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1. G.S. Wagon on Raft made of Waterproof Bags.

2. Cut Raft for Trestle Bridge.

Some Ideas on Field Engineering

SOME IDEAS ON FIELD ENGINEERING.

THE following extracts from the reports on the Annual Field Works Courses of various Companies are published for general information :—

1. WATERPROOF BAG RAFT AND FOOTBRIDGE.

The Field Troops experimented with Waterproof Bags, made of indiarubber with an outer cover of canvas, and inflated by lung power. The bags can be used separately for footbridges or joined together to form rafts.

Fig. 1, *Plate* I., gives suggestions for superstructure for a raft and for a footbridge. *Photo* 1 shows a G.S. wagon on a raft made of 60 bags.

2. SHEET BOAT.

The same units made a Sheet Boat of 6 planks nailed together (*Fig.* 2). A tarpaulin was lashed on outside to the uprights, and a few boards placed in the bottom of the boat.

3. SINGLE BARREL RAFTS.

The Troops also used Single Barrel Rafts, made after the Japanese model, as shown in *Fig.* 7.

4. CUT RAFT IN TRESTLE BRIDGE.

Fig. 3 and *Photo* 2 show a novel method employed by the 42nd (Fortress) Company for forming Cut in a Trestle Bridge which was erected across a moat with no current in the water. The raft supporting the trestles of the cut was made of twenty-eight 108-gallon barrels. A party of 22 men could form cut and re-form bridge in 5 minutes.

5. WOODEN MORTAR.

Fig. 4 shows a 5″ Wooden Mortar constructed by the 7th (Field) Company. It was made up in four sections with iron tongues and bound with 2″ rope, which was kept wet when the mortar was being used.

The projectiles were made of tin, the charge being 4 lbs. 3 oz. of guncotton and the total weight 4½ lbs. The tin case was found too light. The projectiles were fired with No. 8 detonators and safety

fuze to burn seven seconds; this arrangement worked well. A Range Table was made out as follows:—

Charge.	*Range.*	*Time of Flight.*
$\frac{3}{4}$ oz.	48 yds.	$4\frac{1}{2}$ secs.
1 „	110 „	$5\frac{1}{2}$ „
$1\frac{1}{4}$ „	130 „	$6\frac{1}{4}$ „
$1\frac{3}{4}$ „	160 „	$6\frac{3}{4}$ „
$2\frac{1}{4}$ „	176 „	$7\frac{1}{4}$ „

6. ROLLER GRENADE.

The same Company made a Roller Grenade (*Fig.* 5), carrying 24 lbs. of guncotton. It was pushed forward by shafts made of drain rods.

7. LIGHT PILE FOOTBRIDGE.

The 5th (Field) Company constructed a Rapid Pile Footbridge (*Fig.* 6) as follows:—

Light trestles were made, consisting of two legs with a transom fixed by one 5″ nail at each leg. The first trestle having been pushed out into position, a plank, weighted down by men on the shore end, was passed across to the transom. One man then went out and drove in the trestle with a maul, and added a few more nails to the transom when it had reached the required level. The process was then repeated until the bridge was finished.

The man with the maul reached the far bank, 28 ft. across, in $4\frac{1}{2}$ minutes, and the bridge was completed in 8 minutes.

8. LIGHT FLOATING FOOTBRIDGE.

The same Company made a Light Floating Footbridge (*Fig.* 4, *Plate* II.) with single 108-gallon casks at 12′ 3″ centres. To the bottom of each cask was lashed, as outriggers, a pair of light spars 18 ft. long, braced at their ends. The footway consisted of single 12″ planks lashed to the outriggers close to the casks.

The bridge carried men in single file at 4 ft. distance.

9. TUBE HAND-RAIL POST FOR PONTOONS.

The 5th Company experimented with a Tube Hand-rail Post for use on pontoon bridges. The arrangement is shown in *Fig.* 3, *Plate* II.

Iron straps, made to fit over the top and sides of the saddle, are fastened to the saddle by bolts underneath. The straps have short turn-up pieces which meet over the top of the saddle and take the tube post, which is dropped on to them and pinned through. The posts have tee pieces at their tops and holes near their centres, to take respectively 3″ and 2″ ropes as hand-rails.

This fitting does not injure the superstructure of the pontoons. It is sufficiently rigid, and yet sufficiently pliant to give way without serious damage if collided with.

10. FERRO-CONCRETE FOR OVERHEAD COVER.

Fig. 1 shows a design by the 1st (Fortress) Company. This method of constructing Overhead Cover with Ferro-Concrete might prove useful, and should present little difficulty in semi-permanent works. It could easily be disguised or concealed.

11. ELECTRO-CONTACT MINES ON RAILWAYS.

Fig. 2 shows a simple method of firing an Electro-Contact Mine under a rail. It was successfully experimented with by the 10th (Fortress) Company.

12. STRENGTHENED SANDBAGS.

The same Company found that the splitting of sandbags filled with shingle, when struck by bullets, was much reduced when the sandbags were used double, *i.e.* one inside another.

13. MASKING LOOPHOLES.

The 23rd (Field) Company tried a novel means of Masking Loopholes. A network of string was stretched from the top of the loophole to the toe of the parapet, and heather and weeds were fastened to the net. This arrangement fulfilled its object, and did not seriously impede the view through the loophole.

14. ENTRENCHING LYING DOWN.

Fig. 5 shows the French plan for excavating cover under fire, the men working in pairs.

CONTINUOUS OR END TO END COAST DEFENCE.

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

In an article on Coast Defence in the *R.E. Journal* for March of this year, I put forward for consideration certain propositions, which seemed to me to indicate the manner in which economical advantage may some day be taken of the great development of modern artillery in range, rapidity, and accuracy of fire, more especially for Coast Defence purposes. The heavy gun on fixed mountings, firing seawards, with a clear field of view, command, and means of accurate range finding, is a modern weapon of extraordinary power concerning which I asked, "Have we yet correctly gauged its full importance? Has full justice yet been done to the economic value of the range and accuracy of such guns?" By "economic value" I understand obtaining the maximum power with the means available at a given cost.

Placed inland in *defensive* works it is difficult in a hilly country to obtain command, full range, and clear field of view. The siege of Port Arthur showed that, on the other hand, inland for siege purposes the long range of artillery gives it a comparative advantage in the *attack*, because fixed batteries can be constructed at a distance in concealed places, where it is at all times difficult and sometimes impossible for the defender to discover them. Thus placed they can cover the close attack, and concentrate their fire on works which cannot efficiently return it. Placed, however, on the sea coast and firing seawards, whether against ships or against troops endeavouring to land, all the advantages of command, range, and field of fire and view are with the artillery of the defence, which cannot be got at until a landing has been effected. I recommended, therefore, concentrating attention on endeavouring to defy a landing, on such positions as our South Coast, by batteries within shot of one another, a system which machine and magazine guns should further facilitate. Should this prove impossible, time would in any case be gained for the National Army of Defence to concentrate on the point attacked, and a much greater sense of security would be obtained.

It was, however, not so much my intention to compare one system of land defence with another, as to ascertain or consider the relative value under the new conditions for Coast Defence purposes of fixed and mobile artillery on land as compared with ships. If, that is, for a primary cost of £4,000,000 on land defences, we can liberate for free action at sea, and so help to secure the presence "at the

decisive point," of a whole fleet of ships worth some £30,000,000, may it not, under the new artillery conditions, be worth while to do so instead of tying down such a fleet to defend our coasts ?

A writer in the *R.E. Journal* for May, under the name of 'Forts,' has been good enough to make a few remarks which show that my points were perhaps not made clear in all respects. It is encouraging always to find others ready to discuss questions of so much importance to an Empire with so vast a coast line as ours, especially at a time when fleets are growing like mushrooms and steam-ships being constructed by hundreds in quarters where they were almost unknown before. The French, the Dutch, and the Spaniards were of old our principal naval antagonists. Now, we might have others of still greater power.

Unfortunately, however, Coast Defence on land is a branch of the military art which has of late received but little encouragement as a whole. In our large population there are very few who study it, notwithstanding our vast coast line. Even the number who study military and defensive subjects at all is small as compared with other nations. Our coasts are thought to be entirely safe in the hands of the Navy, notwithstanding the fact, as I have pointed out, that even naval officers of the Blue Water School themselves disclaim the power of the Navy to prevent raids. This disposition to discard fixed defences dates from a generation ago, when artillery in fixed defences was far less effective than at the present time and land fortifications were far more expensive than ships. The question now is, whether, considering the great range and power of long-range and quick-firing guns in fixed defences, firing seawards, their relative economic power on land for Coast Defence, as compared with that of ships, has not been reversed. Moreover, has not the power of steam immeasureably increased the possibility of surprise ? 100 small steamers could be concentrated by telegraph and, in fine weather, could convey 20,000 men to any given point.

In discussing these questions and the points referred to by 'Forts' in my previous article, I propose to take a Nelsonian view of the controversy, and to bear in mind that what we all have in view is to discover what is best in the interests of our country rather than merely to gain a point in an argument.

Remembering then the canons of Art—Unity, Proportion, and Relative value—or, as the French say, *Le Tout-ensemble, Les Valeurs, et Les Détails*—in order of importance, let us first consider the unity of our Imperial Defences, naval and military, as a whole, *i.e.* their *Tout-ensemble* or "Altogether" as it has been called. We have an Imperial Navy whose first function is free action at sea, so that it may proceed unhampered to the point of strategic advantage ; our squadrons "concentrating on the decisive point" in requisite strength, sufficient, if possible, to annihilate those of the enemy and keep open our communications at sea. Then we have a

Striking Force, prepared and ready to proceed along those communications to wherever may be for it the strategic or decisive point on land, whether in the enemy's territory or our own; for example to India or South Africa, or, as in days gone by, it proceeded to the Peninsula, or co-operated with the Navy at Louisbourg and Quebec in 1755—1759, or failed for want of sufficient strength as at Toulon in 1793 or for want of good leadership as at Rochefort in 1757. Finally, we have, or require, the Local National Coast Defence Forces and Territorial Army for Home Defence, to look after themselves when the Imperial Navy and the Imperial Striking Force are far away from Home.

In the case of a great naval war threatening the existence of our Empire or Federation the theatre of operations would be practically the whole world, and it would be desirable that every possible ship should be free therein to assist in blockading the enemy's ports, annihilating his fleets, or otherwise keeping open our communications at sea on which our food supply depends. Looked at from this point of view the South Coast of England is but a single decisive point in relation to the whole theatre of war; and, accepting the maxim of Napoleon, quoted by 'Forts,' to "concentrate on the decisive point," I maintain it behoves us to concentrate on that coast our defensive force and energies. Might it not be an incommensurable advantage to have that portion of our coast line strong and self-supporting? If England fail because its South Coast—so open to attack and so vulnerable—is penetrated, what is to become of Great Britain, the mainstay and central figure of the Empire? The great strategic object to be achieved by thus making this portion of our coast strong and self-supporting is this—that the Channel Fleet may thereby be set free to proceed, without giving a thought for the safety of our coast, to the decisive or strategic point of naval importance, and so reinforce our squadrons, either on the one hand in the German Ocean or on the other in the Atlantic. If our South Coast were thus strongly defended on land, our Channel Fleet could do this, without rendering our politicians uneasy lest the inhabitants of our great Coast Ports and Towns might become alarmed because deserted, and without fear of raids or invasion. With the South Coast thus strongly held and self-supporting, the East and West Coasts of these Islands would also be rendered additionally secure by the increased strategic power afforded to the Navy.

There is nothing in these proposals, that I can see, akin to a system of being "strong everywhere." Let us enquire what Napoleon himself actually did in a similar case, that is where he had a strictly limited, but long, line of coast to defend; noting especially how, thereby, he made Nelson's position on the Riviera quite different in 1796 to what it had been in 1795, and such that Nelson himself questioned whether it was any good remaining in the Mediterranean.

The system on which my suggestion for an end to end defence is based is taken from what Bonaparte accomplished then, *i.e.* between the years 1793–6, in so fortifying the Riviera as to practically defy a landing. The result is very tersely summed up by Capt. Mahan, in his *Life of Nelson*, in these words :—"Thus the whole western Riviera from the French border was in possession of the enemy, who had also throughout the previous year so multiplied and strengthened the local defences, that, to use Nelson's own words, 'they have batteries from one end of the coast to the other, *within shot of each other.*' Such were the means, also, by which Napoleon, the true originator of this scheme for securing their communications, insured the concentration of the flotilla at Boulogne eight or nine years later without serious molestation from the British Navy."

Such was the state of affairs in 1796. But it had taken several years to effect this; and as late as 1795, Mahan tells us, the coast defences were not sufficiently strong and self-supporting to secure effectively a sufficient means of supply. Nelson had, in fact, considered "the project of keeping afloat in transports a body of 3,000 troops, which should hover upon the coast and by frequent descents impose a constant insecurity upon the long line of communications from Nice to Genoa."* In other words, he had contemplated the use of a military force to make land attacks and raids. "The same plan was advocated by him against the Spanish Peninsula in later years. . . . On the Riviera in 1795 this means *might have been decisive;* in 1796, in the face of Bonaparte's fortified coast, it could scarcely have been more than an annoyance."* In other words, these end to end defences had made land attacks impracticable, the batteries being "within shot of one another."

The history of this system of Coast Defence is so interesting and, I venture to think, so little known that it may be convenient to give an outline. Napoleon's mind had, in fact, been directed to it, even before he entered on active service at all—except in so far as he had taken part in the revolutionary proceedings of Corsica whilst on leave. Being ordered to rejoin his regiment in June, 1793, he was stationed at Nice, on the service of the coast batteries, and there assisted the Chevalier du Teil, who already at that time "had been inspecting the shores of the Mediterranean and sketching a plan for defending the coast."† In the name of this officer Napoleon wrote at this time to Headquarters, asking the military authorities to furnish a model of a furnace for heating cannon balls better than had hitherto been found possible; and in September of this year, when on his way to Toulon, he was still working on these defences, and from Marseilles despatched powder for the defence of the coast batteries. After Toulon, where he had further opportunity of studying Coast

* Mahan's *Life of Nelson.*
† *Napoleon: The First Phase,* by Oscar Browning.

Defence, and where he played the same energetic part that Wolfe had, 34 years earlier, played at Louisbourg, he was posted to the Army of Italy under Durmorbion as Commander of the Artillery in the Maritime Alps, whence, on a June morning in 1794, "he beheld with delight the blue plains of Italy, already to his prophetic eye the theatre of glorious achievement,"* and wrote to his brother "The time is coming when I shall rule in Paris."

At this time he still held a vigilant eye on the Riviera, passing in July to Genoa and back. After his temporary suspension he became a frequent adviser of the Directory, and strongly blamed the little advantage taken by General Scherer of the victory of Loano.† He wrote in the same year as follows :—"The audacity of the English boats, and the indolence of the Genoese, who allow their own vessels to be taken in their own roads, make it necessary to erect a battery for hot shot at the proper point, which you will exact shall be done by the Governor of Sans Remo."‡ The most vigorous steps were taken at this time to push on these defences for the supply of the Army of Italy. "My plan is being discussed, Vado will soon be taken," he wrote from Paris ; and by the next year, when he started on his Italian campaign of 1796, the scheme of end to end batteries within shot of one another was complete.

The question then that I put forward for the consideration of the rising generation, who may live to see us once more engaged in a great naval war, if it does not come sooner, is this—If, with hot shot and short range weapons, Napoleon could, by means of batteries *within shot of one another*, keep off our navy and defy raids, what might it not be possible and worth while to accomplish to-day with modern long range artillery and rapid fire guns ? Would it afford our mercantile marine no advantage to feel that, from Land's End to The Nore, they could coast securely along under the protection of land batteries "within shot of one another," even without a Naval escort ? Would it be no relief to our Navy that such an escort could be dispensed with ?

Land attacks, even in the days of short range, hot shot, and wooden ships were difficult. In the face of a prepared defence to-day they should be made impossible. The danger always lay in surprise, and this danger has been greatly increased by the speed of steam navigation. Hence the greater need both of batteries within shot of one another and of taking full advantage of machine guns along such important stretches of coast as our Southern border.

Under the old conditions perhaps no general had greater experience of land attacks on fortified places than Wolfe at Rochefort, Louisbourg, and again twice at Quebec. In the ill-fated expedition

* Alison.
† *Letters of Josephine*, by H. F. Hall.
‡ Mahan's *Life of Nelson*.

to Rochefort he was Quartermaster General. There, it will be remembered, he prepared a plan of attack which he presented to the General and Admiral, who approved of it but referred it to a Council of War, who did not like the look of it and declined to take the risk. So the expedition sailed back again to England, and Sir John Mordaunt was tried by court-martial but acquitted. Of this expedition Carlyle says, "The Descent on Rochefort last autumn had a good deal disappointed Pitt and England—an expensively elaborate expedition, military and naval; which could not 'descend' at all, when it got to the point, but merely went groping about on the muddy shores of the Charente, holding councils of war yonder; cannonaded the Isle of Aix for two hours, and returned home without result of any kind, courts-martial following on it as too usual." Poor Byng, the year before, had been tried and sacrificed for failing to relieve Port Mahon.

At Louisbourg, Wolfe, now a brigadier by the selection of the powerful Pitt, himself, cane in hand, led the attack made by boats in three divisions, and was successful. Yet what was his own opinion of that attack? "Amongst ourselves be it said, that our attempt to land where we did was rash and injudicious, our success unexpected (by me), and undeserved. There was no prodigious exertion of courage in the affair; *an officer and* 30 *men would have made it impossible* to get ashore where we did." But 'the officer and 30 men' were not there; and at Quebec later, though present, the party on guard was surprised by a ruse. The men then must not only be on the spot but vigilant. What again would be the chances to-day of such a landing as Abercrombie's at Aboukir?

In his first attempt at Quebec on the Montmorency Wolfe failed through the boats running on a ledge and the excitement of his Grenadiers. At the heights of Abraham his ruse indeed succeeded, but he seems little to have expected it. He told Commander John Jervis, afterwards Earl of St. Vincent, the evening before, that he had a presentiment he himself would not survive; and on landing, as he pointed out to the Highlanders the path up which they were to ascend, he remarked "There seems scarce a possibility of getting up, but you must do your endeavours."

That surprise is the essence of land attacks had been realised by Wolfe after Rochefort, and he thus sums up the lessons he there derived and which guided his later proceedings. "One may always pick up something useful from amongst the most fatal errors. I have found out that an admiral should endeavour to run into an enemy's port *immediately after he appears before it;* that he should anchor the transport ships and frigates as close as he can to the land; that he should reconnoitre and observe it *as quick as possible, and lose no time in getting the troops on shore;* that previous directions should be given in respect to landing the troops, and a proper disposition made for the boats of all sorts, appointing leaders and fit

persons for conducting the different divisions."* The landing at Chemulpo in the recent war was not wanting in careful preparations of this kind, and is the most notable modern instance of a surprise landing made with the assistance of steam power. The Russians in this case were dependent, as we propose to depend, upon naval defence. Their squadron was surprised and overcome. But how different might have been the result had there been a few heavy guns on fixed mountings on land, with a few machine guns and magazine rifles. 'An officer and 30 men' well placed on land may effect much, and may even repel a brigade at sea, or, they may, as Wolfe found, miss a great opportunity. Surprise being the essence of land attack, and being rendered more easy by steam power, the more need is there for end to end defence on portions of coast of great strategic importance and for the skilful application of modern weapons to such defence.

As regards the use of field guns, which 'Forts' considers require an escort, my estimate of the garrisons takes into consideration that "a certain number of men of the garrison would be required as escort, for defence of fixed emplacements with rifles against small boat attacks at night, and as signallers, sentries, and so forth." Alternative sites for such guns would be selected in peace, and all ranges to fixed points measured and field defences with entanglements, etc., provided. In connection with this proposal to use mobile artillery on our coasts, the following extract is interesting. Nelson, in 1796, writes from the Riviera, "For several days the *Agamemnon* has kept close to shore, and harassed the enemy's troops very much. *Field pieces are drawn* out on our standing in shore." In face of this active defence Lord St. Vincent and he had helplessly to watch a convoy passing along shore "wholly out of reach of their power of offence."

In conclusion, as pointed out in my previous article, "It is neither guns nor ships nor machines of any sort which in the end decide the fate of nations; it is the training of men." We are at the present time in a transitional state. The utmost we can do, in respect of men to supplement our Striking Force, is to hope that we may get the much-needed trained National Army which is now our aim, and that we shall not find, as Nelson found with the Fencibles, that "They are no more willing to give up their occupations than their superiors."

The experience of Washington as a British officer many years before the War of Independence is thus recorded:—"We are either insensible of danger till it breaks upon our heads, or else, through mistaken notions of economy, evade the expense till the blow is struck." To this Wolfe in his turn added in 1757:—"The present schemes of economy are destructive to great undertakings, narrow in their views, and ruinous in the consequences." Napier and Southey wrote still later in a similar strain; and as regards the Martello

* *Life of Wolfe*, by Robert Wright.

Towers, it is only too firmly established that these defences were entirely due to Napoleon's threats and not to any forethought as to the probabilities of war. In General Warrand's note on these Towers in the *R.E. Journal* for December, 1906, occur these words—"As a result of the *invasion scares* which it was Napoleon's policy to promote and maintain, Martello Towers were built in large numbers on our exposed coasts." It is noteworthy that this too was a system of batteries "within shot of one another."

Finally, in the annals of 1803 is to be found recorded the following interesting incident. A bill was that year introduced "which comprehended the arming and training of our whole effective male population. . . . In recommending such a measure, Mr. Yorke * expressed a wish of living to see the day *when the use of the musket would form part of the education of the British youth*, as that of the bow did in the time of their ancestors; for this would be the best method to remove all danger of our subjection to a foreign yoke. So vexatious a scheme was not generally acceptable to the nation; nor was the danger which ministers seemed to dread so great as to justify *this extraordinary panic:* in one of the debates to which it gave rise, Mr. Pitt objected to its compulsory nature, and when a hint was given that the first class of unmarried men might suffice, the remark met with very general approbation."† This first class included, however, all unmarried men between the ages of seventeen and thirty.

Of the Palmerstonian works the amusing anecdote is told, that, whilst they were still in progress, Palmerston made enquiries as to whether they were being built of gold—as though their cost had begun to pall when the cause for alarm had fled.

We cannot indeed prophecy, but the youngest can prepare and be prepared to act amid a "choice of difficulties," as Wolfe so expressively called it; and I recommend the following proposition for consideration.

"It cost just over £5,500,000 to surround four naval bases of our South Coast with monumental Palmerstonian Works," in 1869. How far would this sum go towards defending our whole Southern Border to-day with artillery and machine guns on the end to end system of fixed batteries within shot of one another and intermediate mobile batteries, escorts, electric lights, alternative emplacements, etc.

We of this country, especially in matters of war, require to think not only Imperially, but navally, militarily, and coast defensively, bearing in mind the relative value of (i.) our free Navy, (ii.) our free Army or 'Striking Force,' and (iii.) our local fixed Coast Defences and National Army.

* It is curious that it was a General Yorke who ten years later was mainly instrumental in introducing universal service into Germany.

† Hume and Smollett.

THE SIEGE OF ISMAIL, 1790.

By Major-Gen. E. Renouard James, late R.E.

From 1474, when Turkey first gained possession of Ismail by conquest, until the demolition of the fortress in 1856, it was considered the key of the Lower Danube, and during that period its ownership changed many times.

In 1770, the place was taken after a long siege by Russia, whose army is stated, on insufficient evidence, to have lost 20,000 men. It very soon became Turkish again, but in 1790, was besieged by a Russian army under Souvaroff, and captured with immense slaughter. Being abandoned by its captors, Turkey took possession of it again; but it fell into the hands of the northern power a second time in 1809, and her right to hold it was confirmed in 1813, when the whole province of Bessarabia was ceded to Russia under the Treaty of Toplitz.

In 1856, Ismail passed with the southern portion of the province, under the Treaty of Paris, to form part of the new state of Roumania; but the territory of which Russia was then deprived, together with the site of the former fortress, reverted to her in 1878, under the Treaty of Berlin, for the last time.

In the following notes, I shall deal with the siege by Souvaroff, and, fortunately, am able to base them on a rough plan made by myself in 1856, in which year I was attached to the International Commission for the delimitation of the new frontier in Bessarabia.

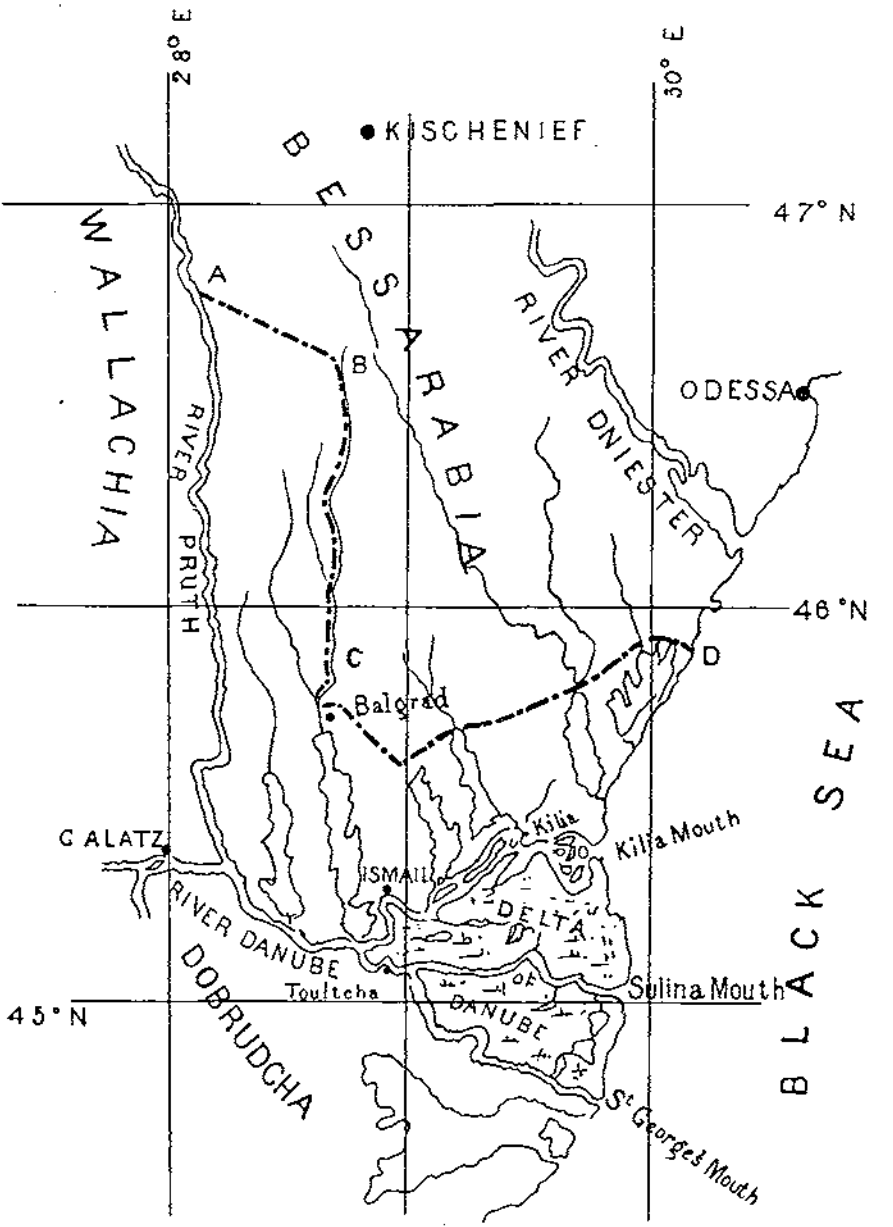
Obtaining permission from the British Commissioner, Lieut.-Colonel E. Stanton, R.E., to visit the little fortress, I spent two days there. My being able to inspect the place without interference was due, doubtless, to the fact that it would soon cease to be Russian; and the fortifications being in process of demolition, no danger could be apprehended from a foreigner obtaining some knowledge of them.

Ismail stood on a hill overlooking the Danube, with a slight command over the straggling village of Tukskov, which lay to the east at a distance of about three-quarters of a mile on the other side of a shallow ravine, from the bottom of which a road, crossing the Kilia channel by a bridge of boats, led to Toultcha (see *Plate* at end).

I found a lodging at a little inn in the village, the wide unpaved streets of which were laid out in rectangles (in the fashion common in country places in Russia) mainly covered with gardens on which one-storied houses stood widely detached from each other. In the centre of the place, only, there were two churches, a few little shops, and

MAP OF SOUTH BESSARABIA.

SHOWING THE PORTION CEDED BY RUSSIA IN 1856 NOW REGAINED.



New Frontier of 1856 A B C D
Previous Frontier—River Pruth & Danube.

the police station. By this arrangement, a very small population often occupies a comparatively large area, and my plan must be understood to convey that idea. According to Clyde's geography, a work quite out-of-date, Tukskov had once a population of 32,000; but I conceive this to be a gross exaggeration, for the impression left on my mind was that even a tenth of the number would be in excess of the truth.

As I lounged about Ismail during my short visit, there is no doubt my movements were closely watched and reported on. I did not dare to make notes openly, for the Russians would have taken offence had I done so, and would not have lost the opportunity of being able to accuse the British Commissioner of employing his officers as spies. When I think of the shortness of my visit, I am rather proud of my plan, which was made entirely from mental notes and bearings. I returned to my lodgings at intervals to jot down as much as I could carry in my head at once, going again and again to the fortress in a manner which may have seemed suspicious. Of course, a sketch-plan so made cannot have any pretensions to accuracy, and may have important omissions; but it is certainly valuable, in the absence of a better one, as an adjunct to a report, and a general provided with such a map would be fortunate. I have not found a plan of Ismail in any library, and, if one should exist, could not put mine into competition with it; but in such a case my notes made on the spot would be doubly valuable. I was extremely gratified to hear that my rough plan and notes had been considered worthy of being shown to Her Majesty Queen Victoria, who graciously ordered that her approval should be conveyed to me.

The ancient fortress was in the shape of an irregular polygon, built on ground at its highest level 200 to 300 feet above the river, with a command in all directions except towards the north, on which side there was a gentle rise towards the country. The greatest span was about half-a-mile, and the enceinte was formed by five short fronts, with bastions, curtains, and ravelins, connected by some irregular faces. The broad base of the polygon on the river side was defended by a simple indented parapet on the summit of a low cliff, but round the rest of the fortress there was a ditch, covered-way, and glacis. The works were in a semi-demolished condition, and I could not form more than a rough idea of their design, which I will explain by my plan.

Commencing at the top of the cliff at A, there was an ancient masonry tower. The flanked curtain between bastions A and B had a masonry escarp, covered by a ravelin, through the centre of which ran the road to Tukskov and Kilia. The counterscarp was unrevetted, and the covered-way commanded the steep slope of the ravine. The crest of the enceinte at this part may have been 30 feet above the covered-way, and the escarp from 35 to 40 feet high.

From B to C the trace was irregular, and consisted of an indented rampart with masonry escarp, covered by a lunette and glacis with unrevetted counterscarp, the command being considerably less than between A and B.

From C to D and E, the lines faced the rising ground towards the north, with a stronger trace to compensate for a much smaller command. C was a semi-bastion, and D and E full bastions, with chemin-de-rond along the top of the masonry escarp, and, in front, a continuous tenaille, or interior glacis, from C to E. Ravelins covered the curtains; in front of the whole there was a covered-way with unrevetted counterscarp and outer glacis. A double communication near the centre of the northern fronts gave access to a small square outwork on the open ground some 40 yards in advance. A road leading to the country ran through the curtain CD.

From C to E, I estimated the command of the crest of the enceinte over that of the glacis at 25 feet or less; but as the works were half demolished at this part, I could not form an idea of the height the escarp originally had. Apparently the front between D and E was thought the most vulnerable, as the bastions were strengthened with interior cavaliers.

From E, the highest point in the fortress, the lines took a sharp turn southwards, the crest of the enceinte falling quickly to a lower level at the demi-bastion F. A ravelin commanded the steep slope at the north-west angle of the fortress, overlooking the ravine on this side. The irregular trace from F to G increased in command to from 30 to 40 feet over the covered-way, the latter commanding the steep slope of the ravine to the west. The road to Galatz ran through the curtain in this space.

At G a square masonry tower stood on the edge of the cliff, and apparently this, as well as the tower at A, mounted two tiers of guns.

A half-finished defensible barrack, covered by an interior line of retrenchments, occupied the inner space between D and F; this was intended, it may be supposed, as a citadel.

Probably in the days of the Turkish occupation, the centre of the fortress was filled by the very narrow crooked streets of an oriental town, which the Russians had replaced by open rectangles containing a church and military quarters. Numerous bombproof huts, built of timbers roofed with earth, had been placed behind the bastions to house the troops. The heavy guns, which had been on the ramparts, were parked together; and forty or fifty small boats lay at anchor in the stream under the cliff. I was informed that 10,000 men were employed in the demolitions, but this must, I think, have been an exaggeration.

The above description may appear superfluous, as the fortifications were demolished, but it is not so at all to a student of Souvaroff's siege. In 1856, I knew nothing of the siege myself, but, on my return to

England, the poem of Don Juan, by Byron, which may not be worth much as a source of military information, gave me the clue I needed for commencing a study of it. I was agreeably surprised to find that the poem was by no means pure fiction, but that, on the contrary, it was founded on *L'Histoire de la Nouvelle Russie*, by le Marquis de Castelnau, and other works, which I have had no difficulty in finding in the library of the British Museum. I have not, however, been able to find a plan, and my own hastily-made one has been my only medium for studying the incidents of the siege. The deductions I have made may not be very accurate ; but I offer them for what they are worth, and support them, as far as I am capable of interpreting the various authors, by the actual words used by the latter.

On the 30th November, 1790 (old style), says Castelnau, the place was approached by a Russian force numbering 20,000 land troops in addition to 7,000 or 8,000 Cossacks. From the *Gentleman's Magazine* of 1791 it appears that Admiral Ribas, with a fleet of fifty sail, had partly destroyed the Turkish flotilla on the Danube, and had gained a footing on the islands of the Delta south of the Kilia channel. In this periodical the Russian strength is given as 25,000 by land and 3,000 by water, which agrees fairly well with Castelnau's first figures. In a different place the latter gives the total as 22,700, and says that the battalions, excepting those of the grenadier regiments of the Black Sea and Nikolaieff, had not more than 500 men ; so we may reasonably accept the last total as the land strength inclusive of the Cossacks.

Very diverse accounts are given of the state of the fortifications in 1790, but that of Castelnau seems, on the whole, the most reliable. He states that Ismail had a circumference of nearly 3,000 toises, or 6,395 yards, but does not tell us how this measurement was made. Taking the circuit of the place, along the crest of the covered-way and gorge-parapet, from my plan I get 2,500 toises, and am, therefore, content to leave my scale uncorrected. I may say, here, that I worked by pacing—my paces being 30 inches—and plotted my work on an approximate scale of 3 inches to 1 mile.

It would appear that the place now called Tukskov was the original Ismail, for the fortress is described as enclosing a Moldavian faubourg, situated on the left of the town and commanding it. This was rather unintelligible to me at first-reading, for, as I read on, I found the term "the town" applied to the fortress and not to the present Tukskov. The historian's first standpoint seems to have been on the island south of the Kilia channel, but a confusion is made in the narrative, more than once, between right and left, and we are often obliged to judge of his meaning from the context. He goes on to say the earth rampart was very high and the ditch very deep, the ground in front being absolutely swept by the fire ; there were neither advanced works *nor covered-way*. The last statement seems hardly

supported by the balance of evidence. Another account says that previously to 1774, Ismail was surrounded by a single wall of the so-called Genoese type; but after that date was improved by European engineers, among others by a German named Richter, and the work had been badly finished by a Greek. The *Annual Register* of 1791 gives the credit, or blame, to a Spanish engineer, but is evidently much in error, for it is stated the town was surrounded by *three walls*, each covered by its proper ditch, and that the ditches could be *filled by the waters of the Danube*. I understand the supposed three walls to be nothing more than the main rampart and the inner and outer glacis along the northern fronts, and I think the accounts of the assault prove that there were few, if any, masonry escarps. The steepness of the natural slopes on the eastern and western sides made the attack difficult, and possibly some portions of covered-way had been formed to enable the ravines to be searched by the fire of the defence. I judge, however, that the ravelins, lunettes, and the greater part of the covered-way were non-existent, and also that all the counterscarps were unrevetted. The impossibility of filling the ditches with water from the Danube is proved by my plan.

Castelnau tells us "a stone bastion, with narrow, open gorge, and very massive walls, had guns in casemates and 'en barbette,' to defend the Danube bank"; and also, "on the right (left?) of the place, a cavalier 40 feet high, mounting 22 pieces of ordnance." It is evident the cavaliers at A and G are referred to. Again, "the place was absolutely open along the bank of the river, for the Turks never believed the Russians could possess a flotilla on the Danube." The indented parapet I saw along the edge of the cliff must have been erected after 1790, and it is also clear that the defensible barrack and inner retrenchment did not exist at the time of the siege.

Among many conflicting statements it is difficult to form an opinion on the strength of the Turkish garrison and the population of the place. Castelnau gives the garrison as over 36,000, but I can find no confirmation of such a large estimate. According to the *Annual Register* of 1791, the Grand Vizier, in person, with 13,000 chosen troops, had reinforced the place on the menace of danger; and if we allow 5,000 as the number previously there, and the same number, as a maximum, for the civil population, we get a total of 23,000. The statement of the periodical is not, however, consistent with another made in it, that 24,000 soldiers alone perished in the contest, no quarter being demanded or given, and that the total number of Turks, inclusive of the inhabitants of the town of all ages, sexes, and conditions, who lost their lives, was 30,816. A still greater exaggeration is made by Dr. Lawrence, and is apparently accepted by Castelnau later, in stating that the number of the slaughtered was 38,816; but this was evidently a misprint for the already excessive statement, which may have been given in some publication of the time, of 30,816.

It is a striking instance of the exaggeration of numbers frequently to be met with in history, and I may be excused for mentioning at this place one of a similar character exposed by myself in my notes on the "Battle of Hastings," recently published in the *R.E. Journal.* I cannot bring myself to believe that within a space of about a quarter of a square mile the exclusive numbers exceeded 24,000 persons, although each authority quoted from pretends to be able to vouch from trustworthy sources for the statements made.

The Russian troops on land attempted an attack simultaneously with the fleet. In advance, three columns were commanded by Lieut.-Generals Paul Potemkin and Serge Lvof, Major-Generals Lascy and Meknop; in support, three other columns were under Count Samoiloff and Generals Bezborodka and Koutousoff, with Orloff, Platoff, and Ribaupierre in reserve. Two columns attacked by water under Ribas and Arsenieff, Brigadiers Markoff and Tchepaga. Two batteries were thrown up on the island opposite Ismail, and several equally advantageous results were hoped for from their fire. The first was the bombardment of the place from the rear by 48-pounders, and, the town being in the form of an amphitheatre, every shot would tell; the second was to support the fleet in its attack; and the third, apparently very plausible, that the town's population would be thrown into such consternation that capitulation would be compulsive. But the fault of despising the enemy was made; the batteries were badly constructed, and the gunnery practice was most ineffective. The ranges were calculated wrongly, a fault which caused the loss of two fire ships which burned prematurely in midstream. The Turks slept until this event happened, and until 6 a.m. suffered no damage whatever.

It would have been wiser for the Russians not to pursue their plans for attacking; but notwithstanding these mischances the ships advanced at 7 a.m. on the 1st December, and at 9 o'clock, having reached a point 50 toises (100 yards) from Ismail, came under a heavy fire of grape and musketry. The batteries on the island seconded the efforts of the fleet, but it was soon perceived that the combination of fire was insufficient to reduce the place, and a retreat was ordered at 1 p.m. During the engagement a small Russian gunboat was blown up, and another, carried down by the strong current, ran ashore and fell into the hands of the enemy.

The Turks lost many men and several vessels, but were not daunted; and immediately they perceived the Russians in retreat, a number of the bravest among them threw themselves into boats and attempted a landing on the island with the object of destroying the batteries. They were repulsed with great slaughter by Count de Damas.

According to the historian the Russian troops behaved splendidly. Among the foreigners with them, especially distinguished for their

conduct, were the young Prince de Ligne, who became a field marshal in the Russian service, and the young Duke de Richelieu.

After this failure there was much debate as to the tactics which ought to be adopted. Admiral Ribas urged that the place could only be taken by assault, and, his view being strongly opposed, insisted that the question should be referred to Prince Potemkin, the powerful minister of the Empress Catherine II. In the meanwhile several new batteries were erected, and on December 12th fire was opened from 80 pieces mounted along the shore of the Danube. So little effect was produced that it was decided to raise the siege; but on the 13th, when the re-embarkation of the troops had actually commenced, a courier arrived from Prince Potemkin, announcing that Marshal Souvaroff would immediately take command of the combined military and naval force before Ismail. The despatch from the minister to the marshal was short and characteristic; it ran thus—"You will take Ismail at any price whatever." At the moment of the arrival of the courier, the Turks, believing the siege was raised, were cheering loudly, and were terribly disappointed at the new turn of affairs.

On the 16th, two horsemen, thought at first to be Cossacks, were seen approaching at a galop, and proved to be Souvaroff himself, with one guide, who carried on his crupper a small bundle containing the whole of the general's baggage. There was great enthusiasm in the Russian camp, for Souvaroff's multiplied successes and his bravery had gained him the confidence of the army. The batteries fired salvoes of salutes, and a sanguine hope of victory took the place of the depression of spirit which had hitherto reigned. Everything changed as if by magic. The camps were moved closer to the place, fascines and storming ladders were prepared, and new batteries established. It does not appear that there were regular siege approaches, and I have not found any detailed account of the sites and armament of the batteries, beyond a statement that they were placed on every commanding spot.

The ardour of Souvaroff, his extraordinary activity, his scorn of danger, and his absolute confidence of success were communicated to every private soldier, and there was not a man in the army who did not wish for the honour of being present at the assault. This "little, odd, old man," as Byron calls him, dressed in his shirt sleeves, drilled his troops personally in the smallest details, and taught them especially the use of the bayonet. The writers of the time give many anecdotes of this extraordinary personage. The author of *Tweddell's Remains* (1815), who professes to speak from personal intimacy with Souvaroff, declares he dined at 9 a.m., slept on the ground almost naked, and drilled his troops at a temperature of 10° below freezing point of Reaumur. In *L'Histoire de la Nouvelle Russie* (1820) he is described as a man of small stature, and as one who, although of high education as well as refinement, and master of nearly every European

language, loved to conceal his virtues by the eccentricity of his actions. Satisfied to live on bread and onions, he exposed himself recklessly to danger, and affected to despise everything but brandy and courage. His loyalty to his sovereign, his neglect of self, and his strong sense of religion were undeniable, but wholly irreconciliable with the cruelties and brutalities he permitted in his soldiers. No man ever lived whose character was so full of contradictions.

I may pass over most of Byron's imaginative stanzas, but must not omit to mention that at this stage Don Juan and his friend Johnson, who had escaped from Turkey in Moslem dress, are introduced. The latter had already been in Russian military service, and had distinguished himself in the assault of the breach at Widdin, where he had fallen wounded and been taken prisoner. The comrades are brought before Souvaroff, who remembers Johnson, and are attached to Johnson's old corps, the Nikolaieff regiment, which is to lead the assault.

On the 21st December commenced one of the most terrible cannonades noted in history. There were 40 pieces in the land batteries, 100 in those on the island, and 500 at least in the flotilla. The Turks answered briskly, and soon one of the Russian ships was blown up. Admiral Ribas objected to make the assault before daybreak, on the ground that it would be to the disadvantage of the Russians, but was overruled. Subsequent events proved he was right, for the assailants lost touch in the darkness, and the first column which reached the ramparts was almost decimated by the enemy's fire while waiting for support.

The assault was made in the early morning of December 25th. It was quite dark, and there was a thick fog, through which the flashes of the guns momentarily lighted up the sky. Looking across the Danube, the reflections of the fire in the water offered a singular *coup d'œil*. The Russians advanced in eight columns, of an average strength under 3,000 men. Three columns attacked by land with a total strength of 5,700, under Potemkin, Lvof, Lascy, and Meknop. Three others supported them under Koutousoff, Ribaupierre, Samoiloff, Bezborodka, Orloff, and Platoff, with a total strength of 10,300. We are told that the fifth and sixth columns were each composed of three battalions of infantry and a body of dismounted cavalry. Colonel Cobley, an Englishman who commanded a dismounted hussar regiment, states in a letter that he went into action with 975 effective officers and men, and lost 2 majors, 14 captains and subalterns, and 600 men, being severely wounded himself. This officer claimed to have saved the lives of 300 Circassian women, who were on the point of throwing themselves into the Danube to escape from the violence of the Russian soldiers.

The attack by water was composed of two columns under Ribas, Arsenieff, Markoff, and Tchepega, with a total of 6,700. This brings

up the Russian total to 22,700; and as on a former page the combined land and water force has been estimated at 25,700, we may accept 22,700, as approximately the number actually engaged in the assault.

Before the advance commenced redhot shot, bombs, and carcases were poured into every part of the town, producing horrible effect. It does not, however, appear to have destroyed the spirit of the defenders, for the assaulting columns had advanced but a few toises from the batteries when they were detected by the enemy, who had not fired a shot during the night. The Turks opened a hot cannonade, lighting up the whole front, which increased in intensity as the advance continued. Musketry fire came from the entire line of the ramparts, and the place is said to have had the appearance of an active volcano casting its fiery stream on every side. An universal cry of "Allah," repeated again and again, arose from the town, and the historian laments his inability to convey in words an adequate idea of the extraordinary scene.

According to the *Annual Register* (1791), the principal Russian column was led by Souvaroff himself, who, after the assailants had been repulsed with great slaughter, and the combat had lasted three hours, is described as having performed a desperate feat of valour, planting a standard on a Turkish battery with his own hands. This episode is not mentioned by other authorities, and it seems incredible that a general commanding an army could have performed such an action.

Let us go back to statements of probable accuracy. The attack by water under Arsenieff was exposed to a fearful fire, and lost a third of its officers before daylight. Among the wounded were the Prince de Ligne (severely), General Markoff, and the Duke de Richelieu; but the last could have been slightly hurt only, for we soon find him in another part of the attack. The marine column is said to have been exposed to the fire of 300 guns and 3,000 muskets.

Most of the Russian troops seem to have crossed to the attack from their camps on the island, and two brigades appear to have disembarked at the foot of the ravine to the eastward of the fortress. One of them, I judge, moved up the ravine to the high ground, and made its attack (as I suppose) from the north-east between C and D; another column, principally composed of the grenadiers of Fanagoria, disembarked lower down, and escaladed the entrenchments and palisades between B and C.

The historian at this stage quotes from the personal narrative of the Duke de Richelieu, who, in spite of his wound, seems to have hastened in the direction taken by the right column. The Duke's words are adopted by Lord Byron in describing the experiences of Don Juan and John Johnson. In the darkness he lost sight of the troops advancing in front of him; but judging of the direction in

which they had gone by the sound of heavy firing, he assumed the column under Lascy would be found if he went straight on. Rallying a large number of infantry men, who like himself had lost their way, he found his conjecture was correct, for in fact Lascy's column had that moment succeeded in reaching the top of a rampart. The column, as far as I can judge, had fought its way to the inner glacis between C and D. The Turks, behind traverses and from the flanks of bastions C and D, poured a tremendous fire on the column from both artillery and muskets. The Duke de Richelieu states that he climbed up with the men following him, and reached the "talus interieur," which might, perhaps, mean the crest of the inner glacis. There is nothing in the description to denote that the escarp at this point was a masonry one. On each side of the point reached, which is stated to have been at two feet above the natural ground level, there was a space, nine or ten feet wide, on which men could form actually under the cover of the palisades which had been placed by their ignorant constructor in such a manner as to be of positive advantage to the assailants. The stragglers under the Duke (or according to Byron, *Don Juan*) numbered about a hundred, and their arrival was most opportune to the hard-pressed Lascy, who approached the Duke and tendered him the most flattering thanks, for with this reinforcement he was enabled to renew his advance at a very critical moment in support of the other attacks. I judge that this column now succeeded in forcing its way on to the superior slope of the main rampart between B and C, and commenced action in the direction of bastion D, which had at last been entered from a different direction by Koutousoff, after two or more repulses.

It is not clear at what exact point Koutousoff attacked first, but I think his column must have landed from boats somewhere to the westward of G, and, marching by a detour to the open ground north of the fortress, made its attack on the front ED. Some of his boats were carried down by the strong current, the section of the column in them landing either at the gorge of the fortress or to the east. The main column is described as having suffered very heavily. The general himself, who afterwards became Prince of Smolensko and gained distinction during the French retreat from Moscow, is stated to have marched to the assault with the gaiety of one going to a fête, with the sangfroid and amiability habitual with him. Jumping into the ditch, closely followed by his men, the summit of a parapet was gained with the utmost difficulty, and at this point Brigadier-General Ribaupierre, an officer universally esteemed, lost his life. The Turks, outnumbering the attackers very greatly, drove the column back into the ditch twice. The attack was renewed at rather a different place, and the remains of Koutousoff's and Lascy's columns at last joined hands and together gained possession of the line of ramparts between D and C. It was found impossible, however, to make a further

advance for some time in opposition to the desperate resistance made by the Turks, who fought with fanaticism.

It was about this time that the masonry tower A at the east end of the gorge was captured, but it is not clear by whom. Apparently, its defence had been neglected, the attention of the defenders being taken up in opposing Lascy's and Koutousoff's attacks on the high ground. As stated before, the boats with some sections of Koutousoff's men had drifted down, and a landing had been effected without opposition partly above and partly below the eastern end of the gorge. The men who found themselves inside the fortress, opening the Kilia gate, admitted those who were on the glacis outside, and together they possessed themselves of the stone tower. Apparently they were supported by the marine column, or they could not have maintained the important advantage thus gained.

The acquisition of the tower was the most important success the Russians had as yet gained, and it became possible to advance inside the town towards the high ground, where the Turks retired into bastions F and E and continued to offer the same fanatical resistance. There is nothing to show that the inner line of retrenchments existed in 1790.

Two desperate sorties were made by the defenders of the high bastions into the streets of the town, into which the Russians now commenced to penetrate. But the position of the attackers was so critical at this time that it became necessary to bring the Cossacks to make a new attack on the northern front, at the place where the ditch was the deepest.

They fought on foot, in parallel eastern and western columns, under Orloff and Platoff respectively. The Cossacks were in a disorderly mob, and the western column under Platoff was in danger of annihilation, the corpses of the fallen filling (it is stated) the bottom of the ditch, when the reserve battalion of Polsk, which had been held in reserve, came marching over the bodies to their relief. Lieut.-Colonel Yesoukoff, the brave commander of the battalion, was killed, but the position was assured, the Turks at the point of attack being exterminated by the Polsk men. The eastern Cossack column under Orloff suffered cruelly, being repulsed in several attacks with a loss of two-thirds of its number.

The criticism of the historian, made in respect of the Cossack assault, may have been sound in 1790, but does not apply in the present day. He remarks that it was an error to give too many cartridges to soldiers whose first duty was to carry the position by main force, as it caused the advance to be too slow, the men remaining exposed to grape and gun fire longer than they need have been.

At this stage of the fighting the main reserves on the land side were brought up by Meknop, but the historian does not make it clear at

which point they attacked. The general himself was killed. The joint forces now attacked bastion E from within and without, meeting with an obstinate resistance still, but soon carrying the work. From this moment the Russian victory was assured, but the Turks, who must have lost all hope, continued to fight with fury. The bastion was defended by the Seraskier (the Ottoman general-in-chief) who was killed, pierced by sixteen bayonets. The historian relates that a young officer of the English navy, who tried to persuade him to surrender, was killed by a pistol shot. Byron, in describing the fighting at this time states—

> "'Twas blow for blow, disputing every inch,
> For one would not retreat, nor t'other flinch."

There was death and destruction on every side; the furious soldier no longer listened to his officers; maddened with blood, he breathed carnage only, and everything else was indifferent to him. The historian assures us that the Russians put three thousand Turks to the sword. The scene in the streets was simply a massacre of the helpless townsfolk, and it is difficult to credit the accounts left to us. I give an extract from an article by Dr. Lawrence in the *Annual Register*, 1791.

"No man could describe the horrors which ensued. The ferocious victors, instead of being struck with admiration and respect by the noble defence of the brave garrison, were so enraged at the great slaughter of their fellows which had taken place that no bounds could be prescribed to the excess of their fury. All order and command seem to have been entirely at an end during the horrors of that terrible night; the officers could neither restrain the slaughter, nor prevent the general plunder made by the lawless and ferocious soldiers. Thousands of the Turks, incapable of enduring the sight of the horrid scenes of destruction in which all that was dear to them was involved, rushed desperately upon the bayonets of the enemy in order to shorten their misery, while those who could reach the Danube threw themselves headlong into it for the same purpose. The streets and passages were so choked by the heaps of dead and dying which lay in them that the progress of the victors in their eager search for plunder was impeded. Among those who fell were a number of the bravest, most experienced, and renowned commanders in the Turkish armies. Six or seven Tartar princes of the illustrious line of Gerai perished with the rest. A few hundreds of prisoners were preserved to serve as melancholy recorders of the destruction they had beheld. It appears, from an accurate enquiry set on foot by an Ottoman commander of rank, that the whole number of Turks who perished in the slaughter of Ismail amounted to 38,816."

As already stated by me, the 38,816 must be a misprint for 30,816, but the latter number is quite uncorroborated by any reliable

evidence. We have noted that the attackers numbered 22,700 only; and the area enclosed within the fortifications of Ismail being less than one-third of a square mile, the authenticity of the statement of the numbers killed is quite beyond belief, although it is only fair to state that it agrees with the account in *L'Histoire de la Nouvelle Russie.*

It is pleasant to learn that one brave officer, who had distinguished himself in the fighting perhaps more than anyone on the Russian side, displayed humanity amid all the excesses of the Cossacks. Byron makes Don Juan this hero, but the credit must properly be given to the young Duke de Richelieu, who was a volunteer in the Russian service, and afterwards became the founder and benefactor of Odessa, where his memory is regarded with reverence. Byron tells a romantic story, but I will content myself with a quotation from Richelieu's own words.

"I saved the life of a little girl, ten years old, whose innocence and candour were in striking contrast with the surrounding rage. On reaching the place where the combat ceased, and the carnage begun, I perceived a group of four women with their throats cut, and the beautiful child was seeking shelter under their bodies from the fury of two Cossacks who were on the point of massacring her. Attracted by the spectacle, I did not hesitate to take the unfortunate little thing into my arms, but the barbarians pursued her still. I had much difficulty in restraining myself from attacking them, but contented myself by keeping them at a distance with a few blows of my sword. I had the pleasure of noticing that my little prisoner had suffered no other evil than a slight scratch made by the weapon which had been used to kill her mother."

Admiral Ribas preserved the greatest coolness at a moment which might have proved fatal to the Russians who were dispersed in pillaging. Seven or eight thousand Turks, united in front of a mosque, were sufficient to have turned the scale, but the admiral imposed on them with a bold countenance, threatening they would receive no quarter if they did not lay down their arms, and persuaded them to submit.

Although the place was now in Russian possession the fanatical Turks stood at bay in isolated groups, and sold their lives rather than be taken prisoners. In an angle of the high bastion an old Tartar Khan fought on with his five sons round him; the latter all fell before his eyes before he was himself struck with a mortal wound, after killing a number of Cossacks with his own hand. Byron enlarges on this incident in many stanzas, but I leave his poetry to be studied by who will.

One more incident to be related will complete the story of the fall of Ismail. Although the Russians were in every part of the town, the stone cavalier G still held out, being defended by the governor of

the province, an old man, a Pasha *à trois queues*. Told that the rest of the town was conquered, he was at last persuaded to authorize a capitulation to be negotiated with Admiral Ribas. During the colloquy which ensued he remained reclining on his carpet spread on the ruins of the tower, smoking his pipe with the same tranquility and indifference he would have displayed had he been entirely ignorant of all that had passed.

Souvaroff was now conqueror. The despatch sent by him to the Empress Catherine was one of the shortest on record, and may be freely translated as follows :

"Glory to God, and honour to thee!
The fortress of Ismail's taken by me."

The Russian losses, on the authority of a general officer, are given by Castelnau, as follows :—

Killed.—General Meknop, Major-General Ribaupierre.

Wounded.—The Prince de Ligne, Colonels Mitaczoff and Labanoff.

Others killed and wounded.—

33	Lieut.-colonels and majors.
396	out of 650 subordinate officers.
4,000	soldiers killed.
4,000	died from their wounds.
2,000	slightly wounded.
Total 10,429	

The young Duke de Richelieu (according to Byron, *Don Juan*) was sent with the despatch to St. Petersburg, where, to quote the words of Dr. Lawrence :—

"The ostentatious and fantastic exhibition of the bloody trophies taken at Ismail was unworthy of the greatness, the magnanimity, and the high character of the Empress. The tragedy should have closed at the conclusion of the last act on the spot. This display was attributed more to a desire of gratifying the excessive vanity of Prince Potemkin, than to the wishes of the Empress herself."

The books from which I have obtained information in the compilation of this memoir are the following :—

Don Juan, by Lord Byron, published 1822.

L'Histoire de la Nouvelle Russie, by the Marquis de Castelnau, published 1820.

Russia, by Count Segur.

Dr. Lawrence, in *Annual Register* of 1791.

Gentleman's Magazine, 1791.

Letters and Thoughts by Field Marshal Prince de Ligne, 1808.

Tweeddell's Remains, 1815.

*INFORMATION ON THE BATTLEFIELD.**

By Bt. Col. J. E. Capper, c.b., R.E.

Preliminary Remarks.

As a prelude to my lecture, I must state that I am avoiding reference to general reconnaissance and confining myself, as far as I can, to the questions arising on the battlefield itself, when armies are within striking distance.

Information depends on two mutually dependent, but distinct, services, viz. :—

(1). Services for Transmitting Information.
(2). Services for Obtaining Information.

I place the transmission first, as in any well-organized army services must exist for the transmission of orders, and should be capable of transmitting all messages, whether of the executive or intelligence staff.

I must not be taken as minimising the immense importance of the strategical information obtained by the cavalry, on which all movements must be based, nor of the tactical information gained by them when two armies are manœuvring against one another prior to the actual fight. I would, however, submit that complete and accurate information on the field of battle is also of the very highest importance.

I would also like to quote from a lecture given by one worthier than myself at the Staff College some little time back :—

"Unfortunately for us there has always existed in the British nation a sort of contempt for any soldier who does not fight absolutely with his own hands. We have always, so far as public opinion goes, both in and out of the army, looked down on every one who did not actually lead troops in battle. . . . Thus we see our 'Intelligence' services are always in danger of being starved in peace and overlooked in war."

Now, I think we must all recognise the truth of those words ; and though our more thoughtful soldiers fully realize the importance of the auxiliary services which render the movement and control of a modern army possible, and though the army telegraphs have been latterly increased and greater attention is being paid to signalling, the nation has hardly yet begun to realize it, and even among ourselves

* Lecture delivered before the Aldershot Military Society.

there are still many who, in estimating the strength of an army, only count guns, sabres, and bayonets.

The battlefield has been aptly compared with a chess board. But how different is the game! In the one case is evolved a well-ordered scheme with every piece in its right position, each under the absolute control of the master mind, who has perfect knowledge of his own and his enemy's dispositions. In the other, after the first few moves, doubt and ignorance prevail; the scheme is hampered at every turn by pieces moving independently, or unable to advance, or beaten back when expected to move forward; whilst few pieces remain under the absolute control of the master, who knows but little of his enemy and can see only a small portion of the board. Even with a well-laid scheme there are but even chances of success against an enemy of equal strength, whilst the waste of energy and the confusion are appalling. What now is the whole difference between these pictures? In the first case there is perfect information, with perfect means of conveying it to the master brain, and perfect control of the movements of the men. In the second case these are either wanting or very imperfect.

The importance of perfecting both of these instruments of battle cannot easily be exaggerated.

There is no salvation for an army, however brave, however well trained to fight, which on the field of battle has to trust to the blind and semi-independent work of isolated units, if it is opposed by the combined force of an equally capable army acting as a whole under the well-informed guidance of its supreme leader.

Owing to the great distances at which modern weapons kill, and to the great extension of modern battle lines, information in the field becomes harder and harder to procure, whilst far more complicated and scientific arrangements have to be made for transmitting it.

TRANSMISSION OF INFORMATION.

We may consider the means at our disposal for the Transmission of Information to be :—

1. Manual.
2. Visual.
3. Electrical.
4. Miscellaneous.

1. MANUAL.

Manual methods are :—

Foot Orderlies.
Mounted Orderlies.
Cyclists.
Motor Cars.

All have their uses and their disadvantages.

Manual systems must generally be used to carry to and from the terminals of other systems. For short distances they are good; but for longer distances they may be slow, depending on nature of country, state of roads, etc. The bearers may be killed or lose their way, and the delivery of the message be impracticable. Where maps, photographs, or lengthy reports have to be sent, the manual method is obligatory, and it must be resorted to when other systems break down.

2. VISUAL.

Visual methods are :—

Flag-signalling by Semaphore.
Flag-signalling by Morse Code.
Lamp-signalling.
Helio-signalling.
Signals attached to Balloons or Kites.
Rockets.
Fires.

Semaphore is easy, but suited only for short distances. A proposal has been put forward, and I believe tried with good results, that it should be the only visual method allowed within units such as the battalion.

Flag-signalling is good and rapid for distances up to from 3 to 6 miles, according to size of flags. The messages are liable to interception by the enemy.

Ordinary *Lamps* may, at night, have a range of 6 miles or more. Powerful acetylene lamps have been read even in broad daylight up to 10 miles, but they are heavy and cumbersome and their messages can be intercepted.

Helios are good and rapid when light is good. At short ranges they are somewhat dazzling. Their ordinary limit is about 15 miles, though in exceptional circumstances they have been read at from 70 to 100 miles. Messages sent by them are not easily intercepted owing to the small angle of the flash, which is only 100 yards broad at 6 miles range.

Every visual signal station should be equipped with helios, lamps, and flags.

Such stations are often very difficult to establish within the enemy's fire zone, and all visual signals invite his attention to the place where they are seen. They depend for their efficiency on weather conditions, and are useless in flat enclosed country.

Signals attached to Balloons or Kites have the advantage that they are seen simultaneously by most of the troops within a considerable radius. They appear to be particularly useful for making simple code signals for a simultaneous attack, halt, or withdrawal. But it is doubtful how far they can be successfully used for conveying informa-

tion or detailed orders, because, if used for this purpose, a long and complicated code is necessary, whilst codes are clumsy things to carry about in the field and may easily fall into the enemy's hands. It is different in the Navy, where the code is carried on the ship and cannot be taken unless the ship is, and even then may be destroyed at the last moment.

The use of such signals is dependent on weather, and the equipment for a station is somewhat bulky. They do not appear to be worth carrying except for issuing general orders and for very special purposes, unless used by the wireless telegraph stations where they would support the wires.

Flag and lamp signalling have been successfully carried out from a manned captive balloon to a station at a distance on the ground, but it is very trying work on the balloonist.

Rockets have the same uses as balloon signals. They are inferior, however, in that, unless sent up exactly at a pre-arranged time and from a fixed place, they may easily escape notice. Moreover, if different colours or numbers are used, it is extraordinary what different opinions exist among the viewers as to what signal was really made. Every rocket signal should be exactly repeated by the receiving station, or very grievous mistakes may occur.

Fires are only useful for a certain pre-arranged signal of an important event, whether of news or for orders.

3. ELECTRICAL.

Electrical methods are :—

Telegraph along wires—air line or cable.
Telephone along wires.
Wireless Telegraphy.
In future, possibly, Wireless Telephony.

The electrical methods of transmission are being more and more depended on, owing to the rapidity and accuracy with which they transmit messages and the perfection of the material and personnel.

The *Telegraph* along cables forms the main portion of the system. It is rapid and accurate ; but it requires a very highly skilled staff, and once laid, considerable delay is caused should it be necessary to alter the position of the main stations. It cannot ordinarily be brought in the open in daylight within the zone of the enemy's fire, and the cable is liable to be cut by accidents or by the enemy's shell.

The *Telephone* is a most valuable instrument. It can be attached to the main telegraph lines, so that the Commander-in-Chief can speak personally to his subordinate generals or to any individual observing station. Light lines carried by men can be sent forward or right and left from the terminal telegraph stations right into the fighting lines

or to the artillery. Such lines will often have to be abandoned as the fight progresses, so that ample reserves of wire are required.

The telephones are very apt to get out of order if entrusted to unskilled men ; the batteries working them run down unnoticed and give out at a critical moment, and the light wires are very liable to interruption. Also, unless the men are really accustomed to them, messages are liable to be wrongly transmitted, and it is difficult to fix the responsibility. As far as possible all messages should be taken down in writing by the receiver and they should be invariably repeated by him.

The Japanese found they answered admirably *when ample time* was available for preparation.

Telephones should be used but sparingly for "orders." A Russian officer (Neznamoff) says that they were found to cause undue interference from behind and jumpiness and "nerves" at the front.

In Manchuria the excessive cold broke the wires, and the batteries of both telegraphs and telephones gave out at times in severe frosts.

Major H. B. Wright, R.E., is of opinion that their use should, as far as possible, be restricted to occasions where "personal communication between officers" is required. I extract the following *re* wireless telegraphy from his notes :—

"*Wireless Telegraphy* is practically the only means of communication between Army Headquarters and the Cavalry force. In its present state it can be relied on to a distance of 30 miles, using portable masts, or to greater distances using balloons to carry a wire into the air. It should not be looked on as only available for the cavalry, as it may be required to establish communication over country which is inaccessible to troops.

"Two companies are now provided for the British army, of which each provides four stations, allowing two for each moving force, one to be kept working till the other is ready for use."

Communication is liable to interruption by the enemy's wireless stations, and it is slower than wire telegraphy. The latest development of wireless telegraphy may enable us to avoid interruption by tuning our instruments.

There is, as far as I know, no development of wireless telephony which will enable it to be utilised for military purposes.

4. MISCELLANEOUS.

Carrier Pigeons may possibly be utilised for conveying messages. I read that attempts are being made to train them to "home" from portable wagons, but I do not know with what success.

Dogs can also be utilised as messengers, but we have done nothing to train them as such. From their small size they might escape death where men could not, and be particularly useful in the firing

line and at night. From their known ability as sentries, and with our soldiers' proverbial ability to train animals, it seems a pity that no efforts are made to utilise them for military purposes.

THE BRITISH SYSTEM OF TRANSMISSION.

Having shortly enumerated the various methods available for transmission, let us examine how far these are provided in the British army.

Orderlies are provided haphazard from any troops which happen to be handy, without any reference to their special fitness for the duty. The O.C.s of regiments or battalions called on to provide them are deprived of their services just as they are going into action, when their ranks should be as strong as possible; whilst the men themselves would, in most cases, far prefer being with their comrades in the fight, and have no special keenness in their work.

Signallers are trained in every unit, and in many cases reach a high standard of efficiency. They are taken for this duty only from their units and placed under signalling officers, who in their turn are withdrawn from their companies for this service during peace; on mobilization they are replaced in their units. The duty of these men is to their unit first—their signalling duties rank only second.

The instruction given them is necessarily limited, and they cannot reach that standard of excellence which may be expected from men whose foremost duties are those of signalling. Moreover, during company training, when they might spend a great deal of time in signalling, their opportunities for practising their technical work are small, owing to the limited area their units cover.

Telephones, which may be said to be still in an experimental stage, are worked under various arrangements, sometimes by the R.E. of the Field Companies, and sometimes by men of the purely combatant arms.

Telegraphs alone are worked throughout as a combined unit, by the R.E. of the Telegraph Companies under one head—the Director of Army Telegraphs.

Each method is independent of the other, and we have, in fact, no system at all.

The necessity of the various services is recognised, and efforts have to be, and are being, made to meet the necessity in each case. But the arrangements made are largely makeshift, lead to waste of the available material and personnel, and do not tend to really efficient working of the transmission services as a whole; whilst co-operation between these services entails an undue amount of work on the part of the heads of the various departments and also on the Chief Staff Officer.

It is improbable that on any large battlefield all parts will require

to be equally supplied with all methods of transmission. Thus, in one part open country with convenient hills may lend itself admirably to visual signalling, and the number of signallers here may be advantageously increased. In another part enclosed flat country may be very suitable for telegraph lines, whilst signallers will be useless. Elsewhere wooded and rough country may prevent the laying of cables, and orderlies must be provided. In other parts all three methods may be required.

To distribute the methods available so that all parts of the field are well served without waste, it is essential that our transmission services should be combined under one chief into one perfect piece of machinery, in which every method has its proper place, and where, at a moment's notice, any method may be replaced or duplicated by another.

Moreover, the economical use under varying circumstances of the means of transmission provided entails a thorough grasp of the subject by both officers and men. It is a matter of close and careful study, and is in itself a science.

When a message arrives at a transmitting station the officer or non-commissioned officer in charge should know by what method it can best be transmitted. Sometimes the wires will be blocked, and an important message may be delayed unless signallers near by are utilised; sometimes it may be quicker to use orderlies.

Lieut.-Colonel Watson, Central India Horse, lecturing at the Indian Staff College, says of the three methods:—"No one of these is to be solely relied on. Each is dependent on the other. . . . From the headquarters to the firing line the instruments employed will include wireless telegraphy, light field telegraph and telephone, visual signalling, and orderlies."

I think it may be agreed that we cannot omit one of these, as no one system is in all cases to be relied on.

During last training season a small experimental Transmission Company was formed in the 2nd Division. It was entrusted to Capt. D. H. Blundell, K.R.R., and combined the signallers and orderlies of the division. This company was under the officer for training, but not for discipline, and it was well and carefully trained for its special work in the short time available. It was used throughout divisional training.

During manœuvres the combination of services went a step further, and telegraphs and telephones within the 2nd Division were also placed under Capt. Blundell's charge. The result would appear to have been a very marked improvement in the general efficiency of the transmission services.

Capt. Blundell gives us as a result of his experience:—"It would be better that any company of this sort should be under the discipline of the officer who is training them, and that the men comprising it should

be quartered together. . . . So long as the telegraphs and telephones and the Communication Company worked under separate control . . . co-operation was hard to arrive at . . . because neither officer in charge knew exactly what the other was doing. It would have been of value to the Communication Company if they could have worked with the R.E. Telegraphs before going on divisional training. . . . To get the best work out of a Communication Company, it must be working *with* the telegraphs; and to ensure this, all methods of communication within a division should be under one control."

This expression of opinion from an officer who has had the experience of working under the old methods and also on the improved system is very valuable, and what is true for the division is equally true for the army corps or for the army generally.

To ensure the one control and thorough co-operation it appears to me to be absolutely necessary that the whole of the transmission services should be formed into one Corps, and that all members of this Corps should be specially trained for the important and complicated services they have to render.

The authorities might look with favour on the formation of such a Corps, which could hardly fail to lead to "increased efficiency with reduced expenditure."

FOREIGN SYSTEMS.

In this connection we can learn from other armies.

In the American Army (I quote from Colonel Watson's paper) "The entire system of communication in the field is in future to be undertaken by a single institution, the Signal Corps. This Corps is one of the Staff Departments of the army, with its own chief, a General Officer, and his staff at the War Office. Officers are selected from the line for their special qualifications, and men are enlisted specially for the Corps. Both officers and men are trained in special schools. In each Division of 18,000 men (three brigades, one cavalry regiment, and six batteries) there is a battalion of the Signal Corps, numbering 15 officers and 333 men, organised in two mounted companies of 55 men each and two dismounted of 110 men each.

"The mounted company has two sections each of 27 men. Each section has a Cable Squad and a Buzzer Squad. The cable can be paid out from light carts (each drawn by one mounted man's horse) or from the top of a pack saddle or a hand barrow. The buzzer line—8 lbs. to the mile—is carried on a pack mule and paid out from a reel fastened to a man. Each squad is divided into groups of four men, each group carrying two flags, a helio, and a lamp.

"The dismounted company, of which 25 men are mounted, work the air line, and do orderly and patrol work. . . . There are no signallers with units, which seems a pity.

"This system has the supreme advantage of cohesion; moreover its Chief is a permanent General Officer of the Headquarter Staff, who can devote his time entirely to the problems of communication, and should be able to complete all arrangements during peace, so that everything may be ready for war. . . . The whole system, up to the most advanced detachment, is entrusted to the Signal Corps, who, realising the danger to the wires to be apprehended from the exploits of the enemy, and the possible failure of the visual apparatus from the effects of the weather, carry a complete equipment of both."

TRANSMISSION CORPS.

In such a Corps, formed of our existing sanctioned troops, would be included :—

(1). The Air Line Telegraph Companies, keeping the Army Headquarters connected with the Base.

(2). Two Cable Telegraph Companies, for two armies each of three divisions, enabling the Headquarters to keep in touch with the Divisions.

(3). Six Divisional (Cable) Telegraph Companies, enabling the six Divisional Headquarters to keep in touch each with two Brigades* up to a limit of 8 miles of cable in each case.

(4). Two Wireless Telegraph Companies, each of four stations, enabling each of two Armies to keep in touch with its Cavalry Division or Brigade.

(5). An Establishment of signallers drawn from the existing Regimental Signallers, who might also work the portable telephones.

(6). An Establishment of Mounted Orderlies, Cyclists, and Foot Orderlies, who at present are drawn from the purely combatant troops.

(7). Possibly a few Motor Cars, which, besides facilitating the rapid conveyance of individuals with reports, messages, etc., might be utilised for quickly establishing signal stations in an emergency.

The detailed organisation of such a Corps would be a matter for careful consideration by a competent committee. I am strongly of opinion that its constitution would enable the services of transmission to be carried out far more effectively than at present; whilst the number of men required beyond those sanctioned for the telegraph companies would be less than the number now withdrawn for these services from the fighting lines of the purely combatant troops.

Major H. B. Wright, R.E., lays down the following principles:—

(1). Each unit of command should include, as an integral part of itself, the personnel and equipment required for its own internal communication.

* The Establishment now sanctioned for a Divisional Telegraph Company was apparently based on the organization of 2 Brigades to a Division and is insufficient to keep in touch with 3 Brigades.

(2). To avoid divided responsibility and unnecessary duplication of work, all means of transmission of orders and information should be organised under one head within each unit of command.

He does not believe that the head of the branch can supervise further units, such as brigade telephones, in war, nor that he should have direct control of units allotted to brigades, divisions, etc.; but as adviser to the General Officer Commanding-in-Chief the head may possibly exercise some supervision, and he should superintend the training of all units in peace.

The principle of the control of training in peace being under the head of the branch is certainly sound; and it is probable that a Corps on these lines would work satisfactorily, it being assumed that portions may be withdrawn from time to time and allotted to other units, just as are the divisional artillery or engineers.

A typical diagram of Telegraphic Communications for an army of 3 Divisions (old organization of 2 brigades) and a Cavalry Brigade is shown on the accompanying diagram. It will be noted that all lateral communication to other units has to pass through the rear. Signallers can of course send it direct along the front, but telegraphs and telephones, except in a stationary defence, cannot do so.

COLLECTION OF INFORMATION.

Information on the battlefield can be gained either

1. By actual View of the incidents.
2. By questioning Prisoners.
3. By Letters, Uniforms, etc., on dead and wounded.
4. By Intercepting Signals.

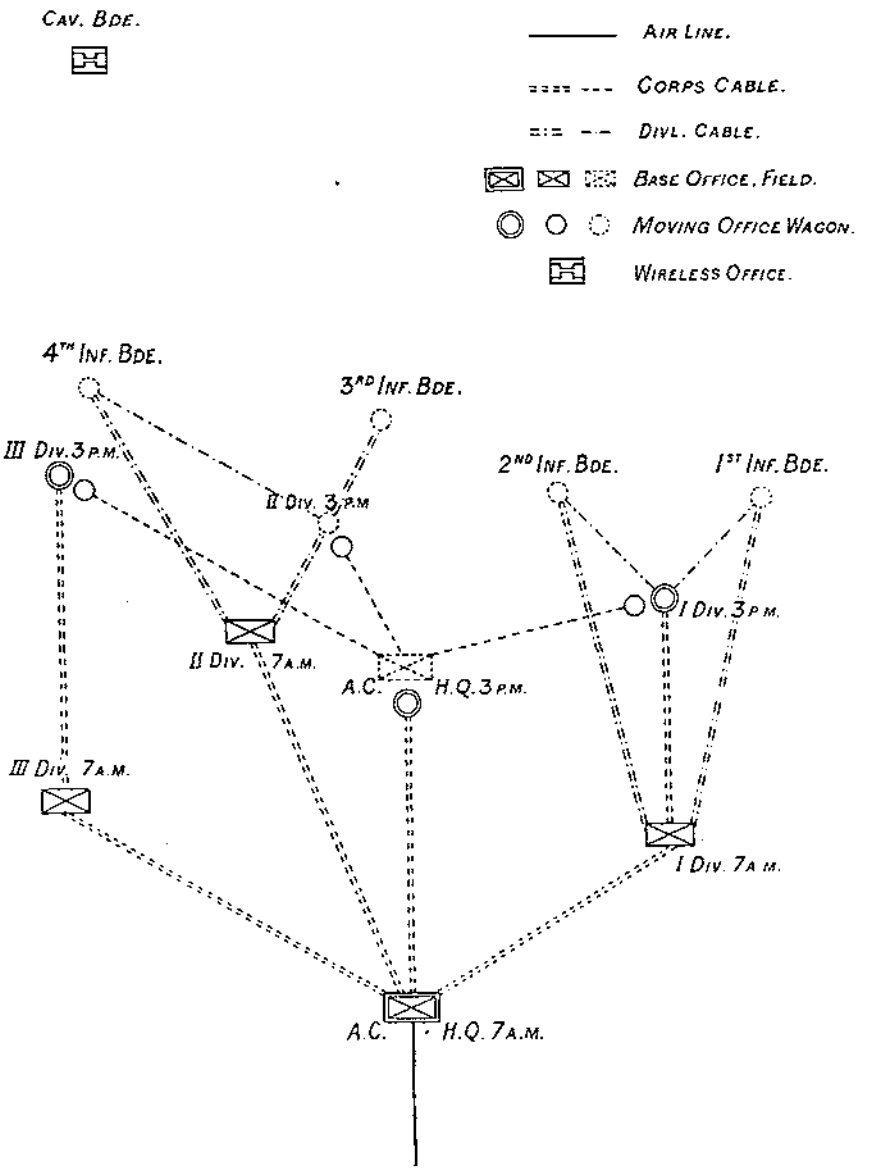
In the 1st and 4th cases the information can be obtained from a distance; in the 2nd and 3rd cases only by coming into actual contact with the enemy.

The great bulk of our information will be obtained by actual view, either with the eyes or glasses, and it is the information so gained which will generally be most important on the battlefield.

Information must therefore be procured chiefly by placing men where they can best see what is going on.

In the old days a Commander-in-Chief placed himself, if he could, on a hill where he could see the whole battlefield. Now, with battles extending for miles both in width and depth, he can himself see but a small portion of the battlefield; he is best placed in some quiet sheltered spot, where he can calmly digest and act on the information sent him by others. This spot will be the nerve centre of the battle, to which all information comes and from which all directing orders issue, and should, if possible, remain constant throughout the battle.

DIAGRAM OF TELEGRAPH COMMUNICATION.



Movement of the Commander-in-Chief to an advanced position of the battlefield is undesirable for various reasons, of which one is that it entails a stopping of some of the means of transmission, as the main artery is shifted.

At present our means of obtaining information by actual view are :—

(1). By sending individuals as close to the enemy as possible.
(2). By placing officers on hills or other advantageous places with powerful glasses.
(3). By raising observers in the air by balloons or kites.
(4). By feint or even pressed-home attacks on certain portions of the field.

General Scobell writes :—"On the near approach of armies, tactical patrols will be sent out, furnished chiefly by the independent cavalry. They will be supported by formed bodies, and obtain information by force, as they cannot afford to lose any time in deviations or subterfuges.

"The victorious cavalry should be able to report every important move the enemy may make on the battlefield; the defeated cavalry should everywhere be blocked.

"If no decisive cavalry fight has taken place, the mounted forces must *fight* to obtain information round the flanks and in rear of the enemy's positions."

He also states, "As for information on the battlefield, the Commander-in-Chief must judge for himself from the information he gets from his divisional commanders, etc."

General von Bernhardi says, "In no case can such information during the action be obtained by the actual employment of the fighting power of the divisional cavalry."

We may accept it as conclusive that along our front of battle the cavalry, except when overwhelmingly victorious, will no longer be used for the collection of information, though they will guard the flanks, and, if possible, push patrols round the enemy's flanks.

Who will therefore collect this information? Is it the attacking infantry?

General T. Capper writes, "The great defect in all battles is that people become so engrossed in what is going on in front of them, that they *quite forget* to send word to the rear and to units and corps on their flanks."

In the stress of action officers and men in the fighting lines have their own proper duties to perform—duties of the highest importance and sufficient to absorb their whole energies. Their sphere of action is comparatively small, and it appears unreasonable to expect them, at times when their whole being is centred on their share of the fighting in their own neighbourhood, to remember that information is wanted elsewhere. After a severe attack, in which maybe most of

well as other armies will be furnished with an equipment of them. Myself, I think that considerable numbers will be in existence before five years are past.

There remains the method of obtaining information by feint or real attacks to make the enemy show up, or by real attack to get possession of points from which more can be seen. These may be inevitable, but they are costly in men (witness the attack on 203-Mètre Hill at Port Arthur), and the results obtained may be in no way commensurate with the sacrifices necessitated.

There is always also the great danger that a feint attack may develop into a real one, and the real one become so involved that a general engagement may be brought on before it can be extricated.

A fight to obtain information, followed by the withdrawal of the engaged troops, is also apt to cause a feeling of depression among these troops, who cannot understand why ground they have won after considerable efforts should be given up without a fight.

NATURE OF INFORMATION.

Information on the battlefield may be divided into two classes, viz. :—

(1) Information that only concerns the unit or units in the immediate neighbourhood, which should *not* be transmitted,

and (2) Information which is of interest to the army generally, or to units at a distance, which *should* be transmitted.

As an instance of the former :—It may be vital for an attacking Brigadier to ascertain whether a particular portion of the line his brigade is to attack is more or less strongly held. If the brigade, however, is in itself strong enough to carry out the attack successfully, this information is of no use to higher authority, and should not be transmitted. The fact, however, of his having successfully attacked and taken the position, or that he is unable to advance further, should be at once reported.

We have seen that there is some danger of the fighting lines omitting to send back information. General T. Capper writes, " In theory we minimise the difficulty by telling off a Staff Officer (in Divisions the D.A.A.G., in Brigades the A.D.C.) during the fight for *communication only*. *E.g.*, the Divisional General decides to attack, and tells his C.S.O. The C.S.O. has now to write orders and organise the attack ; palpably, *he* has no time to tell others. The D.A.A.G. hears the order given, and, without any further hint, reports to superior authority in rear, to friendly troops on either flank, and to anyone else concerned.

the senior officers are killed, and where confusion will be great, when the absolute immediate necessity is to reform and make good ground already gained, there will almost for certain be delay in reporting the fact that the attack has succeeded. But such delay may make all the difference between a local and a general success.

Neither from the cavalry nor from the engaged infantry can one hope to get good and regular information as to the progress of a battle.

There appears to be a distinct want in the fighting lines of men whose object is not to fight but to give their whole energies to obtaining and communicating information.

Whatever provision is made to fill this want, the great bulk of the information will probably be gained by officers with glasses on convenient eminences, should such exist. What can be seen from a bird's-eye view of a battlefield cannot fail to be of very great importance, both as regards the enemy's movements and the progress of our own troops.

BALLOONS.

Such a view is given by the balloon or kites. In their present stage both useful and accurate information can be obtained from these, by officers accustomed to them, within a radius of from 5 to 8 miles, unless the country is thickly wooded or weather conditions interfere with the view, when all visual methods become ineffective.

It is at present uncertain as to how far the enemy's artillery can interfere with our balloon observers. If able to remain in the air, they should be able to give excellent information without undue expenditure of our purely fighting troops, but, in order to obtain it, they should not be kept too far in rear.

DIRIGIBLES.

In the near future we may expect to see both dirigible balloons and motor-driven æroplanes used as ærial scouts.

The dirigible balloon suffers at present from serious limitations, and its great bulk would appear to render it very vulnerable in the day-time. It exists in the French army, and we must take it into account. It is difficult for it to find shelter from winds when on the ground, and it appears more useful for sieges than for field armies.

The æroplane, when it comes, will be different; it will move fast and be little liable to injury, as bullet holes in the surface will cause it little damage. It will be able to go considerable distances, even against strong winds, and is safe on the ground wherever it can find a little shelter.

At present we do not know of any really practical machine, but even during this year it is probable such a one may make its *débût*; and with the first real success it may be imagined that our army as

be brought by such a corps could not fail to improve the general work of the army in this direction. Each unit would still remain responsible for obtaining such information as was of "local" interest.

CONDENSING MESSAGES.

One way in which we may all assist in relieving the signal and telegraph troops is by learning to condense our messages. Every redundant word is directly detrimental to efficiency.

Major C. P. Scudamore invites my attention to a message which was handed in by a Staff Officer at a signal station at the Delhi manœuvres of 1902, and to the message as transmitted by him *with the concurrence of the writer* :—

AS WRITTEN.	AS SENT.
43. 9th, 11-30 a.m. Please direct Colonel Gordon to detail 19th Bengal Lancers from his brigade and despatch regiment as quickly as possible to Panipat where regiment is required for duty with General McRae's movable column. Kindly acknowledge receipt.	43. 9th, 11-30 a.m. Send 19th B.L. to Gen. McRae, Panipat—acknowledge.

He also writes "Much more use could be made of maps in condensing messages by numbering or lettering certain spurs, villages, etc."

SQUARED MAPS.

Now this brings me to a point of the greatest importance as regards information, and that is the use of squared maps. These maps should invariably be provided by the Intelligence Department for all military purposes. I cannot refer in detail to their use for reconnaissance purposes; but even on the field of battle the Intelligence Staff should be able to issue numbers of rough squared maps showing with fair accuracy the main features of the field.

Orders to go to certain places, and information which requires reference to certain places, can be much more easily conveyed both from and to people by the use of squares, and localities can be very accurately defined.

Who among us has not had the weary task of finding on the map "the cross roads half a mile north-east of point 201 on road between Somewhere and Another Place"; and how many of us have not pored over a map for five minutes to try to "describe" the point to which attention is directed?

One of the criticisms against the Russian balloons in the late war with Japan was, that though they could see things all right they

"This principle we try to repeat right down to the unit, and I am sure it is sound."

If this principle enunciated by him is accepted, it entails having with each unit someone whose primary business it is to obtain information and pass it on; and, here again, I think that this work is sufficiently important to warrant the employment of special officers and men for the purpose, in fact of a Scout Corps working under the general direction of the Intelligence Branch.

That a Corps of Scouts specially trained to obtain and send in information would be of value to the cavalry in the preliminary reconnoitring may be admitted; and on the field of battle these men would become available for work along the front, being told off to divisions under a special officer allotted to the divisional staff. They would be specially useful for the following reasons:—

(1). They would be men accustomed to consider whether information was of only local or general interest.

(2). Their attention would be confined entirely to their work.

(3). Their officers would know each individual man and how far his reports might be depended on.

(4). They would be specially trained to report in short and clear terms.

(5). The officer at each stage would form a responsible authority as to whether the messages could be condensed or delayed.

Moreover, it is exceedingly important that those who have to report should have full and detailed knowledge of the situation and the intentions of the Commander-in-Chief, such knowledge as cannot safely be entrusted to the whole of the army.

General Scobell writes on this subject concerning cavalry patrols in their relation to strategic information:—

"These patrols will receive very clear and definite orders and . . . be given all possible information and also the intentions of the Commander-in-Chief. This last is very important, as without knowing what the supreme commander means to do it will be most difficult, perhaps impossible, for a patrol to distinguish between important and unimportant details."

I have noticed that information from a balloon is often quite correct but valueless for the same reason—that the observer has been in ignorance of the situation and intentions of the General Officer Commanding, and has therefore reported unimportant events. The Scout Corps, the balloons, and all other special sources of obtaining information should, of course, be under the same control, viz., the head of the Intelligence Branch.

I am not suggesting that no one else should be expected to furnish information, but such a corps would ensure information coming in at a time when the combatant troops are required for purely combatant purposes; and the perfection to which the system of reporting would

could not describe where they were. In the absence of detailed maps without squares this is difficult.

With the use of squares difficulties vanish, and any locality can be described very shortly with approximate accuracy.

In using the squares the number should always come first, then the letter. If great accuracy is required it may be assumed that each square is sub-divided into four smaller squares, thus 

, and one of these numbers following the letter shows what portion of the square is referred to. Thus, with half-inch squares on a scale of one-inch to the mile localities can be described within a quarter mile. Points such as cross roads, spurs, etc., can be absolutely accurately defined in a moment, and recognised in the same short time by the receiver. Thus the long message above becomes "cross roads 15 D 4."

Whether any change is made in our "information" services or not, this is one that should undoubtedly be made at once.

I have no time to go into detailed accounts of the equipment and working of the various units for obtaining and transmitting information, nor to discuss whether the proportions of these in our army suffice for an army in the field.

I feel strongly that our present methods are based on no sound system, and that a better organization of the methods we possess should lead to far greater efficiency in the performance of these duties. I have placed my thoughts on this subject before you with a view to attracting more general attention to it. I cannot pretend to any authoritative opinion in the matter; but I think that any proposed action that may assist our Chiefs on the field of battle to obtain certain information of what is going on, and may enable them to ensure their orders reaching their destinations quickly and accurately, is worthy of your most earnest and careful consideration.

TRANSCRIPT.

FIRE FROM COAST DEFENCES AT SHIPS.*

In the present state of international politics it would be superfluous to dwell upon the immense military and national importance of an efficient system of coast defence, both active and passive. No great nation can afford to dispense with such a guarantee of the integrity of its sea frontiers. This has once more been demonstrated by the wars between China and Japan, Spain and America, and the recent war in the Far East. Even a nation which relies principally on the strength of its navy must prepare for war in good time by building permanent coast defences; for these, when rightly used, are valuable for offence as well as for defence. Germany, who has inscribed the word *Weltpolitik* upon her banner, is gradually recognizing that a complete system of coast defence is essential to participation in the affairs of the world, and is beginning to make up her deficiencies in this respect.

It is too often forgotten that the cost of bringing the defences of the whole German coast up to date would not exceed the price of a modern battleship.

In this essay it is proposed to deal only with the principal feature of a system of coast defence, namely the coast battery. Attention will be directed principally to the artillery armament, its fire tactics, and its fire effect, touching only lightly on the question of fortification. The action of the defending fleet and its support by the batteries will not be considered.

Coast Artillery.

The principal object of the defences of a coast battery (including both close-defence and distant-fire works) is to afford protection to the permanent emplacements of the coast artillery. This artillery must have a large field of fire and a high rate of fire; it must be powerful, yet capable of being quickly handled; it must offer a small target; and it must always be ready for action. A relatively small number of coast guns will have to engage moving ships carrying a large and well-protected armament; the former must therefore be capable of rapidly changing their target and of penetrating thick armour.

The naval guns opposed to the battery will consist of heavy and medium high-velocity guns, firing armour-piercing shell, common shell, occasionally shrapnel, and sometimes but rarely high-explosive shell. To these the coast battery will oppose guns firing armour-piercing shell for use against armoured sides, belts, decks, and turrets; common shell and high-explosive shell; and shrapnel, which are very effective against men working on deck and against the unarmoured portions of the ships.

* Extracts from an article by W. Stavenhagen, late Captain, Prussian Army, in the *Mitteilungen über Gegenstände des Artillerie-und Geniewesens*, No. 10 of 1906.

An abundant supply of all these projectiles must be available in close proximity to the guns. And, last but not least, the coast battery must be fully equipped with well-protected appliances for laying, range-finding, and observing, and with lights for illuminating the field of fire.

The coast guns will consist of heavy and medium guns which, since they have the same duties to perform, will be of the same calibre as the guns of the battleships and armoured cruisers. The calibre will be from 9·5″ to 12″; the length at least 40, sometimes even 50, calibres. These guns are intended to engage the naval guns, and to pierce armour at the extreme range of which they are capable. Light guns which cannot pierce armour are incapable of defending the entrance to a harbour, and are useless against the enemy's rapidly-moving cruisers which will fight at extreme ranges owing to the weakness of their armour.

HEAVY GUNS.

The 9·5″ and 12″ guns constitute the backbone of the defence, and will be mounted at the most important points. They range up to 9½ miles. Since their projectiles will rarely strike at right angles to the surface of the armour, but usually at a more or less acute angle, they must have a considerable surplus of penetrating power in hand. This entails the use of heavy charges of smokeless powder, either nitro-glycerine or guncotton powder. This powder must be slow-burning in order to obtain high velocities with relatively moderate pressures at the breech. This again necessitates the use of gun-steel of high tensile strength and high elastic limit. The gun must be long and have strong but quickly-operated breech-closing gear.

(Here follows some details of the Krupp 9·5″, 11″, and 12″ guns of 45 calibres, ranging at 15° elevation to 8½, 9¼, and 9½ miles respectively; and of the Krupp 12″ gun of 40 calibres, ranging at 44° elevation to 12½ miles. The 12″ guns are capable of penetrating any existing armour at ordinary fighting ranges). Germany possesses few 12″ coast guns; most are 11″. But the French coast artillery are still more behind the times. Their regulation coast gun, for use against armour, is the 9·5″ forged steel built-up gun. They have also cast-steel built-up guns of 9·5″, 10·6″, and 12·5″ calibre, but these are old guns far inferior to the Krupp guns of the same calibre. Russia has 10″, 12″, 6″, 9-pr. and 2·24″ guns and 11″ and 9″ howitzers. At Port Arthur 119 of these guns and howitzers were mounted in 21 batteries.

Armament o Battery.

The number of guns to be mounted in a coast battery depends upon local considerations, such as the importance of the harbour, the nature of the ground, the amount of support to be expected from coast-defence ships and gunboats, the probable strength of the adversary, and the amount of money available. For instance, one 11″ gun costs as much as seven 6″ or twenty 3″ guns.

We have also to consider the rate of fire, and the weight of projectiles that can be directed upon a target in a given time. Thus a 9·5″ gun fires only 0·75 aimed shots per minute, without counting the time taken to observe and correct the fire. With unaimed fire the 9·5″ gun fires 2·5 shots per minute, the 11″ gun 1·5 shots, and the 12″ gun 1 shot. This

works out to a total weight of metal discharged in two minutes, at unaimed fire, of 1 ton from one 11″ gun, 3·9 tons from seven 6″ guns, or 7·25 tons from the twenty 3″ guns, for the same initial expense of armament. The rates of fire are taken at 1·5, 5·5, and 26·5 rounds per minute respectively. The weight of metal discharged is roughly in the proportion of 1 : 4 : 7. If we take the striking energy as a measure of effect the comparison is more favourable to the heavy gun; we find that it takes two 6″ or three 3″ guns to deliver the same weight of blow in a given time as one 11″ gun.

In practice it will be found desirable to observe the same proportion between the numbers of guns of each calibre as has been found to be the best in the Navy. This of course is subject to local conditions, to the strength of the probable antagonist, and to the support afforded by our own ships.

mmunition. The ammunition to be stored in the coast battery may be reckoned at 100 to 125 rounds for each heavy gun. Of these rounds $\frac{1}{5}$ to $\frac{1}{2}$ will be A.P. shell, $\frac{1}{3}$ common shell, and $\frac{1}{6}$ to $\frac{1}{3}$ shrapnel.

rmour. If the coast guns are to be protected by armour (which depends on local conditions, such as the height of the battery) then, in Germany, our practice is to mount heavy guns in pairs in chilled cast-iron cupolas. These are well adapted for resisting heavy projectiles, since there are no bolts or rivets to fly about. Two-gun cupolas are cheaper than single-gun cupolas, and considerably cheaper than hoods of rolled and hardened nickel steel.

Cupolas can be traversed as quickly as these heavy guns can fire; thus an 11″ gun cupola, weighing 850 tons, can be traversed by hand through a complete circle in $3\frac{1}{2}$ to 4 minutes. This rate of traverse is sufficiently rapid to engage even a torpedo boat passing at full speed, to say nothing of ordinary targets such as battleships. Even if 6 minutes be assumed as the time for a complete revolution of the cupola, this gives only 1 second per degree of traverse.

MEDIUM GUNS.

The bulk of the armament of coast batteries usually consists of 6″ and 4·7″ guns. At medium ranges these are especially suitable for engaging rapidly moving ships, owing to their high velocity and rate of fire. They are capable of penetrating thin armour. They are also useful for protecting minefields and booms, repelling close attacks, and preventing small vessels from approaching to sweep for mines. The latter duty will be performed in combination with the light guns.

The 6″ is preferable to the 4·7″, because its shell and its shrapnel are far more powerful, although its rate of fire is only 6 rounds per minute as against 12 for the 4·7″. This gives a slightly greater weight of metal per minute discharged by the 4·7″; but this small advantage is outweighed by the greater striking energy of the 6″ gun.

The Krupp 6″ gun is 41 calibres long; it ranges $8\frac{1}{2}$ miles at 21 degrees elevation.

These medium guns will usually be mounted at about the same height as the upper deck of a battleship, giving angles of impact nearly normal to the armour. But where the armour-piercing effect is insufficient they must be assisted by the heavier calibres.

Ammunition may be reckoned at 500 rounds per gun, including ½ common shell, ⅛ to ¼ A.P. shell, and ¼ to ⅓ shrapnel. Ammunition.

Medium guns will usually be mounted singly in turrets or hoods of rolled nickel steel. These give sufficient protection, and are light and handy to traverse, a necessary quality when engaging torpedo boats. It is undesirable to mount these guns in pairs, but this is sometimes done to save expense. Armour.

LIGHT GUNS.

A certain number of light Q.F. guns will be required. The duty of these is to engage torpedo boats, repel landing parties, and protect minefields. They may also be used at close quarters against men on deck. They are sometimes mounted to sweep the fort ditches.

These light guns are mostly of 2·24″ and 3·46″ calibre, firing 45 and 20 shots per minute respectively. The 3·46″ shells will penetrate the sides and boilers of torpedo boats at 1,650 to 2,200 yards.

A liberal supply of ammunition must be provided, since a gun will fire away 200 to 225 rounds in a 5-minutes' fight. A fair allowance is 1,000 rounds per gun, of which ⅔ should be shrapnel and ⅓ common shell. Ammunition.

These guns are always mounted singly, usually on disappearing mountings, so that they may be reserved for the final stages of the fight. The shields must be light and handy and must offer a small target; they should therefore be of nickel steel plate. Armour.

COAST HOWITZERS.

These are of the greatest importance. Flat trajectory guns are unable to pierce armoured decks on account of the acute angle of impact, even when firing from high sites at angles of depression. Neither can they pierce the roofs of turrets, which offer very small horizontal targets. Howitzers, on the other hand, are able to pierce armoured decks, to attack the engines and the vitals of a ship, to drive shells through her bottom, to prevent her from manœuvring and from anchoring even at extreme range.

The best weapon for this purpose (at least in Germany) is the Krupp 11″ howitzer, 12 calibres long. Its range at 43° is 6¼ marine miles. The 470-lb. shell has a M.V. of 1,400 fs., M.E. of 6,300 foot tons, and penetrates a horizontal steel deck 3·8″ thick. At shorter ranges the penetration is greater; thus at 6 miles, with 60° elevation, the 470-lb. shell penetrates a horizontal armour plate 5·2″ thick, and the 760-lb. shell penetrates 6·7″; whereas the thickest armoured decks are not more than 5″, more usually 3·5″, often only 3″ thick.

The accuracy of the Krupp howitzer is very good, and at anchored targets is better than that of the heavy guns. Thus even at the extreme range of 7 (English) miles the 50% rectangle is only 58 feet long by 19·5 feet broad.

These howitzers are cheap to mount, since they require no shield protection, except when they are mounted so as to be capable of direct fire at close quarters. They are fitted with illuminated night sights and electric firing gear.

Owing to their comparatively slow rate of fire howitzers should be mounted in batteries of 4. For the defence of a harbour at least 2 such batteries, preferably 4, will be required.

Ammunition. Ammunition may be reckoned at 100 to 125 rounds per howitzer, of which half should be A.P. and semi-A.P. shell; the other half should either be all common or equal proportions of common and shrapnel.

Command Posts, Rangefinders, and Searchlights.

At least two armoured command posts must be provided for each coast battery. Rangefinders should be preferably of the D.R.F. type. Electric lights must be provided in sufficient number to illuminate the field of fire. All the above must be in nickel steel armoured cells.

(The author here gives particulars of speed, armament, etc., of various species of war vessels, and discusses ships considered as targets).

Naval Tactics.

Setting aside blockade tactics, which are of a more or less passive nature, ships may attack coast forts in two ways. The first is a regular artillery attack on the forts, often combined with a bombardment of the harbour. The second consists of a dash past the forts into the harbour. In either case the ships will be in rapid motion during the whole attack.

There will be little or no attempt at methodically bombarding the forts, breaching their parapets, and piercing their armour. Attempts will rather be directed towards silencing those fort guns which interfere with the operation to be carried out. Ships will gradually advance, on curved courses, with constant changes of speed and direction. They will traverse as quickly as possible the zone rendered dangerous by howitzer fire, namely from 11,000 to 4,400 yards. At points recognized as specially favourable for attack they will drop buoys, so that the range will not have to be found afresh when they pass these buoys again. The actual artillery combat will be carried on between 4,400 and 1,100 yards; sometimes, but rarely, the ships will anchor in this zone. This advance to a range at which the armour can be penetrated is both rash and dangerous; the battle will usually be decided at ranges of 3,300 to 2,200 yards.

The dash into harbour is the culmination of a successful attack. But it may sometimes be boldly attempted at the commencement of the fight, either taking no notice of the coast batteries or continuing the dash with an attack on the batteries. The latter procedure is most difficult for the batteries to meet. The dash into harbour is made at full speed, with the greatest boldness and decision, and is pushed home even if the obstacles (booms and mines) have not already been cleared away. It is usually made in line ahead with torpedo boats leading. It is often preceded by a feint in another direction.

FORT TACTICS.

Whichever nature of attack is attempted, every gun must be brought to bear upon the attacking ships. When the forts are attacked every gun should open simultaneously. When a dash at the harbour is attempted the rate of fire should be as high as possible. Light guns should pour a storm of shells upon the advanced guard of torpedo boats, which will usually contain at least one boat intended to destroy the mines. Heavy and medium guns will concentrate on the ships.

In a night attack the part played by the searchlights is of the greatest importance. They serve to discover the enemy, to dazzle him, and to hide the movements of the defending ships.

(Here follow details of ammunition for coast guns and of fire discipline).

SHIPS COMPARED WITH LAND BATTERIES.

Little is to be learnt from modern historical instances as to the probable result of a combat between forts and ships. The success of the English against Alexandria in 1882 is discounted by the fact that the forts and their garrisons were of inferior quality; but it is important to note that after the battle the English ships had not enough ammunition remaining for a sea fight, nor had they any means of replenishing their supply. In the Spanish-American War the Americans made no serious attack upon the forts at Havana, Porto Rico, or Santiago; they did not wish to risk their ships. In the recent war in the Far East the Japanese never engaged the Port Arthur forts; they remembered the sea-fight on the Yalu, which had to be broken off because the ammunition was exhausted. It is true that on the 9th February, 1904, the Japanese ships engaged Golden Hill and 3 other batteries for 40 minutes at a range of 8,500 to 9,500 yards; but not a single hit was made on either side, and after this the Japanese kept out of range.

At the present day, other things being equal, there is certainly no advantage on the side of the ships. In fact the advantage is the other way. For the heavy guns of the ships lose their accuracy and finally become useless after firing a comparatively small number of rounds, and these guns cannot be replaced; whereas the forts can easily replace their guns, at least those of medium calibre. The ships carry only sufficient rounds for a two-hours' fight; whereas the coast guns can depend upon a practically unlimited supply.

Recent peace-time experience has demonstrated that the fire from forts is far more accurate than that from ships. This is due to the following causes:—Stable gun-platforms, better system of fire-control, better knowledge of the field of fire, possibility of accurate range-finding, and greater facilities for observing fire, especially across the range. Moreover the coast guns will as a rule outnumber the ship guns; they are disposed in batteries of 4 to 6 guns, carefully arranged with a view to concentration of fire.

On the other hand, the accuracy of the fire of the forts is reduced by the mobility of the ships. But when a squadron intends to deliver accurate

fire it is obliged to anchor, and it then offers an easy target to howitzers, a weapon which ships at present do not possess.

Guns may be used at ships either anchored or on the move, howitzers preferably at anchored ships and at extreme ranges.

THE COAST BATTERY AS A TARGET.

The batteries offer low and scattered targets, of small depth, difficult to locate and to range upon. From an unstable gun-platform, especially when on the move, it is far more difficult to make hits than to do so from the battery. Decisive effect can only be obtained by destroying the gun-detachments; to do this the ships must approach to from 3,300 to 1,650 yards. Preferably the ship should anchor in a dead angle, if such can be found; but this is the exception with well-designed works. Failing this, anchoring would only be permissible if the ships were greatly superior in force.

Range-finding from a ship is most difficult, and this will prejudice the effect of the ship's fire.

A single hit is not likely to produce a serious effect upon a well-armoured fort, whereas one hit may explode a ship's magazine or her boilers. Moreover the forts, being better provided with ammunition, can continue the action much longer than the ships. The latter will therefore be unable to carry out a systematic attack lasting all day, but will have to trust to a dashing attack and a storm of rapid fire. They have however the advantage of being able to bring a more or less converging fire on any fort selected for attack.

Taking all these considerations into account we must conclude that ships will not be able to silence (far less to destroy) strong coast batteries unless they are in overwhelmingly superior force and are prepared to expend so much ammunition as to render them unfit for a sea-fight. Even so they are not likely to succeed in destroying the forts, unless they land parties to attack them, covered by the fire of the ships at close ranges.

Since the main object of a fleet is to fight other ships, it will usually avoid attacking strong coast defences or even coming within range of their guns. Such an attack is only permissible when it is the necessary preliminary to a sea-fight—as when the enemy's fleet have taken refuge in harbour or under the guns of the forts. In this case an engagement with the forts is only an unavoidable incident of the combat; but then there must be no danger of having to encounter naval reinforcements despatched by the enemy to the scene of action—unless indeed the attacking fleet is strong enough to detach a squadron to meet such reinforcements. Or, as a last resource, it may be necessary to force a passage through a channel, or to enter and destroy an important harbour, running the gauntlet of the forts to do so. This may occur as a very exceptional case when there is no work left for the fleet to do at sea; that is, when the enemy has no ships left. But usually the fleet will only have to support the attack of the land forces upon the coast defences.

Generally speaking the fire of low-sited gun batteries is both more accurate and more effective; the trajectory is less plunging, and the shells strike the armour more nearly at right angles to the vertical plane. Height of Batteries.

Low-sited batteries have less dead water in front of them, and can therefore engage ships at closer ranges and can continue their fire up to the last moment.

On the other hand observation is easier from the high-sited battery and the battery is far easier to protect, especially when earthen parapets are used. Owing to the flat trajectory of their guns it is practically impossible for ships to drop shells *into* these batteries at short and medium ranges, at which the angle of descent is very small or is even negative. Open batteries with guns firing over a parapet have a much narrower field of fire than armoured turret batteries, namely about 150° as against 360°; but this arc is sufficient in most cases.

Subject to special local conditions, the question of high *versus* low-site batteries is one of protection *versus* effect, which must be combined to the best advantage. If, as is usually the case, full advantage is taken of available high sites, it will generally be necessary to provide low-site batteries as well for covering minefields and guarding channels.

Low-site batteries must almost always be armoured; islands in the channel form suitable sites. High-sited batteries must be so placed as to have no dead water in front of them; or, failing this, the dead water must be covered by the fire of other batteries at short range. The most modern mountings allow of 13° of depression, but 5° to 6° of depression is as much as can be given with older mountings. If extreme depression is required, this implies that the guns must be mounted high above the parapet, when they will be badly exposed. Moreover the steep superior slope of the parapet weakens the crest. For these reasons the best height for gun batteries will rarely exceed 165 feet above sea level.

Howitzer batteries should be placed as high as possible; this gives better protection and better facilities for observation. But occasionally local considerations may render it desirable to choose a low site for a howitzer battery in order to obtain better protection from the shape of the ground.

In general it will be best to mount both guns and howitzers in open earthworks. Costly armoured batteries should be employed as sparingly as possible; the extra protection afforded by armour is rarely necessary in view of the relatively inaccurate fire of the ships. The money saved by using earthworks instead of armour will be applied to the best advantage in the provision of the most modern and most powerful guns.

REVIEWS.

SIMPLE MAP-READING, REPORTING, ETC., FOR N.C.O.s AND MEN.

By Lieut. & Qr.-Mr. J. V. Laughton, 21st Lancers.—(7″ × 5″. 71 pp. 1s. 6d. May & Co., Aldershot).

This little book is written for Cavalry in particular. Part I. contains notes on Map-reading. Part II. has chapters on the use that can be made, as regards time and bearings, of the Sun and Stars. There are many useful hints on Horse-Management, "deductions" when Scouting, Reporting, and kindred matters. The whole is arranged by lessons, and is a useful type of what can best be attempted with a class of N.C.O.s and men.

E. P. Brooker.

SCOUTING AND RECONNAISSANCE IN SAVAGE COUNTRIES.

By Capt. C. H. Stigand, Q.O. Royal West Kent Regt.—(6½″ × 4″. 150 pp. 5s. Hugh Rees).

This pocket-book is intended to assist travellers in finding their way in comparatively unknown country and in making rough sketches of their route. It also gives numerous hints to scouts, dealing with observation of details connected with natural features and the tracks of men and animals. At the end is some log paper, some sheets ruled like a field book for use in sketching, a pencil and india rubber. It should be a useful book for travellers who do not wish to be loaded up with log books and Nautical Almanacs, but desire to know enough about the sun and stars to use them in finding their way about.

The notes on the customs of natives and habits of animals are concisely written and should be useful anywhere, but especially in Africa.

Chapter I. gives advice on finding the bearing of a route with the aid of sun and stars. The method employed is an approximation, depending on rough tables for the declination and departure of sun and stars, from

which tables it is possible to determine with sufficient accuracy for marching the true bearing at any time of a heavenly body. These tables are very short, and are easily understood and applied. They are intended for use when it is inadvisable or difficult to use a compass, *e.g.*, in iron-stone country or on horseback.

Chapter II. deals with the observation of landmarks and the necessity of noting small points, such as curious rocks and trees peculiar to certain localities or of special appearance. This is with a view to assist the traveller when returning to camp or in giving directions to natives. The chapter concludes with a *resumé* of points worth noting—(*a*) before a march begins, (*b*) when in progress,—and gives a few notes on Field Book traverse with the aid of watch and compass.

Chapter III. deals with tracking. Details of the spoor of various domestic and wild animals are given and notes on their habits when grazing and moving. Points to which the attention of a tracker should be drawn are mentioned, and the necessity of actual practice in the field is insisted on.

Chapter IV. contains a few general hints on health and clothing, suitable chiefly for a scout or one who travels with a minimum of impedimenta. Clothing should be of a mottled colour and harmonise with the probable background. There is a list of useful articles to be carried on the person. Points to be observed when choosing sites for bivouacs and methods of adapting one's habits to the particular country are described, and the assistance of a native tracker is advised.

Chapter V. describes customs in vogue among various tribes, chiefly in Africa, such as methods of blocking and indicating the road, tribal marks, and differences of food and weapons.

Chapter VI. gives hints on reconnoitring hostile villages, etc., method of questioning natives, and moving without attracting notice. It describes the way to approach a village and to avoid alarming wild animals and dogs.

Appendix I. explains the use of 3 star charts, enclosed in a pocket in the cover, viz.:—(1) Northern constellations, (2) Southern constellations, (3) Equatorial stars.

These charts give lines showing the position of the meridian at certain times and dates, and by interpolation the stars near the meridian at any other time can be found. The latitude being known, the stars which are visible at the time in question can also be determined from chart 1 or 2. Chart 3 is for use when travelling east or west and gives a belt of stars a few degrees on each side of the Celestial Equator. The method of using it is simple and is explained in the text.

Appendix II. gives hints on training men as scouts and trackers and suggestions concerning the improvement of memory and perception of details in every-day life.

The cover, of durable canvas, has scales of centimètres and inches. There is a good index; but the absence of a list of contents is a disadvantage when all the page headings bear the main title of the book instead of the titles of the chapters.

G. F. EVANS.

REPORTS OF MILITARY OBSERVERS ATTACHED TO THE ARMIES IN MANCHURIA DURING THE RUSSO-JAPANESE WAR.

PART III.—REPORT OF MAJOR JOSEPH E. KUHN, CORPS OF ENGINEERS.

(Published by the General Staff of the United States of America).

This is one of the best reports on the Russo-Japanese War yet published. Without going into great detail, it gives a deal of information for all branches of the service. Owing to the absence of long and dry accounts of operations, it is a very readable volume to which the general reader can turn with interest.

The writer was with the Japanese Army from July, 1904, till September, 1905. As he is an officer of Engineers, the book should be of especial interest to that branch, but much general information is given in a simple form. There are occasional touches which relieve the work from monotony, as, for example, the statement on page 51 that in the Japanese Army the casualties from horse management exceeded those due to the bayonet, a convincing testimony to the viciousness of the Japanese pony.

The writer does not hesitate to criticize where he thinks criticism necessary, and his description of Japanese sanitation and hygiene, page 47 onwards, might with advantage be read by all who are in the habit of running down the British medical arrangements in the field.

Except for descriptions of Russian works, the volume deals entirely with the Japanese army.

Commencing with the infantry, details are given as to standards of height, terms of service, equipment, rations, etc. Not much is said about organization or tactics, but some useful general information is given.

The same remarks apply to the report on cavalry.

As regards artillery more attention is paid to the organization. The writer (page 31) puts a strong case for the provision of high-explosive shells for field artillery. He devotes a little space to methods of employment.

Under the heading of Engineers some useful information is given, special sections being devoted to the pontoon equipment, to sanitation (which includes medical statistics and a description of veterinary hospitals), and to army telegraphs.

Transport and supply are next dealt with, information being given on the subjects of conveyance by sea of men and horses, of broad and narrow gauge railways, of animal transport, packing of supplies, etc.

A few pages are devoted to army organization and general staff, to the government of the occupied territory, and to the characteristics of the theatre of war.

Owing to the difficulty of obtaining information, the subject of submarine mines is only lightly touched upon.

The Japanese machine gun is described, with a few remarks on the methods of employing it.

Field fortification does not receive all the attention one might expect; but some excellent drawings and photographs are given, and a short but interesting description of obstacles constructed close to the enemy's trenches. This subject is closed with the remark:—"As was to be expected, the material damage inflicted by artillery on field works proved a negligible quantity, but some form of head cover was shown to be necessary to give protection and confidence to the troops when long exposed to shrapnel fire."

The greater portion of the remainder of the book (pp. 115 to 205) deals with Port Arthur. The author arrived there in time to witness the final scenes of the siege, and remained for two months after the surrender in order to inspect the works. An excellent little history of the siege is given in a condensed form, followed by a detailed description of the Russian works, including the coast defences. It is well illustrated by maps, drawings, and photographs. Some description follows of the special methods of warfare employed in the siege, such as the use of hand grenades, siege artillery, etc., but the Japanese siege-works are not very fully dealt with. The losses on the Japanese side during the siege are placed at about 56,500, exclusive of sick.

The writer witnessed the closing scenes of the battle of Mukden, of which a description is given; and on page 221 will be found a repetition of the case for high-explosive shells with field artillery.

A few words dispose of the remainder of the campaign, and the volume closes with some general conclusions to be drawn from the war. The slowness of the Japanese movements is noticed, and their transport arrangements unfavourably compared with those of the Russians. The value of Port Arthur as a factor in the war is pointed out; a few lines devoted to infantry formations and ammunition supply; the use of machine guns is advocated, though no suggestions are made as to the way in which they should be handled; and the writer concludes with some words of praise for the Japanese soldier and his officers.

The book is profusely illustrated with drawings and photographs well reproduced. It can be recommended to the large number of readers who, owing to lack of time or of enthusiasm, are indisposed to tackle long reports containing many statistics and the minute details of military operations.

A. BANNERMAN.

NOTICES OF MAGAZINES.

ANNALES DES PONTS ET CHAUSSÉES.

4th Quarter, 1906.

LIFE AND WORKS OF JEAN RODOLPHE PERRONET.—Born at Suresnes on 25th October, 1708, and left an orphan at an early age, Perronet was at first destined for a military career; but he was led to take up the profession of architect, which in those days embraced the office of engineer. During his apprenticeship he was largely employed on works connected with bridges and roads. He rose rapidly in his profession, and in 1747 was given an appointment that conferred on him the right to conduct and supervise works in all parts of the kingdom. In 1750 he was promoted Inspector-General and in 1763 First Engineer, and he continued to work in Paris up to the time of his death in 1794. He also created the School of Bridges and Roads, and for 47 years was its Director.

In his capacity as First Engineer he carried out numerous and important works, principally in the district of Paris, the inspection of which he had reserved to himself. He also designed works for other parts of the kingdom, and was charged with frequent missions of inspection or to give advice in difficult cases.

Of bridges he constructed 11 and prepared designs for 8 others. The bridge at Brunoy was remarkable for its decoration. Others, such as the single-arch bridge at Nogent and the three-arch bridge at Chateau Thierry were of the usual type of the period.

The most interesting ones are those which show the system of construction he created; these are the bridges at Neuilly, the Pont Sainte-Maxence, and the Pont La Concorde, which he built himself, and the bridge at Nemours, which was built after his death from his designs.

It is from an examination of the architecture of these bridges, and by studying a "Memoir on the Reduction of the Thickness of Piles and on the Curve that should be given to Arches," that we can judge of his innovations and teaching.

An accident that occurred during the construction of the bridge at Mantes seems to have given him the idea of his new system of construction. It happened, in 1763, that of two arches then on centrings one was nearly completed while the other was barely commenced. The pier that separated them was displaced, by reason of the inequality of the pressures, towards the side of the incomplete arch. By loading up this arch the displacement, which was only small, was arrested. But,

small though this displacement had been, the fact remained that the pier loaded on one side only had not been able to resist the pressure.

Up to this time it had been considered necessary that each arch should be stable in itself without the support of any adjoining arches, and it was estimated that this condition was fulfilled when the piers were made, as in the case of the bridge at Mantes, with a thickness equal to $\frac{1}{3}$th of the arch opening. This "Rule of $\frac{1}{3}$th," although quite irrational, since it took no account of that essential element the height of the piers above the river bed, was at that time accepted as an article of faith. The accident of the Bridge of Mantes ruined its authority and Perronet proclaimed its falsity.

But, since the piers designed with a thickness of $\frac{1}{3}$th of the arch openings were found insufficient to give safe abutment, the question was whether they should be thickened still further at the risk of obstructing the flow of the river? Perronet rejected this solution. He considered that by obstructing the current with wide piers under-scouring was liable to be caused, this having been a source of failure in many of the bridges of the middle ages. He considered it better to change the system,—to reduce the size of the piers instead of increasing it, to give them the sole office of sustaining the weight of the arches, and to resist the thrust (balanced on each pier and transmitted from one arch to the next) by means of the abutments. The massive portions of the bridge being thus brought on to the banks the least possible obstacle is offered to the flow of the stream; whilst the reduction in thickness of the piers becomes a guarantee of durability to the bridge. Such is the system, universally followed in modern bridges, that Perronet conceived and resolutely applied. However, in order to adopt this plan, of which the weakness is that the ruin of one arch entails the fall of the whole structure, one must be able to rely upon the solidity of the foundations; on this point the construction of the Royal Bridge had given valuable lessons, and many bridges built subsequently had proved its importance.

The bridge over the Seine at Paris, now called "La Concorde," was built by Perronet in the years 1786—1791. It is his last work and is, perhaps, his masterpiece. This bridge, more than any other in Paris, has marked the influence of political vicissitudes by the frequent changes of its name. When the designs were first prepared it was to be called Pont Louis XV.; in 1786 it was re-named Pont Louis XVI., in 1791 Pont de la Revolution, in 1795, after the Terror, Pont de la Concorde, at the Restoration Pont Louis XVI. again; and finally, in 1830, it once more became the Pont de la Concorde.

The bridge consists of 5 arches. These are segments of circles of unequal openings, and are carried on very thin piers terminating in the form of columns. The centre arch is 96 ft. wide, the two adjoining ones 87 ft., and the two outer ones 78 ft. The width of the bridge is 46½ ft. The piers are 9 ft. thick.

The total cost was 3,860,000 livres, the original estimate having been 3,000,000 livres.

C. H. VERSTURME-BUNBURY.

ENGINEERING NEWS.

May 9th, 1907.

RECENT DEVELOPMENTS IN BLOCK SIGNALLING.—The recommendations recently put forward by the American Railway Signal Association practically constituted a complete break-away from European practice. In America, in fact, it is only recently that a serious attempt has been made to systematize signalling on all lines, for it is only recently that block signalling, or indeed signalling by fixed signals, has been really adopted extensively. The most noticeable feature about the recommendations of the R.S.A. is that it is proposed to give a considerable variety of indications by the same signal, *i.e.* signals restricting "Rights," signals conferring "Rights," signals giving information.

The system proposed for adoption is indeed the outcome of the "Train Despatching" system. Where runs are long and the possibilities of trains running out of course are considerable, there is in fact a reason for the system of directing train movements by despatcher such as we have no parallel for. Again, the amount of traffic on many lines is not sufficient to justify a permanent staff at many intermediate sidings or crossing places. It is hence necessary to provide for instructions to the train men as to crossing or passing arrangements at such sidings.

The general features of the system proposed are:—

(1). Two lights and two arms in combination comprise each signal indication.
(2). Separate and distinct indications are given by the same type of signal for both block sections and interlocking limits.
(3). Separate and distinct indications are given for high speed and intermediate speed.
(4). Each of the two semaphores for any one indication has three positions for the arms and three lights for the lamps.
(5). At interlocking plants the signals indicate for speeds rather than for routes.
(6). A small arm and low power lamp low down on the post are to control movements usually made by hand signal.

I quote the above, but it is not particularly lucid. Indeed, it is difficult to see the advantage of number (5) over our usual arrangement of showing by the height and arrangement of gantry or bridge signals the actual route and the relative importance of the road to which they apply.

In the case of the indication "Prepare to stop at next signal" the second arm is practically a repeater, like a distant signal, of the arm next in advance; but with the difference that it is arranged alongside instead of below the principal arm.

The indication "Stop and proceed cautiously" implies permissive working, necessary perhaps where block sections are long, but never as secure as absolute block. It is very difficult to define what "proceeding cautiously" means, and absence of certainty in such a matter means risk.

The two-light indication is undoubtedly more distinctive than the single

light; but it does not seem fully clear what arrangement is intended where there is a complicated junction. Surely it would be best that each line should be separately signalled; this would probably mean better locking also.

There is a strong tendency to eliminate the white light altogether, and a satisfactory yellow light is said to have been obtained, which is to be used for distant signals.

The use of the upper quadrant instead of the lower has a good many advantages; particularly that, as it is not necessary to counterweight the arm, power can be saved in working—an important consideration now that so many electro-pneumatic power plants are being installed.

EXPERIMENTAL TEST OF A RAILWAY TERMINAL SYSTEM.—An account of experiments as to the most efficient way of operating the Brooklyn terminal station. The scheme which gets the maximum number of trains in and out in a given time has the disadvantage that the same platforms are not used always for the same routes, and this means confusion and consequent crowding among the masses of people hurrying to catch their trains. Where large numbers of people all want to catch trains at the same time it is practically essential that trains should have a regular starting platform.

C. E. VICKERS.

MEMORIAL DE INGENIEROS DEL EJÉRCITO.

January, 1907.

NEW COAST ARTILLERY.—By Colonel Don Joaquin de la Llave.—The existing Coast Artillery dates back some 15 or 20 years. It is composed of hooped and tubed guns of 30 c.m. (mod. 1892), 24 and 21 c.m. (mod. 1891), the tubed 15-c.m. gun (mod. 1885), and howitzers of 30 c.m. (mod. 1892), 24 and 21 c.m. (mod. 1891). The muzzle velocities of the guns vary between 500 and 540 mètres per second, and the charges are of brown powder. The howitzers have an effective range of 8,000 to 9,000 mètres. All are of wrought iron, reinforced with steel. At the time they were made they compared favourably with the artillery of other powers.

In 1896 the need of a new Coast Artillery of steel was felt, and a committee was appointed to consider the matter. It recommended the construction of steel guns of 26, 24, 21, 15, and 12 c.ms., 45 calibres long, with initial velocities of 710 mètres per second, using smokeless powder, and of steel howitzers of 26, 24, and 21 c.ms. with initial velocities of 350 mètres per second.

Of these pieces the only ones that have been made are the 15-c.m. Q.F. gun L/45, commonly called Munaiz-Argüelles, and the 24-c.m. gun L/45 of 28 tons designed by General Ordoñez. A large number of the former have been mounted on the Spanish coast defences though it is not considered altogether a satisfactory weapon. It fires a 56-k.g. projectile

with an initial velocity of 690 m. a second, penetrates 15 c.m. of Krupp steel at 1,300 m., and has a range with 15° elevation of 10,820 m. The 24-c.m. gun, on the other hand, though made some years ago and submitted to numerous trials, has not been adopted.

A new committee was appointed in 1903 and recommended that the following classes of ordnance should be mounted in the coast defences:—

1. Gun similar to the 24-c.m. L/50 Krupp (1901) heavy type, capable of piercing the heaviest armour plates of modern battleships.
2. Q.F. gun similar to the 7·5″ Vickers, and capable of firing 8 to 10 rounds a minute.
3. A 75-m.m. Q.F. gun, similar to the 3″ Vickers, capable of firing 25 to 30 rounds a minute.
4. A 24-c.m. steel howitzer, as designed by General Ordoñez and constructed in the Trubia works; weight of projectile to be the same as that of the 24-c.m. gun.

The author gives a full description of each of these pieces.

THE FIRST ADMINISTRATIVE REVIEW OF THE ENGINEER TROOPS.—By V. Cebollino.—The Royal Corps of Sappers and Miners was first formed by Royal Decree of 5th September, 1802, as a single regiment of two battalions, each of 4 companies of Sappers and 1 of Miners. The article contains its first parade state, showing a total of 50 officers and 690 men, 14 officers and 587 men below establishment.

The remaining contents of this Journal, which appears every month, are a "Military Review" dealing with military events in foreign armies, a "Scientific Chronicle," Notices of books of Military or Technical importance, and Corps News.

M.

REVUE DU GÉNIE MILITAIRE.

April, 1907.

THE DEFENCES OF THE NORTH-EAST SECTOR OF PORT ARTHUR.—This article is founded on information published by Capt. Barmine of the Russian Engineers in the *Eenzheenernee Zhoornal*. A short description is given of each work, together with plans and sections.

Owing to the small number of guns available the Russians attempted to utilize the same weapons for the artillery duel and for the repulse of the infantry assaults. To attain both objects it was necessary to mount them in exposed positions; concealment was sacrificed to command.

PHOTOGRAPHIC RECONNAISSANCE.—A continuation of the article commenced in the February number. The author describes the instruments that should be used for the various operations and goes fully into the practical details of the work.

J. E. E. CRASTER.

REVUE MILITAIRE DES ARMÉES ÉTRANGÈRES.

March, 1907.

HEAVY FIELD ARTILLERY IN GERMANY.—By an Imperial decision of 15th June, 1905, the regulations as to the employment of Heavy Field Artillery ceased to be considered secret, but it was not until the 28th June, 1906, that they were published.

The events of the Russo-Japanese War have provided topics of discussion on various military questions. Among these that of the employment of Heavy Field Artillery occupies in Germany one of the foremost places. The action of this arm is so intimately bound up with that of other troops on the field of battle that of late it has become common to designate it "the fourth arm." Its title no longer conveys the idea of special formations, suitable solely for the attack of fortresses; its rôle no longer possesses interest solely for experts—artillerymen or engineers—the professional defenders of fortifications. This new arm will in future appear offensively and in mass on all fields of battle. The knowledge of its rôle and of its methods of fighting belongs then to the domain of tactics, and is necessary to all in the same way as that of the other arms.

Heavy Field Artillery has been gradually developed since 1892, the crowning stage of this development being achieved in the Imperial manœuvres of 1900, in which the Foot Artillery of the Guard had a brilliant share which definitely decided the incorporation of such artillery in the Field Army.

The first duty that will fall upon the Heavy Artillery is that of demolishing the forts or other permanent fortifications on the frontier, in order to make it possible for the Field Army to penetrate the enemy's territory. This accomplished, a small portion of the artillery will be employed in the siege of fortresses; another, and by far the larger part, will accompany the Field Army in its advance. The mission of Heavy Field Artillery is thus seen to be double, and this duality has produced confusion in some minds. Too often one confounds under the designation of Heavy Field Artillery two absolutely different things. Heavy Field Artillery has been created to overwhelm objectives on the battle field on which the action of Field Artillery would not be sufficiently powerful; it has been detailed to field formations so that it may be constantly at hand; and it is now an integral part of the Field Army. The other artillery that is also called Heavy Field Artillery is in reality Siege Artillery, which has for its object the attack of forts on the frontier; it is kept for this special purpose only, and would not accompany the Field Army in its subsequent advance,

The matériel of the Heavy Field Artillery comprises 3 calibres:—

1. Heavy Field Howitzers of 15 c.m. (6″).
2. Steel Mortars of 21 c.m. (8″).
3. Shielded Guns of 10 c.m. (4″).

There is also a long gun of 15 c.m. that is kept purely for heavy siege operations on account of its great weight.

1. In the *Heavy Field Howitzer* the shell weighs 40 kilogrammes (90 lbs.) and contains 7 kilogrammes of high explosive. Each howitzer is drawn by

6 horses. A battery consists of 4 howitzers, 8 ammunition wagons, 1 observation carriage, 1 battery wagon, and 1 field forge, with supply, forage, and baggage wagons. A Battalion comprises 4 batteries and 8 ammunition columns, giving 434 rounds for each howitzer.

2. The *Steel Mortar* requires a special carriage, and also two wagons for platforms weighing about 4,000 kilogrammes. It fires a percussion shell containing 120 kilogrammes of high explosive. It can be moved only at a slow pace and along good roads, requiring the assistance of a detachment of 2 companies of infantry per battery. It can be fired only from the platform, and cannot open fire till 4 hours after its arrival in position. A Battery consists of 4 mortars, provided with 40 rounds per mortar. The Battalion comprises 2 batteries, 1 light column, and 1 ammunition column.

3. The *Shielded Gun* is a quick firer. It fires either a common shell of 18 kilogrammes or a shrapnel shell of the same weight. Its mobility is similar to that of the heavy howitzers, but it can be fired only from a platform. The Battery consists of 6 guns.

The 10-c.m. Gun is supplied only in small numbers. It will be used chiefly in the defence of fortified positions, where it would be laid upon the main lines of approach and on the flanks in order to impose upon the attack early deployment and long detours. It need not be considered further.

The 21-c.m. Mortar and the 15-c.m. Howitzer are the two essential weapons of the Heavy Field Artillery. The Mortar is not sufficiently mobile to accompany the Field Army; its action is limited to the annihilation of forts and permanent fortifications; and it would accompany the Field Army only for some special purpose. The 15-c.m. Howitzer, however, forms an integral part of the Field Army, and the Heavy Field Artillery proper thus consists solely of this nature of ordnance.

It appears that the proportion of Heavy Field Artillery to other arms will be 1 battalion per Army Corps. It will march normally behind the main body of infantry; but, if the attack of a position is foreseen, it must be pushed forward towards the head of the column so that it may come into action opportunely. Its distribution on the line of march preceding an attack on a position will be :—

1. Scouting Officers, each escorted by 6 mounted men, and riding with the cavalry patrols in front and on the flanks in order to reconnoitre the enemy's position.
2. The Battalion Commander with the Brigade Major of the troops to which this artillery has been allotted.
3. The observation carriages (observation column) in rear of the advanced guard.
4. The batteries and their ammunition wagons as near the head of the main body as can be arranged, usually in rear of the 1st Division.
5. The light column in rear of the main body.
6. The ammunition columns with those of the infantry and field artillery.

The principal rôle of the Heavy Artillery is to co-operate with the field artillery in breaking down that point upon which the commander-in-chief intends to direct the principal infantry attack. To ensure the success of the infantry it is indispensable that from the beginning a superiority of fire should be established over the enemy's artillery; this then will be the first mission that the Heavy Artillery will have to accomplish, in concert with the field artillery of which it constitutes the supports. Bleyhoffer even hopes that the heavy pieces, thanks to their greater range, may protect the deployment and coming into action of the field batteries. As a general rule the heavy pieces are to be employed in battalion, and only exceptionally in isolated batteries. It is not desirable to mass more than one battalion.

The regulations lay down for the Heavy Artillery the principle that has always in the German Army been the basis of the employment of Field Artillery. As soon as the requirements of the fight call for it the Artillery comes into action, deploying all its guns in order to obtain the effect of mass. But in the case of the Heavy Artillery there is a restriction; its ammunition supply is limited, and the object sought to be achieved must always justify its employment. The action of Heavy Artillery is so closely bound up with that of field artillery that the Commander-in-Chief himself must lay down its action when it is required to employ it separately.

The howitzers should be pushed forward as far as possible during the reconnaissance of the enemy's position before making final choice of their sites. They are then advanced to their line of deployment, using the roads, and formed in double columns as far as possible in order to diminish the length of the column. The deployment should take place out of sight, in order to secure the advantage of surprise and to avoid premature losses; if this is impossible, an advance must be made during the daytime up to the limits of the beaten zone, and the batteries deployed at night so that fire may be opened at daybreak. Changes of position after coming into action are to be avoided as far as possible.

As to choice of objective, the heavy howitzers have great power against fixed targets, and their shells are especially effective against shielded batteries and against strong field works, trenches, localities, etc. The most important and strongest objectives must therefore be selected for them.

In pursuit Heavy Artillery is to be used as much as possible, and freedom of action is given to subordinate commanders as to advancing and selecting fresh positions.

Will this Heavy Artillery justify by its efficacy the considerable financial sacrifices that its creation necessitates? May it not, on the contrary, represent under actual fighting conditions an impedimentum as useless as it is expensive?

This is the question that is much and earnestly discussed by tacticians in Germany and elsewhere.

C. H. VERSTURME-BUNBURY.

RIVISTA DI ARTIGLIERIA E GENIO.

April, 1907.

THE NEW GERMAN PROVISIONAL INSTRUCTION IN FIELD FORTIFICATION.*—The battles fought in the Far East have proved that fortification is an inseparable companion to tactics, and indeed may be said to be part of the same thing. So writes Colonel Rocchi in his very valuable *Traccia per lo studio della fortificazione campale*, edition 1905. So much indeed is now generally granted, and in all armies the idea is more and more recognised that to know in good time how to use field fortification as a means for sustaining and increasing offensive power is an important factor of victory. This idea is explained in the German provisional instruction in field fortification, published a few months ago in substitution for the 1893 edition.

The new book is divided into four parts. The first relates to the scope, employment, and method of construction of field fortifications. The second contains rules for the execution of works, and gives numerous types for adoption and disposition according to the circumstances of time and place. The third part deals particularly with the employment of field fortification in the attack of fortresses. The fourth contains various technical details.

The first part is the most important, because it explains in a concise and exhaustive manner the true scope of field fortification.

The proper employment of field fortification requires a knowledge of tactics, acquaintance with the enemy's method of fighting and the efficacy of his weapons, a ready and correct judgment of the value of ground, a knowledge of the amount of work that can be done by the troops with the tools at their disposal, and finally a practical eye for utilising the local resources.

All arms should be accustomed to executing works and to the use of tools. Most of the pioneers should, by the 1st April, be capable of constructing works.

Field fortification, in accordance with its true field of action, should be used in all circumstances when opportunity presents itself, and particularly in the exercise of the combined arms. Peace exercises, which cannot be assimulated to real warfare, and especially such as are not carried out with the stringency of war, may create illusions in regard to what can be done by the troops.

Field fortification has for its object the increase of the efficacy of our own weapons and protection against those of the enemy. It may afford important and sometimes indispensable service, and may allow of the commander economising his troops so as to be able to have in his hand strong reserves at the decisive moment.

It is the duty of commanders of all grades to make use of field fortifications, and by doing so their task is made easier.

* The *Feldbefestigungs Vorschrift*, 1906, was reviewed in last January's number of this Journal.—EDR.

A position is especially of value when it forces the enemy to attack under conditions favourable to our own designs.

The selection of the position, which should be shown on the map in its general lines, depends on the 'situation' at the time. Of chief importance is the simultaneous action of the infantry and artillery at the decisive moment and the concentration of the fire of the two arms on the direction of attack. The position is favourable when it can be arranged with a good field of fire and out of view of the enemy's artillery.

Woods and obstacles which impede the view of the country are disadvantageous, especially on the wings. Obstacles are valuable only when they serve to keep the attackers waiting, without betraying the position. They should form a defence against surprises, and are especially useful in cases where the enemy can advance under cover near to the position. Strong natural obstacles, in connection with lines of artificial obstacles before the front of the position, may prove of advantage for surprising the enemy.

Fortifications should be masked as much as possible, if this can be done without limiting the efficacy of the fire. Dummy works may deceive the attackers as to the position and the real works of defence, and transpositions of the landmarks may be resorted to as a further means for deceiving the enemy.

Various forms of fortification may be adopted according to whether a decisive combat is desired or only a means of gaining time.

Before organising the defence of a position it is necessary to determine the method of employment of the troops. For the construction and occupation of the works, the position should be divided into sections.

Villages, farmhouses, and woods with margins that are easily discernible offer favourable targets to the enemy's artillery, and it is recommended that positions should be taken up outside these, utilising them only to cover the reserves.

Groups of works should consist generally of trenches for the firing line, entrenchments for the reserves, and obstacles when possible. Between the trenches and the entrenchments covered communications should be established, and when these do not exist naturally it is advisable to have recourse to digging.

The entrenchments should be located sufficiently near to the trenches to insure the fire being properly developed during the attack. When circumstances permit, consideration should be given to the construction of light cover to protect the entrenchments from fragments of shells and from shrapnel.

Heavy artillery should be concealed from view, and placed in covered positions. In fixing these positions special importance should be given to roads in the vicinity for replenishing the ammunition. It is of the greatest importance that observation should be made in security and without interruption, especially during the combat.

The infantry should be exercised in all the simpler forms of fortification works. Pioneers, when accompanying other arms, should not be employed on the same works as the latter, but on the construction of the more important defences, on systematising the means of communication, on

preparing obstacles, and on works of destruction. For works of great importance the pioneers should if possible be employed in companies. The infantry employed on works remain in their tactical formation, and the responsibility for the completion of the work devolves upon their officers.

Field and fortress artillery will execute their own works independently.

The tools required for the troops should be obtained when time permits by requisitions on the pioneer parks.

It is necessary to have recourse to all possible means to increase the value of the defence. Railways, tramways, electric lighting, telephones, etc., may all be usefully employed.

The article concludes with detailed plans and sections of the various kinds of trenches, fieldworks, redoubts, etc., all of which are fully and explicitly described.

EDWARD T. THACKERAY.

VOËNNYI SBÓRNIK.

May, 1907.

THE NECESSITY FOR THE ORGANIZATION OF SEARCH LIGHT UNITS IN FORTRESSES.—The writer begins by describing the important part which the illumination of ground by electrical means will play in fortress warfare in the future. He states that a Capt. Schwartz, basing his opinions on the experience he gained in Port Arthur, has come to the conclusion that in each fort there should be not less than three large projectors, and in each interval between the forts two large projectors for illuminating the ground lying in advance of the line of forts.

Besides being required for the illumination of ground, electricity will also be used for lighting and driving ventilating fans in casemates and caponiers.

In order to arrive at some idea of the establishment of a Search Light unit in men and plant, the writer takes a typical instance of a fortress defended by a chain of 12 forts of permanent construction, lying on a perimeter of about 20 miles, and forming the main line of defence. He assumes that it would be necessary to employ at the same time 2 projectors in each interval, making 24 in all; and, supposing that 3 forts would be liable to simultaneous attack, 3 projectors in each of them would be wanted. In addition, projectors of a smaller pattern would be mounted in the caponiers in connection with the defence of the ditches, probably 6 in each fort, making 18 in all. Thus after the close investment of the fortress has begun, provision must be at hand for the simultaneous running of 33 large projectors and 18 small. The projectors are all to be movable.

The writer works out in detail the number of trained men which would suffice for all requirements in connection with the running of these

33 Search Lights and the ventilation and illumination of casemates, etc., and arrives at a total of 322; but this number does not include men for moving the projectors from place to place.

Great stress is laid on the necessity for both officers and men being thoroughly trained during peace time by practice at all seasons with the same engines and appliances which would be used in war time and by a complete study of the ground which has to be illuminated.

At present projectors in land fortresses are manned by detachments of gunners, specially trained for the purpose and superintended by officers who have been through a half-year's course in the ordnance factory at St. Petersburg. These detachments have no sort of organization; and the time of the officers is mostly taken up by their artillery duties, so that they have little left to devote to the study and practice of the use of Search Lights. Moreover, the illumination of ground by electricity being regarded as an accessory duty of the artillery, the projectors are worked with an eye to the interests of the gunners rather than to those of the defence in general; the latter demands not only the illumination of the immediate objective of the artillery, such as an enemy's battery, but also the lighting up of ground over which an infantry advance might be carried out or on which trenches might be constructed.

The writer suggests that the men of the Search Light units should be armed with revolvers and short swords, their weapons being required only for self-defence.

A. H. BELL.

RECENT PUBLICATIONS.

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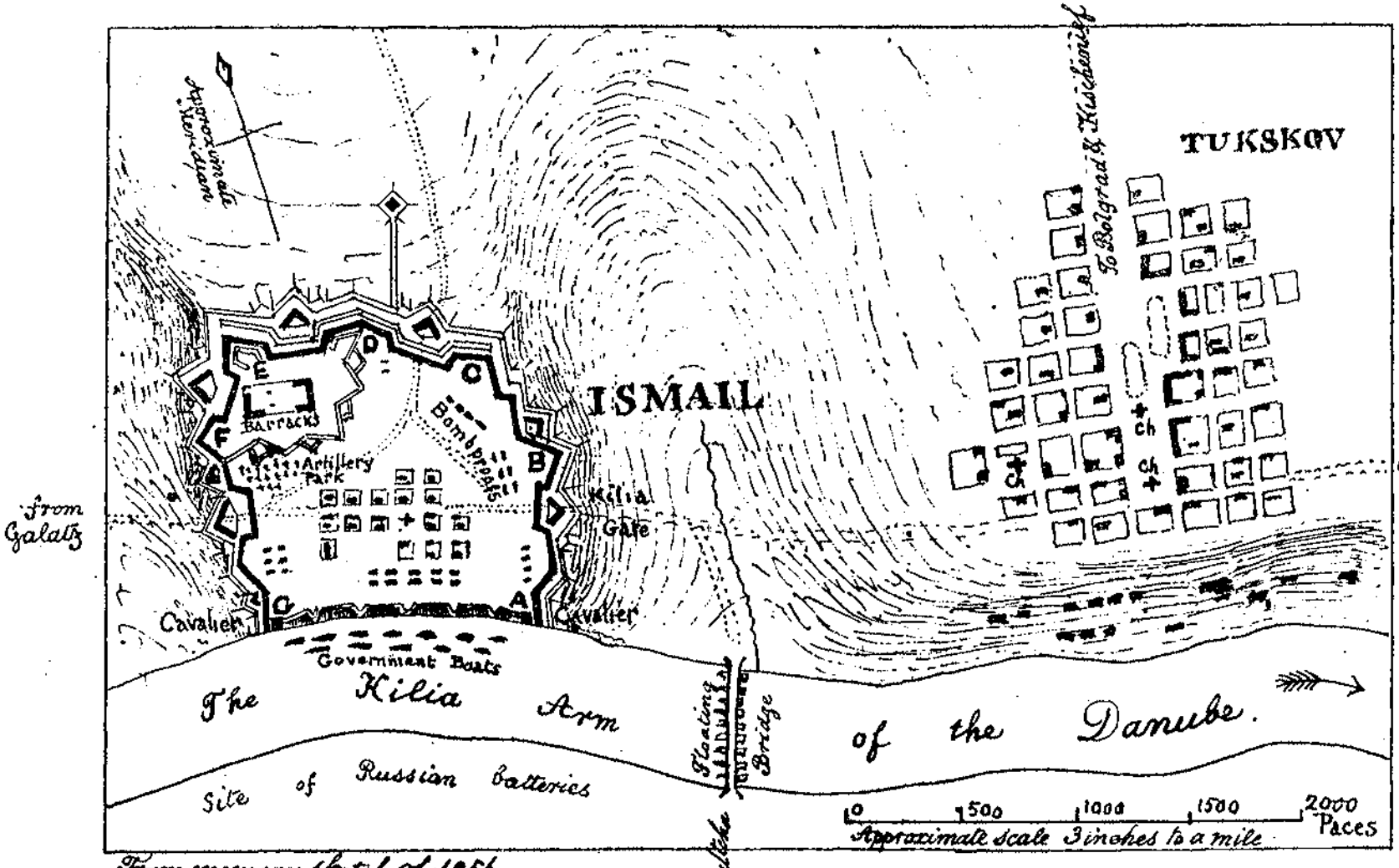
THE ANCIENT FORTRESS OF ISMAIL.

Demolished in 1856.



From memory sketch of 1856.

E. Renouard James.

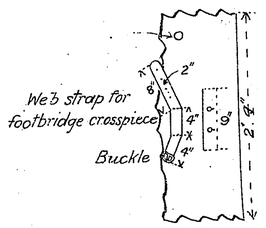
SOME IDEAS ON FIELD ENGINEERING.

SUPERSTRUCTURE FOR WATERPROOF BAG FLOATS.

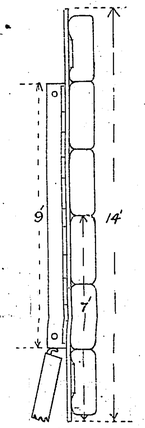
RAFTS.

PLAN

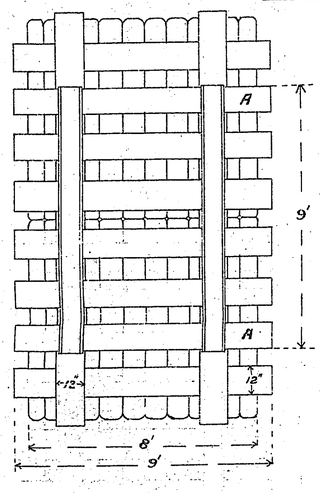
Shewing detail of strap & button fastenings.



SIDE ELEVATION.



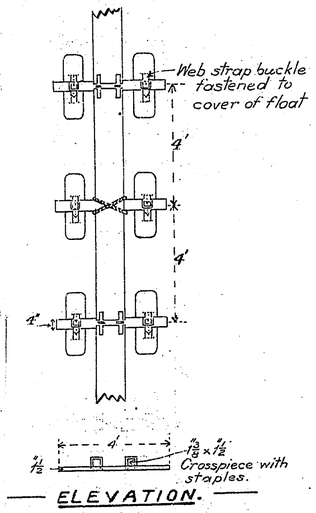
PLAN



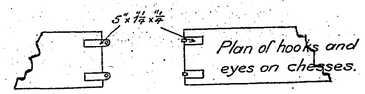
FOOTBRIDGE.

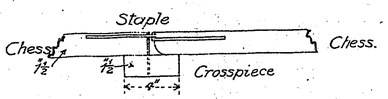
Scale 4ft to 1in.

PLAN.



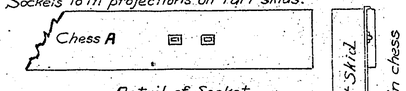
ELEVATION.





ELEVATION OF HOOK JOINT on crosspiece

Scale 8ins. to 1 inch

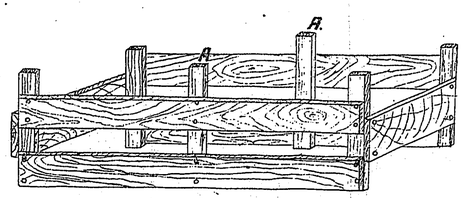


PLAN.

Scale 1/2 to 1ft

Fig. 1

SHEET BOAT



Oars can be lashed to centre uprights A.A.

Fig. 2

CUT RAFT FOR TRESTLE BRIDGE.

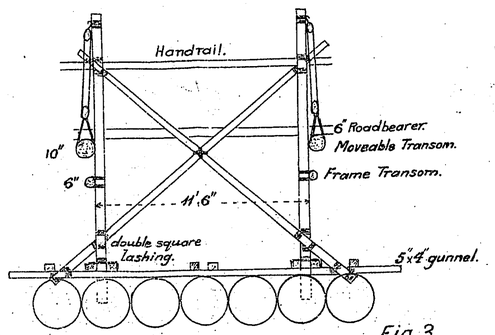
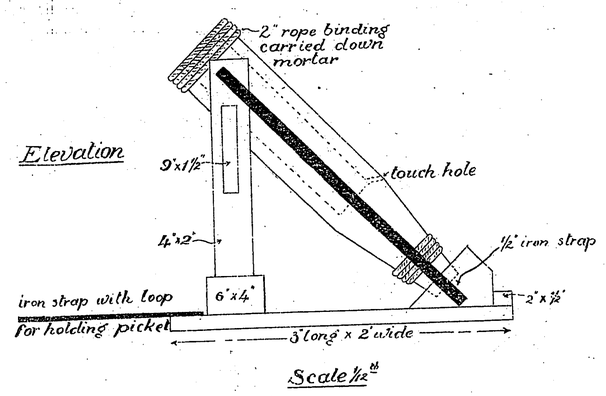


Fig. 3.

Scale 1" = 6 feet.

5" Wooden Mortar



Scale 1/2 in.

24 lb. Roller Grenade.

Horizontal Section

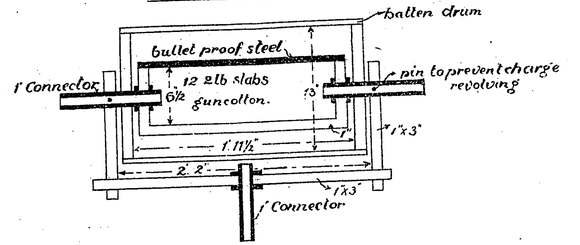
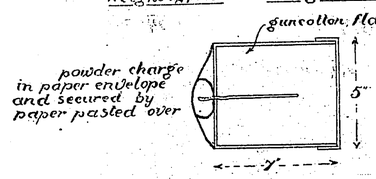


Fig. 5.

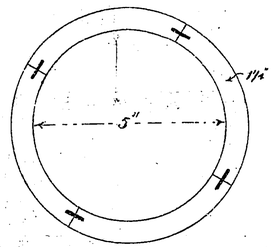
Section of Projectile

Weight 4 1/2 lbs. Charge 4 lbs. 3 ozs.

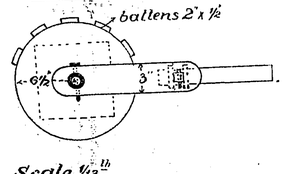


Scale 1/6th

Section of Mortar



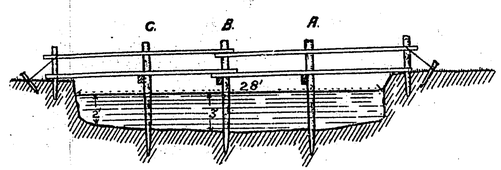
Side Elevation



Scale 1/12th

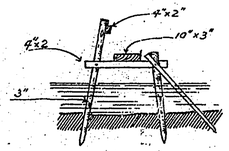
Fig. 4.

RAPID LIGHT PILE FOOTBRIDGE.



SIDE ELEVATION

(omitting struts and one leg)

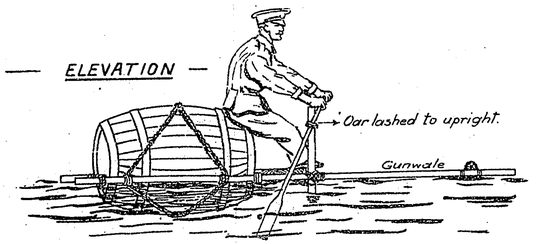


CROSS SECTION

Fig. 6.

SINGLE BARREL RAFT.

ELEVATION



PLAN

Fig 7.