but balloon ascents do not generally exceed from 200 to 500 mètres, and kite ascents from 500 to 600 mètres.

Aeronauts can be used for reconnoitring, correcting the fire of artillery, signalling, and, in exceptional circumstances, for free runs. All orders for work should be either given or confirmed in writing, and a great point is made of keeping copies and records of all orders received, work done, and reports and sketches sent in by the balloonists, as these are required when compiling the report on the work of the unit at the end of the campaign.

The duties of a company commander, on receipt of an order to carry out a reconnaissance, include the following:—

(i.). He must decide on the place and time for filling the balloon. For making hydrogen, water is essential, and therefore the place must have a good water supply. The water need not be fit for drinking, and may even be sea-water, and the quantity required for making and cooling the gas is from 3,000 to 4,000 gallons per hour. Most of this can be used a second time, but after it has been passed through the refrigerator it becomes unfit for drinking, and therefore the place chosen, if on a stream used for other purposes, should be below the horse watering troughs. It should be beyond the range of the enemy's artillery fire, and yet not more than 2½ to 3 miles from the place chosen for the ascent. Plenty of time must be allowed for filling the balloon; the operation for a balloon of 640 cubic mètres, by the alkaline method, takes two hours, and, including preparatory work, four to six hours. A balloon once filled can work with occasional filling up, under favourable conditions of weather, for seven days.

(ii.). He must select a suitable officer to carry out the reconnaissance, being guided in his choice by the capabilities of the officer, his nervous temperament, keenness of vision, ability for transmitting what he sees to paper, etc. In case of prolonged observation, or in case of accident, he must detail a roster of officers to relieve the observer when necessary.

(iii.). He also details an officer, who should not be the one chosen first for observing, to superintend the generation of gas.

(iv.). He must decide on the place of ascent. In this he must be guided by the desirability of having the sun behind the observer during the period of his reconnaissance, and the place must also be accessible for the balloon and winch wagon, and convenient for free management of the balloon ascent.

(v.). He must select the road of approach, which should, if possible, be screened from the enemy's view. At the place of ascent the winch wagon should be concealed from the enemy.

(vi.). And, lastly, he must himself superintend closely the whole progress of the work.

The tasks allotted for reconnaissance may vary in character, as follows:—

(1). When a definite object is detailed for observation. As, for example, "How the enemy is posted in village A," or "The actual position of certain batteries," or "To make a sketch of village C," or "To determine whether the enemy has stores, reserve forage, fuel, etc., in village C."

Or (2) when a definite point of observation is not detailed. As "To decide on the positions of the enemy along the whole front of a position."

In these cases the place for ascent can be chosen chiefly for its convenience for observing, and constant conversation on the telephone should not be allowed to distract the attention of the observer. The results of the observing can generally be kept back, to be included in one general report at the end of the day's work, except when anything of extreme importance (such as the movement of the enemy to a new position or the pitching of a camp within range of shrapnel fire) is noticed. The report should be accompanied by sketches or pencil tracings of the map, on which the results of the reconnaissance are shown in ink or coloured pencil. Local objects, which might serve as landmarks to troops making use of the reconnaissance, should be marked on this map.

The report, when finished, is sent to the Chief of Staff of the force, and a receipt for it should be given on the envelope and returned to the company. This is attached to the office copy of the report and sketches, and carefully preserved in the company records.

(3). The third kind of reconnaissance, varying greatly from the other two in the method of reporting results, is when the balloonists are ordered to carry out a continuous observation of the movements of the enemy, either generally, or over a specified area only. In this case, besides convenience of observing, the place of ascent must be convenient for passing on the information received, and consequently its selection must be shared by the Chief of Staff. The communication between the balloon and earth is carried on by telephone, and the reports may be sent on either by telephone or by mounted orderlies.

There should, if possible, be two observers in the balloon, and of these one should be an officer especially suited to the allotted task, and belonging either to the general staff, engineers, artillery, or topographical corps. The officer chosen should have had some previous experience in balloon ascents, as otherwise little useful observation could be expected of him, and he would find difficulty in comparing the ground with the map.

Two more officers, or trained non-commissioned officers, are required below. The method of working is as follows:—No. 1, in the balloon, observes, while No. 2, with the telephone transmitter attached to his head, follows the observations on a map, and passes them on down the telephone. No. 3, below, is similarly equipped with map and telephone transmitter, and he repeats aloud, following it on the map, the information sent by No. 2, giving that officer the opportunity of correcting any mistake or inaccuracy, and No. 4 notes it down in a field book.

Except in special cases (as when artillery is seen to be moving into position or a column advancing to the attack) these reports should only be sent down at the end of each quarter of an hour, and they are collected by the company commander, and, except in especially urgent cases, are sent on to the Chief of Staff at the end of each hour.

At the end of the day's observing a general report is sent in of the results of the work, and any sketches which No. 1 may make are forwarded either with this, or with one of the hourly reports.

On the envelopes containing these reports the words "From balloon" are written, in the place in which the degree of urgency is usually noted.

(4). The fourth, and most responsible and difficult of all the classes of reconnaissance, is that carried on during a battle. This is essentially very similar to the third kind, but all reports must be sent forward without delay. In case of the discovery from the balloon of a turning movement or concealed approach of the enemy against some point in the position, the company commander must first send a special report of it, by a trustworthy messenger, to the officer commanding at the threatened point, marked "Very urgent, from balloon." He next reports it to the Chief of Staff, adding the information that the news has been sent to the threatened point, and that he is about to send a duplicate, in case of the loss of the original message. This duplicate is sent forthwith by another orderly, and as far as possible the progress of the orderlies is watched from the balloon, so that if both fail, a third may be despatched. In this case the return of the receipted envelope is a matter of extreme importance.

Correcting the Fire of Artillery.

For this work the company is placed at the disposal of an artillery commanding officer, and with him the company commander selects the place of ascent. In this they must be guided both by the convenience of observing, and also of promptly reporting the results to the battery. About a mile in rear, and 600 yards to a flank of the battery, is the most suitable position.

It is necessary for accurate observing that the battery should fire either one gun at a time, or by section or whole battery salvos, in the latter cases all the guns being given the same elevation. They should then wait until the correction is completed before they fire again.

In this observing the results are sent by telephone by No. 4 to the battery. When about to fire, the battery commander sends information to the balloon of the number of guns and the nature of the shell (as "One with shrapnel" or "Section with melinite," etc.), and then sends

the word "Fire," as otherwise the observer may not be on the alert and may fail to notice the strike of the shell, from which only any result can be obtained.

The observer sends down the result of the observation, such as "Short 40 *sazhens*, to right 100 *sazhens*," or "Hit, fire seen in village," etc., etc.

In the absence of telephones the results can be conveyed by pre-arranged signals hung from the balloon.

When artillery fire is being observed from a balloon, it is natural that no other batteries must fire at the same target.

The greater the height of the balloon ascent, the better generally are the results of observing artillery fire.

When there is a good plan of the target, it is useful to divide it into 1-inch or ½-inch squares, and to number them. These plans are then supplied to the balloon and to the battery, and the corrections are shown by squares. This method was used during the bombardment of Sandepu on January 28th, 1905.

SIGNALLING.

Signalling from balloons is carried out when other means of passing information appear to be impossible or exceedingly difficult, and also for the simultaneous distribution of orders and directions to several bodies of troops, which may be at some distance apart. It is carried out by day by means of combinations of frames, in the forms of balls and cylinders (which are visible to the naked eye up to 4½ to 5 miles, and with Zeiss field glasses up to 10 miles), and by night by means of lights.

Signalling may be done in two ways; the first of which is when it is required to carry on conversation between two points, both of which are supplied with signalling aerostats. In this case one station calls up the other with a special signal, and keeps it up until the other repeats it, after which it is taken down. The message is then sent in the same way, no signal being taken down until it has been repeated correctly by the receiving station. If the answering signal shows that the original signal has been read incorrectly, the sending station either leaves its signal up or hauls it down, and after a short pause sends it up again, to call the attention of the receiving station to its erratic reading of the signal. A special sign shows the end of the message.

The second form of signalling is when a single aerostat is used for sending a message which requires simultaneous action in several places. In this case the meaning of the signal may possibly not be divulged even to the company commander; but it is most important that he should get his orders in writing, and that they should specify exactly the form of the signal, at what time it should be hoisted, and for how long. When a signal is hoisted the fact must be reported to the Chief of Staff of the force.

Night signals can be used as marks for orienting special lines and for conversation by the Morse code.

F. E. G. SKEY.

REVIEW.

BEHELFSBRÜCKEN-VORSCHRIFT. 1907.

THIS is the German handbook of temporary bridges, and contains all the instructions issued on the subject except those for pontooning, which are dealt with in a separate manual.

Like all German regulation books, it is small, compact, and exhaustive; this volume has 139 pages, about 6″ × 4½″.

The principal contents are:—

I. Reconnaissance and choice of bridge sites.
II. Collection and testing of available *matériel*.
III. Preliminary considerations, such as measures against drifting obstacles, wind, flood water, and ice; proper distribution of working parties; sufficient supply and reserve of *matériel*, etc.
IV. The various kinds of bridges.
V. Heavy, medium, and light bridges, in which pile, trestle, lock, boat, cask, and raft bridges are described.
VI. Testing, strengthening, and repair of bridges.
VII. Protection and guarding of bridges.
VIII. Ferrying and transport of troops over water with extemporized *matériel*.
IX. Heavy and railway bridges on the lines of communication.

There are some very useful appendices printed on coloured paper—with a view no doubt to their being easily found—giving separately for heavy bridges, and heavy line-of-communication bridges, the size of timber rails and girders required for various spans from 1 to 8 mètres, with 5 or 7 baulks, 2, 3, and 4-legged trestles, etc., so that the exact material required for a particular span can be seen at a glance. There is nothing new or novel in the diagrams, or in the methods proposed; the value of the book lies in its compact form.

'E.'

NOTICES OF MAGAZINES.

Revista de Engenheria Militar.

October, 1907.

Concerning the Creation of the Supreme Council of National Defence (*concluded from the September number*).—The author continues the discussion of the advantages and disadvantages of alliance with Great Britain, and the effect on Portugal of the *entente cordiale*, the Anglo-Japanese alliance, and the meetings of King Edward with King Alfonso at Cartagena, and with King Victor Emmanuel at Gaeta. He also points out the value, to Great Britain, of a friendly Portugal, in the event of a maritime war between the former country and Germany. He presses for the conclusion of a military convention between England and Portugal, and for the defence of the Bay of Lagos.

Some Considerations concerning the Field Balloon Park belonging to the Ministry of Marine (*concluded*).—The author continues his description of the material, and concludes by making certain proposals for its improvement.

Some Extracts from the Report of the Engineer, Rego Lima, on his Mission to the Mines of Cassinga, 1898 (*continued*).—The article continues the detailed geological description of the Bundambungo district.

Coast Defence.—A transcript of the transcript which appeared in the *R.E. Journal* of the article by Major Mielichhofer in the *Mitteilungen über Gegenstände des Artillerie-und Geniewesens*. It is interesting to note that the *R.E. Journal* is studied in Portugal, and that an English translation is preferred to a German original.

November, 1907.

The Military Operations in the South of Angola.—The military operations, which have been in progress for the purpose of reducing to obedience the inhabitants of the Cuamatas district, have been brought to a successful conclusion by the capture on the 24th September of Little Cumato, and on the 6th October of Grand Cumato, after a difficult and trying march, during which the natives offered a vigorous resistance. The executive of the *Revista* offers its congratulations to the troops who took part in the operations.

PRACTICAL INSTRUCTION IN MILITARY ENGINEERING AT THE ARMY SCHOOL.—By Capt. João d'Oliveira.—It is the object of the author to compare the present state of instruction, at the Army School, with what it was when he was a cadet there in the years 1889–92. His recollection, of the courses of instruction, is that they were of but little practical value in fitting him for the position of an engineer officer, and from a close study of the existing programme of studies, he comes to the conclusion that there has been but little improvement during the last 15 years.

NEW INSTALLATIONS OF THE INSTITUTE OF THE INFANTE D. AFFONSO.—This institute is intended for the education of the daughters of military and naval officers. This paper gives details concerning the building, its drainage, and hot and cold-water systems.

JAPAN AND THE UNITED STATES. THEIR NAVAL POWER.—A transcript of an article by Admiral Touchard, of the French Navy, which appeared in the *Correspondant*. It considers the relative naval power of the two nations, and the probable course of events should war break out between them. It was written before orders were issued for the despatch of the United States fleet to the Pacific, so is not quite up to date. The author considers that the first blow struck by the Japanese would be against the Philippines, that a force of 50,000 men might be landed at Cavite, Manilla taken in reverse, and Guam captured by the fleet. Hawai would next be taken, and perhaps used as a base against San Francisco, if the United States fleet had not arrived to protect it. Sea power will be the deciding factor. If the United States fleet is in the Pacific, and it Honolulu, Guam, and Cavite are fortified, the task of the Japanese becomes much more difficult. A Japanese army could not be landed in the Philippines until any American naval force that might be in those waters had been beaten.

'M.'

REVUE DU GÉNIE MILITAIRE.

November, 1907.

THE INFLUENCE OF THE SIEGE OF PORT ARTHUR ON THE CONSTRUCTION OF FORTS.—*A continuation of the previous article.*—As long as the hills Ouglovaia and Takushan were in the hands of the Russians, they commanded Taho Bay, Pigeon Bay, and the plain lying between the latter and the west front. Until Ouglovaia was captured it was impossible for the Japanese to attack from the west. By the capture of Takushan and Siaokushan, however, they were enabled to attack from the north-east. On Takushan the Japanese constructed an observatory, from which they could observe their artillery fire and direct their assaulting columns. It

is clear, therefore, that if the Russians had fortified Takushan in any adequate manner, they could have held it much longer, and so postponed the development of the Japanese attack. Had the fortifications of Port Arthur been finished before the outbreak of war, the Russians could have devoted some labour to Wolf Hill, and have constructed an advanced position here. Wolf Hill commanded the principal roads to Port Arthur, and also the valley in which the Japanese formed their siege depôts. As long as Wolf Hill was held, the Japanese would have been unable to bring up their siege material. These various instances illustrate the important part that advanced positions may play.

During the cannonade, which preceded the Japanese assaults, the Russian guns were completely silenced. This was due to their exposed positions and the absence of shields. In addition, the want of head and overhead cover rendered it impossible for the garrisons to man the parapets of the works, and they were compelled to take refuge in underground shelters. Some of the works were even unable to maintain a look-out. Owing to this, one of the Panlong redoubts was captured by the Japanese, without the Russians in the next work, only 350 yards away, discovering the fact. Under these circumstances it was, of course, impossible for the works to support each other. It is clear that in future every work must be provided with armoured look-out stations and bombproof caponiers, from which infantry and machine-gun fire may be brought, even during the heaviest bombardment, to bear on the intervals between the works. At Ehrlong some caponiers were improvised at the ends of the gorge to flank the intervals. It is estimated that the fire from these caused more than 3,000 casualties among the Japanese.

In future the distance between works should be limited, not by the range of the rifle, but by the range of the search light. The maximum interval appears to be about 1,100 yards.

The Chinese wall, although a relatively feeble obstacle, played a great part in checking the Japanese assaults. They were only able to pass it at points where it had been virtually destroyed. It therefore seems desirable to close the intervals between the permanent works with a deep, permanent ditch and a musketry parapet—the ditch to be flanked by caponiers at each end. This ditch would also protect the batteries situated behind the intervals between the forts, and thus do away with the necessity of providing an infantry garrison for each battery.

It is a mistake to construct temporary works—as distinct from advanced positions—outside the line of permanent fortifications. The enemy's attack should be awaited on the line of the permanent forts, which will be presumably the strongest line of defence. Temporary works should be constructed inside the line of permanent forts, to check the enemy if he succeeds in penetrating the main line.

The need of bombproof shelters, for the infantry in the intervals between the forts, was much felt during the siege. The number of shelters required appears to be: (1) two to hold a half-company each for the garrison of each interval, and (2) one to hold a company for the supports. In addition, shelters must be provided for the reserve of each section.

It is most important that the interior of the fortress should be well screened from view. This can be best done by planting trees.

December, 1907.

It is now generally recognized that all batteries must be hidden, and must use indirect fire only. It does not seem necessary to use concrete in the construction of batteries; earthen parapets and traverses stand shell fire almost as well and are more easily repaired, besides being far less expensive. A number of alternative earthen batteries should, therefore, be constructed, a few concrete bombproof casemates being provided near them, to shelter the gun detachments when necessary.

The Russian batteries, which were situated in the main line of defence, were all captured during the early stages of the siege. It is, therefore, clear that the batteries should be placed some distance behind the line of principal works, so that the enemy must pierce the latter before he can assault the batteries.

It seems desirable to mount only two guns in each battery, so as to reduce the enemy's target as much as possible. The batteries should be arranged in several lines; field guns nearest the enemy, then howitzers, and lastly long range, heavy guns. The batteries should be organized in groups of five or six, with an observatory for each group. Guns that are required to repel an assault should be kept under cover till the last moment.

Ammunition sufficient for three days should be stored in the battery magazines. An intermediate magazine, placed some 300 yards in rear of the group of batteries, should contain a five days supply of ammunition. This magazine should be replenished directly from the main magazine of the fortress.

Every fortress should be provided with a railway, which should be laid and kept in working order in peace time. It will then be available on mobilization for the transport of stores and material. This railway should run behind the batteries, and ample spare material should be provided, so that it may be extended to any fort, battery, or magazine as may be required. The railway must be carefully concealed from the enemy. As steam locomotives betray their presence by smoke and noise, some other means of traction seems desirable. In addition to the railway, there should be a network of good roads connecting all parts of the fortress, and silent mechanical transport should be provided for use on these.

Search lights will be indispensable in future. The *rôle* of fortress search lights will be to discover any massing of the investing troops, to hamper sapping, to reveal the approach of assaulting columns, and to ward off the beams of the enemy's search lights. The following search lights will be required:—One large light in each fort or intermediate work, two smaller lights in the gorge caponiers of each work to flank the intervals, and two small lights in each interval to light the ground in the immediate vicinity. The latter should be mobile lights, fitted with

dynamos and engines, so as to be quite independent. The search lights should be controlled by the artillery, so that lights and guns may work together.

There should be two telephone systems in a fortress; the first to be devoted entirely to the artillery, and the second to connect the infantry works with each other, and with the general staff. Only underground cables should be used, and these should be laid in wooden channels. In the zone exposed to direct artillery fire the cables must be laid deep enough to escape damage by the heaviest shells. Elsewhere, the depth need not be so great. Each work should be connected to the general staff by two alternative routes.

Wireless telegraphy should be utilized to connect the fortress with (1) towns or fortresses in its vicinity, (2) with advanced positions and outlying forts, and (3)—in the case of coast fortresses—with the fleet.

The garrison of Port Arthur was originally fixed at 11,300, or 760 men per kilomètre. It actually amounted to 41,016 at the beginning of the siege, and of these 34,503 were effective. The garrison was distributed as follows:—Coast batteries, 1¾ battalions; first line, including advanced positions, 25¼ battalions; general reserve, 7¼ battalions; garrison of the citadel, 13 battalions of militia, and one company. It will be noticed that the general reserve amounted to only one-sixth of the total force. Shortly after the Japanese commenced their attacks the general reserve had dwindled to two battalions. By November the companies had been reduced to between 60 and 70 effectives. The infantry were divided into three reliefs. The first relief was on duty in the works, the second relief was employed on repairing the damages caused by the enemy's fire, and the third relief slept, one-half being fully equipped. The infantry, therefore, only got one night's sleep in three. This so severely affected their health that at the end of the siege there were only 5,000 men really fit for duty, 12,000 only nominally effective, and 26,000 sick.

Judging by the experience of Port Arthur, the author calculates that a fortress, with a circumference of 56 kilomètres, will require a garrison of 129,000 infantry, allotted as follows:—

23 forts at 400 each, and 23 intermediate redoubts at 200 each	14,000
Garrison of the front attacked (two intervals) ...	5,000
Remaining intervals	20,800
Local reserves	12,900
General reserve	76,300

These numbers will allow of one night's sleep in two. After five months siege the number of effectives will be reduced by a half, and the general reserve will then amount to 11,800 only. The writer calculates that 10 fortress companies, four railway companies, a telegraph battalion, and three balloon sections would be required for this fortress.—*The article will be continued.*

EMPLOYMENT OF TRACING PAPER FOR GRAPHIC SOLUTIONS.—A short description of a method of solving geometrical problems by the help of a sheet of tracing paper, on which are drawn the variable elements in the problem. This is laid over a sheet of ordinary paper, on which the constant elements have been laid down. The tracing paper can be given a movement of translation, or rotation, or a combination of both. The following is a specimen of the problems which can be solved in this manner:—

A right angle ABC moves in such a manner that the line BA passes through a fixed point on the axis OX. The apex B moves at the same time along OY. The length BC is constant $= l$. Find the intersection of the curve traced by the point C with a given straight line, which is parallel to OX, and distant b units from it. The equation to be solved is then $b^2(l^2 - x^2) = (ax - x^2 + l^2)^2$. By the aid of the tracing paper the graphic solution of this formidable equation is made easy.

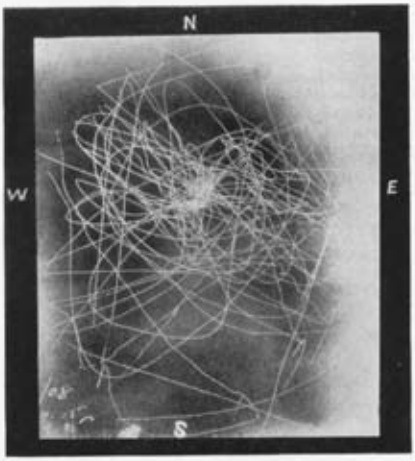
J. E. E. CRASTER.

CORRESPONDENCE.

EARTHQUAKE AT JAMAICA, 2ND JANUARY, 1908.

SIR,

I enclose you a seismographic record of an earthquake which occurred here on 2nd January last, in case you may consider it of sufficient general interest to publish in the *R.E. Journal*.



KINGSTON EARTHQUAKE, JANUARY 2ND, 1908.
SEISMOGRAPH RECORD.
Time—8 hrs. 9 mins. a.m. Duration—20 seconds.
Max. Horizontal Movement—0·314 inch.
Magnified 12 times.

This earthquake is described, amongst others, in the following cutting from the Jamaica *Daily Gleaner* of 7th January last:—

"This rather large series of local shocks was followed by the severe shock of January 2nd. It occurred at Kingston at 8 hrs. 9 mins. 15 secs., and its intensity all over the island was about the same, and between Nos. III. and IV. of the earthquake scale.

EARTHQUAKE

"At Kingston its duration was 20 seconds; the general direction was from S.E. to N.W., and the movement was 0·314. But this recorded movement included both the elastic waves of the seismologists and the undulations of the ground to which I have frequently called attention.

"At Chapelton there were tremors for 3½ seconds, then there was a pause for 1½ seconds, then tremors again for 5 seconds, and finally undulations for 5 seconds, making altogether 15 seconds. There was no doubt about the undulations, they could be seen as well as felt, and the water in a large iron tank was dashed from side to side."

The earthquake did practically no damage in Up Park Camp, as the buildings there are now built so as to resist earthquakes, but it caused a good deal of damage in other parts of the island.

The disastrous earthquake of 2nd January, 1907, was of an intensity of VI. on the earthquake scale, but as any recording instruments then existing were wrecked, no seismographic records of it were obtained.

The ruin produced by that earthquake, and the small amount of restoration that has so far been effected, must strike anyone coming here for the first time almost in the nature of a shock, and an interesting report of the extraordinary freaks and vagaries of earthquakes, might be written.

Probably, however, none but those who come into close contact with earthquakes take much interest in them.

I am indebted to Mr. J. F. Brennan, of the Public Works Department, Kingston, for this interesting record.

W. R. STEWART,
Bt.-Col., R.E.

The Editor, *R.E. Journal.*

RECENT PUBLICATIONS OF MILITARY INTEREST.

JANUARY, 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.

EIGHTEEN MONTHS WITH RUSSIA'S ARMIES IN MANCHURIA. VOL. II. (Achtzehn Monate mit Russlands Heeren in der Mandschurei). By Major Freiherr von Tettau. 483 pp. Seven maps and numerous photographs. 8vo. Berlin, 1907. Mittler. 8s. 6d. (For Vol. I. see page 8 of No. 1).

This volume continues the narrative from the close of the Battle of Liao-yang to the end of the war; it is fully equal in dramatic interest and military value to its predecessor. Major von Tettau continued to be attached to the 10th Army Corps until it was broken up during the Battle of Mukden, but he is able to give an excellent account of the action of the other corps from Russian sources, so that the volume is practically an account of the Battles of the Sha Ho, Hei-kou-tai, and Mukden from the Russian side. It is very rare that such a clear narrative is obtained from the unsuccessful side so soon after the events; the book might very truly have been entitled "The Causes of Russian Defeat"; it is worthy of the closest study.

A good deal of light is thrown on General Mishchenko's raid; the orders for it are given *in extenso*. The intention is thus stated:—"I have decided to attack the station Ying-kou (where there are great magazines), and to destroy it completely." The raid was carried out at a walk. One charge only was made—against some infantry firing from behind a wall. The greatest care appears to have been taken to keep well away from Japanese troops and their line of communication, the Dalny-Liao-yang railway. Yet among the younger cavalry officers, at any rate, General Mishchenko, though an artilleryman, was considered to be the best cavalry leader in the Russian Army, and there seems to have been considerable difficulty in replacing him, for during the 41 days that he was on the sick list, wounded, no less than 11 senior cavalry officers were tried as a substitute for him.

The geographical objective seems to have been the favourite one with the Russians; as the author says, "the objective of the attack was not the annihilation of the enemy, but the conquest of a piece

of ground . . . which had no significance in relation to a decisive victory"; "the objective was not to defeat the enemy, or even to separate him from the rest of the army, but it was to drive him behind the old railway dam."

Taking no risks was characteristic of all the Russian operations. General Kuropatkin had a number of fortress guns brought down to the Sha Ho lines by field railway. "Towards the end of February, when the decisive moment approached, the thought uppermost in everyone's mind was to get the guns away in safety as soon as possible." Careful arrangements were made, not only to guard the flanks, but the rear; but the flank detachments (*e.g.*, Dembovski's at the Battle of the Sha Ho, which actually overlapped the Japanese left flank) remained in "positions," and would not take decisive action.

The attacks were always of the "progressive" nature; at the Sha Ho, Lieut.-General Stakelberg's army (Kuropatkin's "direction" to him is numbered 10,053 (!)) was to begin the battle and obtain a decisive result on the Japanese right flank; when this was attained the other armies were to attack. The Battle of Hei-kou-tai affords another example. General Kuropatkin's "direction" was to the effect that the "2nd Army should begin the attack alone, and gradually capture the fortifications of the Japanese left wing. The attack of the other armies, which were to hinder the enemy from sending reinforcements to his left wing by demonstrations, was to be dependent on the progress of the attack of the 2nd Army." The tactical ideas of the commander of the 2nd Army were quite in accord with those of the Commander-in-Chief, and he, also, sent his troops into action progressively, with the result that hard fighting was only done by the 1st Siberian Army Corps, whose commander (Lieut.-General Stakelberg) "possessed initiative and enjoyed responsibility" (*Verantwortungs-freudigkeit*); thus it happened that only one of the three armies, and only one-third of that army, was engaged, while more than eight-ninths of the Russian forces looked on. Lieut.-General Stakelberg lost 6,891 men, 29 per cent. of the strength of his corps; he was removed from his command and sent back to Russia. He and his corps had been brought from the extreme left of the Russian line to the extreme right, for the special purpose of making a decisive attack.

During the progress of this puzzling battle the Russians took a "rest day."

At Mukden, on the 6th March, there is the same strange picture: "An army of 370 battalions is to attack; the attack is entrusted to the Right Army of 130 battalions. This army again orders its Right Detachment, 40 battalions, to begin the attack. This detachment directs its Right Column to take a village held by the enemy, and two regiments are sent to attack it; as they do not make progress, the whole army waits and abandons the attack."

There was frequent interference from the higher leaders in the province of subordinates. The commander of the 10th Army Corps

constantly received direct orders by messenger and telephone from General Kuropatkin, which were at variance with those issued to him by the commander of the 2nd Army, to which the 10th Army Corps belonged. Yet when direction was necessary, as, for instance, when the 6th Siberian Army Corps looked on at the defeat of the 17th Army Corps at the Sha Ho, no instructions were sent.

During the most critical moment of the Battle of Hei-kou-tai, Lieut.-General Stakelberg was called on by an "urgent" letter to render statistics as to his strength and equipment, and expenditure of ammunition, to report minutely on his general staff officers, to make recommendations for St. George's Crosses, and give other particulars beloved of bureaucrats. He might as reasonably have been asked to send in a travelling claim (in duplicate) for his march from the eastern to the western flank of the army. His corps, it may be mentioned here, was sent to the left flank during the Battle of Mukden, and then marched back to the centre.

The initiative was invariably left to the Japanese. Orders for the offensive, however, were frequently issued overnight "for to-morrow," but as the Italian attaché pointed out, "to-morrow" (*zavtra*) in Russian really means "never." The orders were generally followed by counter-orders:—"The attack ordered will not take place."

The muddle and intermixture of units at the Battle of Mukden seems almost incredible. General Kuropatkin's reserve on the 19th February consisted of (1) the 16th Army Corps (less one brigade), (2) the 72nd Division (with the 10th Artillery Brigade), and (3) the 146th Infantry Regiment. On the 25th February he sent the 146th Infantry Regiment and one brigade of the 72nd Division to the left; on the 26th half the 41st Division (of the 16th Army Corps) to the right, and the remainder of the 72nd Division to the centre. This left him only the 25th Division (of the 16th Army Corps), which he sent to the right on the 1st March. He meantime endeavoured to collect another reserve, asking for an army corps from each Army; as the Armies were all heavily engaged they could not comply, but sent driblets—a division, a brigade, even battalions. The troops which were thus collected to repulse the attacks of General Nogi's Army were rapidly grouped together in "detachments"; not a single higher unit of the *Army List* appears to have fought on the west of Mukden. The "North Detachment," on the 10th March, consisted of 51 battalions, 21½ squadrons, and 132 guns, drawn from 11 different army corps, 16 divisions, and 43 infantry regiments.

It is of interest to read that in one of the few successful Russian operations, the counter-attack on Yu-hung-tun at the Battle of Mukden, "the Russians abandoned their massive formations, and the Kozlov Regiment, which passed close by the place where I was standing, was formed in eight or nine long thin lines, which followed one another at about 80 or 90 paces distance, with from four to five paces between individual men."

In a final chapter Major von Tettau sums up his experiences and the lessons of the war. With every justification he says: "These

lessons are not novelties; they merely confirm what we (Germans) have long recognized as the basic truths of training and leading troops. For us, therefore, the lesson is to hold fast to these truths, and to educate ourselves to be leaders who love initiative and do not shirk responsibility, and, by iron discipline and all available energy, to educate our soldiers to be patriotic, and self-thinking and self-acting warriors."

REPORTS OF MILITARY OBSERVERS ATTACHED TO THE ARMIES IN MANCHURIA DURING THE RUSSO-JAPANESE WAR. Part V. General Staff (U.S.A.). 216 pp. 28 photos. 8vo. Government Printing Office, Washington, 1907.

This volume contains reports on the organization, administration, and tactics of the two armies. The account of the Japanese Army, which takes up three-quarters of the volume, is the fullest and most complete that has been made public. Lieut.-Colonel McClernand, the writer of it, comments specially on the fact that the affairs of the Japanese Army are conducted "with much less writing than with us." "In the offices of the Chief of Staff, Minister of War, and their assistants I was particularly impressed by the absence of the numerous bundles of papers so conspicuous in our department"; and he attributes this great economy of time and energy to the "total absence of non-military persons" in these offices.

It was stated positively to him that "no written records are required in a company except one book called *chutai meibo*, translated 'a company roll,' in which is entered the names of men on joining and leaving the company, the names of all killed and wounded, and of those sent home or to hospital, etc.

"At battalion and higher headquarters a book called *jinchunisshi* (daily record of campaign) was kept. In this was entered everything of importance . . ."

Ration returns were submitted daily; there was a prescribed form, but usually a slip of paper, on which was entered the mere number of rations required, was used.

Returns of strength were made every 10 days, in battle daily, if possible. "Company returns are consolidated at battalion headquarters, and then forwarded to the headquarters of the regiment, where similar consolidation is made; and so on, up to army headquarters."

The men are paid every 10 days by a selected non-commissioned officer, who receives the money from the battalion paymaster. A note of the payment is made in each man's small-book by the use of a stamp. Stoppages are rare; they are refunded in cash to the paymaster.

Routine correspondence with regard to administration was carried out direct between the divisional headquarters and Japan and the line of communications, and did not pass through army headquarters.

The photographs exhibit the equipment and transport of the various arms of the service.

HUMAN BULLETS: A SOLDIER'S STORY OF PORT ARTHUR. By Tadayoshi Sakurai, Lieutenant, Imperial Japanese Army. Translated by Masujiro Honda, and edited by Alice M. Bacon. 270 pp. 8vo. London, 1907. Constable. 5s.

This is the account of the author's experiences from the day of mobilization until he was severely wounded in legs and arms on the 24th August, 1904, at the first general assault on Port Arthur. The author's regiment, much to its disappointment, missed the Battle of Nan Shan, but took part in the Battles of Wai-tou-Shan and Chien-Shan, in the taking of the hill of Ta-po-Shan on 26th and 27th July, in the attack and capture of Ta-ku-Shan on 7th and 8th August, and eventually in the first general assault of Port Arthur. The book is purely the story of the author's own experiences, first as a standard bearer of the regiment, and later as lieutenant in the 12th Company of the 3rd Battalion of the same regiment, and though it deals with no questions of strategy and barely touches upon tactics, it is of the greatest interest as a human record. The story is told in a simple, unaffected style, and gives a vivid picture of the desperate struggles of the Japanese in their assaults on the Russian positions.

Perhaps the most remarkable feature of the book is the spirit of intense patriotism and devotion to the Emperor which runs through it, and which, according to the author, was intensified by the Imperial Rescript (given in Appendix B) to the Army and Navy at the beginning of the war. Much has lately been written about the spirit of Bushido, but this simple recital brings it vividly home to the reader. The determination of the troops to die for the Emperor and to avenge their dead comrades; the feeling approaching to shame which animated the author when he emerged unscathed from engagements in which many of his comrades had been killed and wounded; the spirit which impelled each Japanese officer or soldier to help the common cause and one another—all show what enabled the Japanese to effect what they did in Manchuria. The spirit mentioned above is exemplified in this book by many incidents, which are recited in such a way as should inspire others with a desire to emulate those deeds.

THE END OF THE SIEGE OF PORT ARTHUR. An epilogue to *The Truth about Port Arthur*, Parts I. and II. By E. K. Nojin. 487 pp., with illustrations. 8vo. St. Petersburg, 1907. "Herold," 3 Voznesenski Prospekt. 6s. 10d.

This sequel to *The Truth about Port Arthur*, which was produced last year by the same author in two volumes, has been written with the apparent object of extolling the spirit of heroic devotion which inspired the junior ranks of the defenders, and, at the same time, of assisting in bringing home to the responsible commanders the charge of surrendering the fortress without justifiable cause.

The arrangement of the subject is wanting in continuity, and the book suffers from a total absence of any index or table of contents.

The greater part of the material consists of copies of orders and extracts from the letters and diaries of various subordinate officers, the purport of which it is often difficult to discover.

The proceedings of the last conference, held by General Stössel previous to the negotiations for the surrender, are given apparently *verbatim*.

Statistics are introduced showing the state of the armament, the sanitary condition of the troops, and the supply of provisions in the fortress during the siege.

In conclusion, the author quotes the charges preferred against Generals Stössel, Reis, Fok, and Smirnov. The value of the work for historical or tactical purposes is small.

WELLINGTON'S CAMPAIGNS, Peninsula—Waterloo, 1808–15; also Moore's *Campaign of Corunna*. (For military students). By Major-General C. W. Robinson, C.B. 722 pp., with maps and plans. 8vo. London, 1907. Rees. 8s. 6d.

In this volume the previous Parts I., II., and III. of *Wellington's Campaigns* are brought out together. It therefore forms a complete record of Wellington's campaigns from his landing in Portugal in 1808 till the conclusion of the Waterloo Campaign.

As the parts above mentioned have been before the public for some time it is unnecessary to enter here into details of the contents of this volume, and it will suffice to say that the texts, plans, and maps have been revised and a full index added. The book is written in a lucid style, and the maps and plans are clear and good. Though General Robinson does not enter deeply into details of the battles, yet many useful lessons of tactics, as well as of strategy, may be learnt from a study of this volume, and the saying of the late Colonel Henderson, quoted on page 672, should not be forgotten:—"In my humble opinion the campaigns of Wellington, not in strategy alone, but in tactics also, are prolific in instruction."

WATERLOO. By the late Capt. J. W. E. Donaldson, Royal Field Artillery, and Capt. A. F. Becke, late Royal Field Artillery. 79 pp., with maps. 8vo. London, 1907. Rees. 2s. 6d.

This is a re-publication of Chapter V. of *Military History applied to Modern Warfare*, by the same authors. The claim made is that the book "perhaps presents to the military reader how the campaign may be advantageously studied." It is clearly written, and may be of use to students of the campaign to supplement larger works.

MARSHAL TURENNE. By the author of *Kenelm Digby*, etc., with an introduction by Brigadier-General F. Lloyd, C.B., D.S.O. 395 pp., with a map. 8vo. London, 1907. Longmans, Green. 12s. 6d.

This book opens with a short account of Turenne's early life and of his first military experiences, which began at the age of 14.

The next chapter deals with the campaign of 1640 in Italy, during which Turenne distinguished himself at the Battle of Casal, and in which, at the siege of Turin, occurred the extraordinary spectacle of Prince Thomas of Savoy besieging the French in the citadel while he himself was besieged by the French Army, and the last-named were again besieged, in their lines of circumvallation, by the Spaniards. In this chapter some of Turenne's maxims are given, many of which are still applicable.

The next campaign dealt with is that of 1644, in Alsace and the Black Forest, and in this is included the Battle of Freiburg, in which the chief command was held by Condé, under whom the French gained a somewhat doubtful victory over the Bavarians.

In 1645 Turenne was defeated by Mercy and the Bavarians at Marienthal, and afterwards the Battle of Nördlingen was fought, where Condé was again in chief command, and where Mercy was killed; the battle resulted in the retreat of the Bavarians, but the French incurred very heavy losses, and it was largely owing to Turenne that they were not defeated.

The account of the campaign of 1646 in Bavaria is interesting, for although it was bloodless, it displayed to the best advantage Turenne's strategical skill.

With the campaign of 1648, the Thirty Years' War came to a close, and Turenne's activities were transferred to France, where the wars of the Fronde soon after broke out. Turenne fought first against and then for the Court, after the fashion of those times, when everybody changed sides continually, and allies one day were desperate foes the next; thus Turenne was now opposed to Condé. The Battle of the Dunes, on 14th June, 1658, where Turenne defeated Condé and Don John of Austria, and where English troops fought on both sides, is well described.

The remainder of the book deals with the campaigns of 1672–3–4 and 5, against the Imperialists in Flanders, Holland, Westphalia, and Germany, and descriptions of the Battles of Salzheim, Enzheim, Turckheim, and Sasbach are given. At the last battle Turenne, at the age of 63, was killed.

The author is a great admirer of Turenne, and there seems no reason to doubt that besides being a great strategist and tactician, Turenne bore a character for uprightness, fairness, and lack of avarice, which was rare indeed in those days.

The book is well written, and Napoleon's comments on Turenne's operations form one of its most interesting features.

THE AMERICAN REVOLUTION. PART III. By the Right Hon. Sir George Otto Trevelyan, Bart. 530 pp. 3 maps. 8vo. London, 1907. Longmans, Green. 12s. 6d.

This third part carries the story from the beginning of 1777, when Washington, after his victory at Trenton, was wintering his exhausted troops at Morristown, to the summer of 1778, which saw Clinton's evacuation of Philadelphia and his retirement to New York.

Although Sir George Trevelyan does not write as a military historian, and omits to give prominence to dates, numbers, and orders of battle, yet he presents an exceedingly clear and vivid account of the military events and of the conditions under which the British and Americans fought, ample enough for a preliminary study of the campaign. His work is particularly valuable, as the history of campaigns in which the British forces have been unsuccessful is difficult of access; official accounts of them have not been written, and in consequence their study has been neglected. Yet, Lexington and Bunker's Hill, which were dealt with in the first part, bear striking resemblances to Bronkhorst Spruit and Laing's Nek, and many incidents in the second Boer War have their prototypes in the War of Independence fought more than a century before.

Many of the comments made by the author are of distinct military importance. He states that the average value of the British infantry was much reduced, "according to the questionable fashion of that day, by withdrawing the light companies from ten or a dozen regiments," and forming them into special corps; and that while "the American Army never stopped long in any one place without fortifying it to the verge of impregnability," the British commander "objected on principle to fieldworks," and, as he said, "never favoured their construction at the head of line when in force, for fear of diminishing the self-reliance and the well-founded self-esteem of his soldiers."

For the British the year 1777 is a record of blunders and lost opportunities. Sir William Howe, the senior British military officer in America, during a copious correspondence with the War Office, "while he placed on record his conviction that a large number of additional troops was required in America, confined himself (knowing something of his Government) to asking for a reinforcement of 15,000 rank and file, which would raise his army to the indispensable minimum of five and thirty thousand effective men." He represented the danger of operating in the New England States, where the population was large and warlike, and proposed to take the initiative in Pennsylvania, where the local militia was of little account. He considered that the American Commander would be bound to risk a battle, in order to protect the Capital of the Confederacy, and "My opinion," said Howe, "has always been that the defeat of the rebel Regular Army was the surest road to peace." When that army was crushed, resistance in New York and New Jersey would collapse, and a majority of the colonists in these central States would probably accept the rule of the stronger; operations could subsequently be carried out, first southwards—in Virginia and the Carolines—and eventually in New England, for their conquest and subjugation. This was a reasonable and practicable scheme.

The Home Government, in reply, promised Sir William Howe 8,000 men, and "sent him 2,900, but never a bayonet or a sabre more."

As regards the plan of operations also, they had different views.

Lord George Germaine, who controlled the military destinies of the Empire "from a desk in a public office 3,000 miles away," had been placed in this position of practical responsibility "because he could debate, and for no other reason in the world; but he esteemed himself highly as a military authority, although he had long ago (when he bore the name of Lord George Sackville) been dismissed with ignominy from military employment."

Now Germaine "had conceived the ambitious hope of compensating for deficiency in numbers by brilliant and novel strategy." His scheme "looked well on paper, and was cleverly contrived for use on one of those bewildering occasions when a Cabinet of civilian politicians is under the necessity of resolving itself into a council of war." Three columns—Howe's, from New York; Burgoyne's, from Canada; and Colonel St. Leger's, from the Mohawk Valley—were to converge from south, north, and west on Albany, driving the Americans before them, and were thus to occupy the course of the Hudson, and cut off the New England States from the rest of the colonies.

A combined movement on exterior lines before the days of telegraphs had little chance of success without precise and minute directions. "But, as a matter of fact, Sir William Howe (whose army was twice as large as the other two columns together) never received any definite orders at all." On the 26th March he did receive a copy of the instructions addressed to General Burgoyne, and was informed that the Secretary of State would communicate with him by next packet. "No such communication ever reached Howe," but on the 18th May "Germaine wrote to him at great length, acquiescing in an expedition to Philadelphia," and incidentally expressing a vague hope that it might be concluded in time to co-operate with Burgoyne. Howe very properly kept Burgoyne informed of his plans and movements from time to time, an action which his ambitious junior did not, apparently, reciprocate.

Colonel St. Leger's column was delayed *en route* to the rendezvous by having to undertake the siege of a fort which blocked the way, and was skilfully dispersed by a ruse of Benedict Arnold, while still many miles from the Hudson. Burgoyne, a political favourite, who had never had an independent command before, left Montreal early in June. After overcoming enormous physical difficulties, he succeeded in covering 200 miles, and nearly reached Albany; but his small column was hemmed in by the colonists, who swarmed to arms when its isolated position became known. On the 13th October he surrendered with 5,800 men, "of whom half were Germans"; the Americans had previously captured 1,800 prisoners, including wounded. The news of this disaster only reached London on the 2nd December.

Meantime, while Burgoyne was in vain looking for his assistance, Howe, making use of the command of the sea, as McLellan did 83 years after, had in July put his troops on board transports, had

taken them round by sea and up Chesapeake Bay, and had landed them within 30 miles of Philadelphia. He might certainly have reached a point nearer the city, and had a shorter voyage, had he selected the Delaware River as his route. Having landed, he defeated Washington, at the Battle of Brandywine, and his lieutenant, Wayne, in a night attack at Paoli, and entered Philadelphia on the 26th September. He subsequently very successfully repulsed a night attack made by Washington at Germantown.

Six weeks before the end of the year, however, Sir William Howe, "finding the War Office deaf to his call for reinforcements," wrote home and begged to be relieved. Lord George Germaine "resolved not to let slip the unexpected chance of proclaiming to the world at large that the general, and not the minister, was to blame." He recalled Howe, and sent out Sir Henry Clinton from England to succeed him. Clinton soon found that Philadelphia was practically a beleaguered city, and dependent on the Delaware for the transport of food supplies. Washington had fixed his head-quarters 22 miles from the city at Valley Forge, far enough away to be secure from surprise, but near enough to take advantage of opportunities; while his flying columns swept the country of supplies.

The expedition to Saratoga had now brought about further unpleasant results, for on the 6th February, 1778, France concluded a treaty of alliance with the United States, and a fleet, under d'Estaing, was expected off the coast in the early summer.

Clinton determined to evacuate Philadelphia before he was hemmed in by sea; sending his sick and wounded by water, on the 18th June he set off with 17,000 men to march overland to New York; although pursued by Washington, with whom he declined a decisive action (an opportunity for which Howe had sought in vain) at Monmouth Court House, in spite of tropical heat and pestering guerillas, he was successful in reaching his goal, on the 1st July, with the loss of a few hundred men.

Such is the general outline of the story unfolded. While deep sympathy must be accorded to the British generals, who were left to carry out an impossible task, it must be given in an equal degree to Washington, who was hampered by the zeal of Congress that, in the course of 19 months, framed and promulgated four successive army systems; by the dislike of his countrymen to give more than a few weeks' military service and to leave their ordinary occupation; and still more by the intrigues of political generals, who used all their eloquence to secure his removal and that of his prominent officers, and actually went to the length of refusing to his army, when at Valley Forge, supplies of food and clothing that were available; yet, in spite of difficulties, he always managed, by unfailing courage and skilful generalship, to keep a formed body of men in the field as a nucleus of resistance.

The volume contains a vast amount of interesting detail gathered from the diaries and writings of combatants on both sides.

NAPOLEON: A BIOGRAPHICAL STUDY. By Dr. Max Lenz. Translated from the German by F. Whyte. 382 pp., with illustrations and maps. 8vo. London, 1907. Hutchinson. 16s.

This book is a study, partly personal, but mainly political. It gives all the principal events of Napoleon's career from his early days, during the internal struggles in Corsica in 1791–2, to his death at St. Helena. The book is only of military interest in so far as it deals with one of the world's greatest generals, and with the political events which caused, or were caused by, Napoleon's campaigns, for none of the campaigns is dealt with in any but a cursory style, and no strategical or tactical questions are entered into. The political and diplomatic sides of Napoleon's career are more fully dealt with, and much interesting matter is brought out regarding the motives which inspired his diplomatic action at various times.

The author is evidently a sincere admirer of Napoleon, and the book is written in a clear and easy style, and appears to have been well translated.

A STUDY OF FIELD MARSHAL COUNT RADETZKY'S CAMPAIGN OF 1848 (Studie über den Feldzug des Feldmarschalls Grafen von Radetzky, 1848). Anonymous. 30 pp., with 6 sketch maps. 8vo. Vienna, 1907. Seidel. 2s. 6d.

A short critical study of the 82-year-old field marshal's campaign in Northern Italy, which culminated in the Battle of Custozza on the 23rd to 25th July, 1848, and the subsequent pursuit to Milan. The publication of this pamphlet is opportune, in view of the recent 50th anniversary of Count Radetzky's death.

SADOWA. A Study by General H. Bonnal. Translated by Lieut. C. F. Atkinson, 1st V.B. Royal Fusiliers. 255 pp., with maps. 8vo. London, 1907. Rees. 7s. 6d.

This is a translation of the work published by General Bonnal in 1900, and forms part of the series "L'Esprit de la Guerre Moderne."

To students of the campaign of 1866 it needs no recommendation, since they are probably already acquainted with the French version, but to those who have not yet studied that campaign, or who have not a sufficient knowledge of French to read the original, this translation should be of great value. The translation itself has been very well done; the book is well got up and printed in large type, and the maps, though in some respects not beyond reproach, are good and clear. The account of the campaign is excellent—clear, and easily followed, and the comments of the author on the various phases of the operations are instructive. The book is mainly strategical, and gives no description of the minor battles, but presents the general strategical situation every day, supplemented by a separate map showing the situation on the evening of each day, and thus the student is led up to the grand climax of Sadowa. The battle itself is described with great clearness, and is illustrated by

MILITARY MEMOIRS OF A CONFEDERATE. By E. P. Alexander, Brigadier-General, C.S.A., and Chief of Artillery, Longstreet's Corps. 620 pp. Map and plans. 8vo. New York, 1907. Scribner. 16s. 6d.

No one could be better qualified to write the story of the Army of Northern Virginia than General Alexander, who accompanied that army from its cradle to its grave. At the outbreak of the war he was a second lieutenant of Engineers, U.S.A. Commissioned a captain of Engineers in the Confederate Army, he was present at the first battle of Bull Run as signal officer on Beauregard's staff. A few days later he was appointed chief of ordnance of the Army of Northern Virginia. In November, 1862, he succeeded Colonel S. D. Lee in command of an Artillery battalion, which formed part of Longstreet's reserve Artillery. From Gettysburg onwards he was in command of the Artillery of Longstreet's Corps. When the Army of Northern Virginia was reorganized after Chancellorsville, the general Artillery reserve was broken up, and the Artillery was reorganized with a few batteries to each division and a reserve to each corps. It is claimed that this reorganization was the first of the kind ever adopted, and was subsequently copied by the chief European powers.

The author states his object to be "the criticism of each campaign, as one would criticize a game of chess, only to point out the good and the bad plays on each side and the moves which have influenced the result."

The acuteness of his criticism and the impartiality of his judgment render his work of great importance to the military student. The romances, which have too often passed for history, find no place in this narrative. The Battle of Seven Pines is depicted as it really took place. It is clearly shown that Longstreet misunderstood Johnston's instructions, but that the latter, feeling himself partly responsible, shielded his lieutenant by representing in his report the battle as if fought according to his original plan, and also induced his second-in-command, G. W. Smith, to change his report. "The whole history of this battle remains a monument of caution against verbal understandings." The author's account of Chancellorsville rejects the legends of Pleasanton and others, and follows Colonel Hamlin's version of Jackson's flank attack.

The description of the first Bull Run is admirably clear and the criticism luminous. McDowell's errors in the conduct of the actual battle consisted in making a succession of partial attacks in the first stage, and in continuing the frontal attack instead of trying to turn the Confederate flank on the Henry House Hill. The Confederate commanders are blamed for not going "in person to supervise and urge forward the execution of the orders, though time was of the very essence."

The causes of Jackson's repeated failure during the Peninsular campaign are carefully examined, and his conduct from the beginning to the end of that campaign severely criticized. It is pointed out

that he was a day late to begin with, partly because of his passion for Sunday observance, partly because he failed to make up for his loss of time by not demanding better marching from his troops; and by his loss of practically a day "the cream of the whole campaign was lost." Throughout the seven days' battles his operations were marked by a want of vigour and a lack of initiative, which proved all the more fatal, because to Jackson, fresh from his valley triumphs, was assigned by Lee's generosity the shortest route and the largest force, with the opportunity of winning the most brilliant victory of the war. Lee did not write his report of this campaign till eight months later, when "Jackson's great military genius had manifested itself undimmed by any spell," and deliberately glossed over the failure, which had been so brilliantly atoned for. The author rejects Dabney's explanation, that Jackson's failure was due to physical exhaustion, and apparently inclines to the view that Jackson wished to spare his own troops, and thought that the garrison of Richmond ought to bear the brunt of the fighting.

His criticism of the Gettysburg campaign leaves nothing to be desired, except, perhaps, that he had been rather less partial to his corps commander. For he accepts Longstreet's defence of his conduct on the 2nd July as if it were in itself, and without further proof, an irrefutable answer to the censures which have been passed upon him. He condemns the campaign, as planned, because it ignored the sole military advantage possessed by the Confederates, viz., the interior lines. In his opinion, both Lee's invasions of the North were a mistake, and a large part of his victorious army should have been sent to Tennessee and Kentucky, with a view to forcing the Federal forces of the west back upon the Ohio. He quotes the success gained at Chickamauga by the addition of only five infantry brigades, without any artillery, as an indication of what might have been done earlier in the war with the much larger forces then available. One of the chief causes of the failure of the Gettysburg campaign was Stuart's raid round Hooker's rear. Lee's Gettysburg campaign was compromised, just as Hooker's Chancellorsville campaign had been lost, by the absence of his cavalry. Another cause was the failure of the Confederate staff to keep their commander informed of all that was taking place. Hill's movement upon Gettysburg, on the 1st July, which precipitated the battle, was made without either Lee's sanction or knowledge. Ewell throughout the three days of battle fell far short of his duty. The author considers that Stuart would have proved a much more efficient successor to Jackson. The Federal position on the 2nd and the 3rd July was greatly superior to that of their opponents, and the one weak point in Meade's line, the salient on Cemetery Hill, was never attacked. The Confederate management of the battle of the 2nd was "conspicuously bad." The type of the attack ordered was "the echelon or progressive type, as distinguished from the simultaneous." The latter, in the author's opinion, should be the type for any battle not commenced till the afternoon. He agrees with

Longstreet that the attack on the 3rd, as carried out, was doomed to failure, and places the chief responsibility upon Ewell and Hill.

The author holds that each summer campaign in Virginia marked a Confederate crisis, but *the* crisis of the war took place during the fighting round Petersburg on the 15th to the 18th June, 1864. "At no other period was there such depression among the people at home, in the army in the field, or among the officials of the Government in Washington." Had Grant sustained at Petersburg "a second defeat, more bloody, more signal, and more undeniable than Cold Harbour" (and such would surely have been the case, even if Beauregard had been reinforced only by Longstreet's Corps), he believes that public support at the North would have been withdrawn from Grant, whereas the Federal leader, by outwitting Lee, secured a position from which he was never dislodged.

The lack of good maps is a distinct disadvantage to this book.

MILITARY HISTORY APPLIED TO MODERN WARFARE. A Guide to the Study of Military History, exemplified by Studies of the Campaigns of Austerlitz, Jena, Vimiera, Corunna, Salamanca, Waterloo, and the Shenandoah Valley. By the late Capt. J. W. E. Donaldson. 2nd edition, revised and enlarged by Capt. A. F. Becke, late Royal Field Artillery. 395 + xxiv. pp., with maps and plans. 8vo. London, 1907. Rees. 8s. 6d.

A new edition of this publication. It contains a completely new set of maps and plans.

POLITICAL.

MODERN GERMANY. 2nd edition. By J. Ellis Barker. 552 pp. 8vo. London, 1907. Smith, Elder. 10s. 6d.

This book presents, in exhaustive and comprehensive detail, an account of Germany's political and economic problems, of her foreign and domestic policy, and of her ambitions and causes of success. The writer emphasizes his apparent pro-British tendencies by adopting the name of J. Ellis Barker, but his German origin, sufficiently marked by his real name, O. Eltzbacher, under which the first edition of the book was presented to the public, is apparent throughout his composition.

There is much interesting matter in the work, particularly that contained in the earlier chapters dealing with the fundamental principles of Germany's foreign policy and her relations with the various European Powers, and the portions of the book dealing with the German Navy League, operations over sea, and the Emperor as a political factor are instructive.

On the whole, the work is well worth study.

AN OBSERVER IN THE NEAR EAST. Anonymous. 309 pp., with map, and illustrated by photographs by the author and Princess Xenia of Montenegro. 8vo. London, 1907. Eveleigh Nash. 16s.

This somewhat startling work claims to reveal the actual state of affairs in the Balkan Peninsula at the present time.

After a long journey through Montenegro, Northern Albania, Dalmatia, Bosnia, Herzegovina, Servia, Bulgaria, Roumania, Turkey, and Macedonia, the author, who states that he has had private audiences with the various kings and princes of the Balkan States, and with the Sultan, as well as with almost every member of the various cabinets, and that he has been the guest of brigands in Albania, endeavours to place on record what he terms the actual and serious truth. He anticipates that some of his facts will come as revelations even to Balkan diplomatists. The views expressed are decidedly anti-German, and by no means favourable to Austria.

Summarizing his confidential enquiries, the author finds the present position as regards Macedonia a very serious one, and states that Bulgaria has undoubtedly decided to adopt a firm course, which must inevitably lead to war "during the present year" (1907). He is a bold man who ventures to prophecy with regard to the Balkans, and this prophecy has not been fulfilled.

THE DANGERS OF A EUROPEAN WAR ARISING FROM QUESTIONS OF COLONIAL INTEREST (Pericoli di Guerre Europee, derivanti da questioni coloniali). By Professor Gustavo Coen. 70 pp. 8vo. Rome, 1907. Officina poligrafica Italiana. 8s. 4d.

The keynote of this treatise is the necessity for German colonial expansion, and the author points out how such expansion must clash with the interests of Great Britain. The present political situation in Europe is fully dealt with, and the question of German influence in the Middle and Far East discussed.

The subject is treated under six headings, viz.:—

Armaments and a pacific policy.
Pan-germanism.
The German colonies.
The vulnerability of Holland and her colonies.
The rivalry between England and Germany.
Can war be avoided?

BONAPARTE IN EGYPT, AND THE EGYPTIANS OF TO-DAY. By (the late) Haji A. Browne. 399 pp. 8vo. London. 1907. Fisher, Unwin. 10s. 6d.

The first part of this book deals with the French Expedition of 1798, and describes the political conditions then obtaining in Egypt. A description is given of the Battle of the Pyramids, where Napoleon shattered the power of the Mamaluks. The author asserts that the Egyptians were at first not unsympathetic to the French, owing to oppressions they had suffered from the Mamaluks, but that the tactless behaviour of the French, and especially of Napoleon, soon caused a violent reaction. This was further increased by Kléber, when he assumed the reins of government, and it finally culminated in his assassination. The author dates the beginning of the dislike of the English from the time when the English Government stopped the evacuation of Egypt by the French in 1799—1880. He touches

but lightly on the history of Egypt from the evacuation by the French to the beginning of the dual control.

The three healthy influences at present at work in Egypt, in Haji Browne's opinion, are :—

1. The increased acquaintance of the people with European civilization.
2. Their increased knowledge of the social and political condition of the Mahommedan countries of the world.
3. The development of the Arabic press.

He also enumerates the unhealthy influences at work, such as the influence of an anti-Turkish press, the irreligious system of education, the action of certain missionaries, the behaviour of some Englishmen, and the want of respect shown to local and religious prejudices. The Tabah affair, and the Denshawi affair also, in the author's opinion, did a great deal of harm, which was increased by the injudicious action of certain people in England in encouraging agitation against Lord Cromer. He sums up the failure of our administration, "that it has failed in two vitally important matters. It has not in any way qualified the people or any class of the people to undertake the government of the country. It has not educated the people or done anything whatever to ensure the permanency of the good that has been done."

Haji Browne concludes with an appreciation of Lord Cromer's work, and states that though he has himself been an open advocate of autonomous government for Egypt, yet he does not think that the people are yet ripe for autonomy.

The book is a very interesting one, and is written in a clear, readable style.

STRATEGICAL AND TACTICAL.

ENGLAND IN THE SEVEN YEARS' WAR : A STUDY IN COMBINED STRATEGY. By Julian S. Corbett. 2 vols. 476 and 407 pp., with maps and plans. 8vo. London, 1907. Longmans, Green. 21s.

The author is the well-known lecturer in history to the Royal Naval War College, and the two volumes in which he deals with his subject are of especial interest, since we probably see reflected therein the most modern school of naval thought upon the subject of Imperial strategy and amphibious operations.

The Seven Years' War is dealt with for the benefit of those who seek insight into the higher principles of the art of war, and the author contends that no contest—at least for a maritime power—so clearly illustrates the function of the fleet in war. He points out that a study of the history of the wars which gave Great Britain her position to-day reveals the fact that the function of the fleet is threefold—firstly, to support or obstruct diplomatic effort; secondly, to protect or destroy commerce; thirdly, to further or hinder military operations ashore.

That the destruction of the enemy's fleet is the best way of ensuring that your fleet will be in a position to discharge its threefold duties is admitted, but that command of the sea is only a means to an end, the author says, is apt to be overlooked, since of late years the world has become so impressed with the efficacy of sea power that there is an inclination to forget how impotent it is of itself to decide a war against great continental states, and how tedious is the pressure of naval action, unless it be nicely co-ordinated with military and diplomatic pressure. It is for these reasons that the author attaches so much importance to a study of the Seven Years' War. From first to last we were more or less free to use our fleet directly upon the ulterior objects of the war, and throughout the struggle what is called the primary function, that is the domination of the enemy's main fleet, scarcely ever rose above the level of containing operations. From the time, however, when Pitt obtained control and assumed direction of the war he exercised almost undisturbed control of army, navy, and diplomacy; in his hands we see the fleet slipping neatly into its place, shoulder to shoulder with its comrades; it is never used without some close relation to a military or diplomatic end, and conversely the army and diplomacy are always being employed to secure some point which will either strengthen the naval position or relieve the fleet of some irksome preoccupation. Here lay the pith of what Pitt called his system.

For Pitt, army and navy were the blade and hilt of one weapon, and the war under his direction is described as a most brilliant lesson of the way in which the weak army of a strong naval power can be used, of how continental armies may be made to feel the shock of fleets, and of how superiority at sea, combined with expeditionary action, may be made to thwart continental cabinets, to tangle their strategy, and upset their moral balance.

These volumes should prove of interest to all military students. The state of Europe between 1754 and 1763 is dealt with comprehensively enough to show clearly the aims of the several continental rulers, and how each belligerent, both before and during the progress of the struggle, strove to turn the varying aims and ambitions of continental policy to account. The author gives, as it were, a bird's-eye view of the war, in which each naval and military operation is given its relative position in the general scheme, which, so far as Pitt was concerned, was based on the co-ordinated activity of the navy, army, and diplomacy, and consequently on what the author regards as the true application of sea power for a maritime nation.

Pitt's system of undivided control has been exercised in much the same way by Napoleon, the German Emperor, and the Emperor of Japan; but it should be remembered how entirely the conditions of military service in Europe have changed since the period under consideration, for at that period the size of European armies was determined by the length of the national purse, and England, being as well or better off, in this respect, than any other nation, could put

as large an army in the field as most continental nations. Thus some of the author's arguments are not applicable to modern conditions

HISTORY OF FORTRESS WARFARE FROM 1885–1905, INCLUDING THE SIEGE OF PORT ARTHUR (Geschichte des Festungskrieges von 1885–1905 einschliesslich der Belagerung von Port Arthur). By Lieut.-General H. V. Müller. 260 pp. 1 plan and 29 sketches in text. 8vo. Berlin, 1907. Mittler. 7s. 6d.

The introduction of high-explosive shell and of defensive armour for guns effected a revolution in fortress construction. The years 1885–1890 were a transitional period. Since then the chief influences at work have been the invention of smokeless powder, increased rate of fire from guns and high-angle fire of howitzers, and further development of armoured turrets and cupolas. Examples are drawn from the principal European fortresses. The book closes with a study of the defence system and siege of Port Arthur.

INFANTRY IN THE ATTACK. By Brigadier-General H. R. Kelham, C.B. (A lecture delivered before the East and West of Scotland Tactical Society). 8 pp. Folio. 1907.

This is an interesting lecture, and gives an example of the writer's own experience of an infantry attack at Witteput. There is a note on Suvoroff.

AERIAL NAVIGATION.

NAVIGATING THE AIR. A Scientific Statement of the Progress of Aeronautical Science up to the Present Time. By the Aero Club of America. 259 pp., with photographs and diagrams. 8vo. London, 1907. Heinemann. 6s.

This book opens with a general review of the progress made in aerial navigation, and it then has a succession of chapters which go more into detail and touch on such points as dirigible airships, aeroplanes, balloons, propulsion by motors, air currents, etc., and gives accounts of experiments made by various aeronauts.

An interesting statement is made on p. 173, that from a balloon the bottoms of lakes are clearly visible, "a fact that makes airships the natural enemies of submarine vessels"; but the question arises whether this visibility would still obtain when over the sea, unless the sea was perfectly calm.

Many other points of interest to aeronauts are touched upon, and, having been compiled by people with practical experience of aeronautics in all its forms, they would seem likely to be of value.

Among the contributors are the Brothers Wright, Dr. Bell, Lieut. Lahm, Mr. Channte, etc.

THE TECHNIQUE OF THE BALLOON (La technique du ballon). By Lieut.-Colonel Espitallier. 458+xvi. pp. 8vo. Paris, 1907. Doin. 4s. 2d.

A very useful book, going thoroughly into the theory of balloons, their management when free, methods of preserving equilibrium, cutting of material for different forms of balloons, and construction of nets, valves, etc. A short chapter on the manufacture of hydrogen finishes a book which should be a standard work for balloon builders and aeronauts.

MISCELLANEOUS.

OVER-SEA BRITAIN. A Descriptive Record of the Geography, the Historical, Ethnological, and Political Development, and the Economic Resources of the Empire. By E. F. Knight. xii.+324 pp. 9 coloured maps, specially prepared for this volume, include rainfall, temperature, and vegetation. 8vo. London, 1907. John Murray. 6s.

The present volume deals with the Nearer Empire, in which term are included the Mediterranean, British Africa, and British America. The author, who is the well-known traveller and war correspondent, gives a comprehensive account of the British possessions beyond the seas, and explains what the British Empire is; how it came to be; the history of its growth; the physical, political, and commercial geography of its various parts. The eager scramble for African colonies within the last few years, of which other European Powers have secured their share, is well discussed, and the present volume is thoroughly interesting throughout.

MILITARY REPORT ON SOMALILAND. Vol. I. Geographical, descriptive, and historical. General Staff. 273 pp., with maps and illustrations. 8vo. London, 1907. Stationery Office. 2s.

This volume deals with geography, communications, riding and transport animals, climate, trade, inhabitants, history, administration, finance, money, weights and measures, fortifications and barracks, navy, and native warfare. In Appendices are notes on the genealogy of the tribes, fauna, flora, water supply, horse sickness, kit, etc., etc.

THE OFFICER; HIGHER COMMANDERS AND THEIR ASSISTANTS IN GERMANY (L'Officier, le haut commandement, et ses aides en Allemagne). By Jules Poirier. 240 pp. 8vo. Paris, 1907. Librairie mondiale. 2s. 6d.

The contents of this book are as follows:—

Part I., Chapter 1.—Education of the Young Officer.

Chapter 2.—The Officer—

(i.). Officers of Active List (ranks, promotion, pay, pensions, etc.).

(ii.). The Medical Service (ranks, promotion, pay, pensions, etc.).

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HAND-GRENADES, AND THEIR UTILIZATION IN THE WAR IN MANCHURIA (Les grenades à main). By Capt. M. C. Curey (French Artillery). 26 pp. 12 figures. 8vo. Paris, 1907. Berger-Levrault. 9½d.

After a short historical introduction, the author gives description and drawings of some of the hand-grenades used by the Russians and Japanese.

Capt. Curey states:—"This antique engine of war has been nearly completely abandoned by European armies, except, perhaps, by the British." His authority for this is the *Armeeblatt*, No. 37, of 1906, which he quotes to the following effect:—"The English made great use of hand-grenades in the Soudan; the grenades were formed of segments and contained a bursting charge of guncotton. . . . The grenades were exploded by a time fuze. They weighed between 4 and 6 ozs., and could be thrown 100 yards by hand, or 200 yards by a catapult."

THE NEUTRALITY INCIDENTS OF THE RUSSO-JAPANESE WAR (Les incidents de neutralité de la guerre russo-japonaise, 1904). By Lieut. Henri Carré, 131st Regt. Infantry. 110 pp. 8vo. Paris, 1907. Lavauzelle. 2s. 1d.

This work contains solutions of the various problems of international law set during the first year of the Russo-Japanese War.

The rights of belligerents are clearly defined. The author admits that force must always remain the *ultima ratio*.

RAILWAY ENTERPRISE IN CHINA. An Account of its Origin and Development. By Percy Horace Kent. 304 pp. 5 maps. 8vo. London, 1907. Arnold. 12s. 6d.

The author, who, as a resident in China, appears to have been exceptionally well situated for obtaining reliable material for the compilation of the present volume, has supplied a long-felt want, *i.e.*, an up-to-date and accurate record of the origin and growth of railway enterprise in China.

The Appendices contain copies of the more important railway contracts and other documents, which greatly enhance the value of

the work as a book of reference. There is also a general map illustrating railways in China and Manchuria, showing the lines constructed, under construction, and projected.

A good index completes this excellent publication.

THE RAILWAYS OF AFRICA: CONSIDERATIONS THAT SHOULD AFFECT OUR RAILWAY POLICY IN OUR AFRICAN COLONIES (Die Eisenbahnen Afrika's, Grundlagen und Gesichtspunkte für eine kolonial Eisenbahnpolitik in Afrika). By von Posadowsky. 262 pp., with map. 4to. Berlin, 1907. Official publication.

This book is a memoir drawn up for the Reichstag. Part I. is a survey of all the existing railway systems in Africa, with statistical information as to cost of construction, capacity, and remunerativeness of the lines. Part II. deals with railway policy in Africa in its relation to German colonial and foreign policy. The book is valuable as a work of reference.

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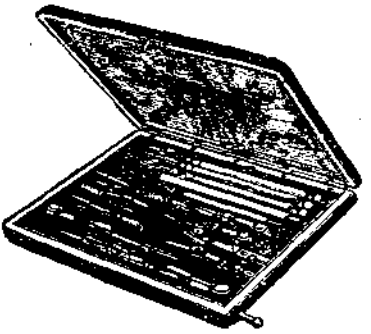

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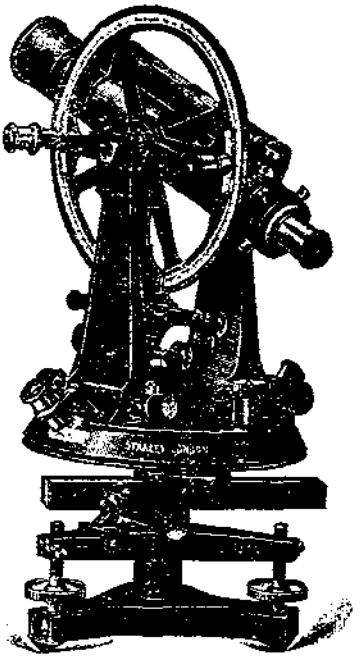

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six plans. Appendices contain a bibliography of the Sadowa campaign, notes on the series "L'Esprit de la Guerre Moderne," notes on terminology, on the organization of the two armies, and on lengths of columns. Mr. Atkinson has done the army a considerable service by his translation.

THE WAR OF 1870-71. OPERATIONS IN THE EAST. Prepared in the Historical Section of the General Staff. 110 pp., with 2 maps. 8vo. Paris, 1907. Chapelot. 2s. 8d.

This volume describes the operations on the Rhine and in the Vosges from the outbreak of war to the 2nd September.

HISTORY OF THE WAR OF 1870-1871. Vol. VI. By Pierre Lehautcourt. 788 pp., with 9 maps. 8vo. Paris, 1907. Berger-Levrault. 7s. 6d.

The 6th volume of this history takes up the story with the retreat after Wörth, on 7th August. It follows the fortunes of MacMahon's army in the retreat to Chalons, the fight at Beaumont, the move to Sedan; and ends with the capitulation on the 3rd September. The book contains little comment on the strategy and tactics of the campaign; it is simply a full record of the events as they occurred; but it brings out forcibly the disastrous effects produced by the indecision of the Commander, coupled with constant interference on the part of the Paris authorities.

GENERAL LEE: HIS CAMPAIGNS IN VIRGINIA, 1861-1865, WITH PERSONAL REMINISCENCES. By Walter H. Taylor, Adjutant-General of the Army of Northern Virginia, C.S.A. 314 pp. 9 maps and plans. 8vo. Norfolk, Virginia, 1906. Nisbaum Book Company. 10s.

In 1878 Colonel Taylor published his *Four Years with General Lee*. The chief interest of that work was statistical, the writer's object being to show that the odds against General Lee were greater than has been generally supposed. The earlier work being out of print, the author was persuaded to publish these memoirs, which were not originally intended for publication. They do not profess to give a critical account of the campaigns in Virginia, but rather aim at enabling the general reader to form a fair idea of each of the great battles fought. Their chief interest will probably be found to consist in the light which they throw upon General Lee's personal character. It cannot be said that they add much to our knowledge of the working of the Staff of the Army of Northern Virginia. The conclusion would seem to be that of all the different departments of an army, an efficient staff is the one least easily improvised. As in his first volume, the author criticizes severely the conduct of Longstreet during the Gettysburg campaign, and supports his opinion by quotations from a review of Longstreet's *From Manassas to Appomattox* in the *Journal of the Royal United Service Institution*, October, 1897.