

# THE ROYAL ENGINEERS JOURNAL.

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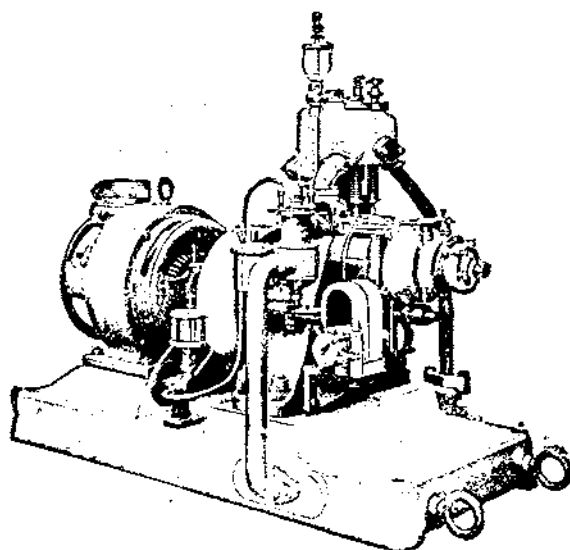
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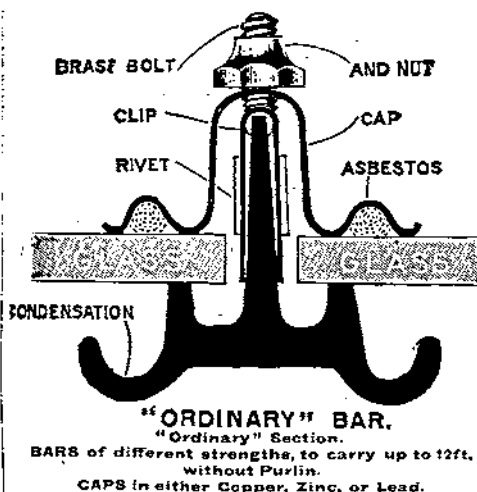
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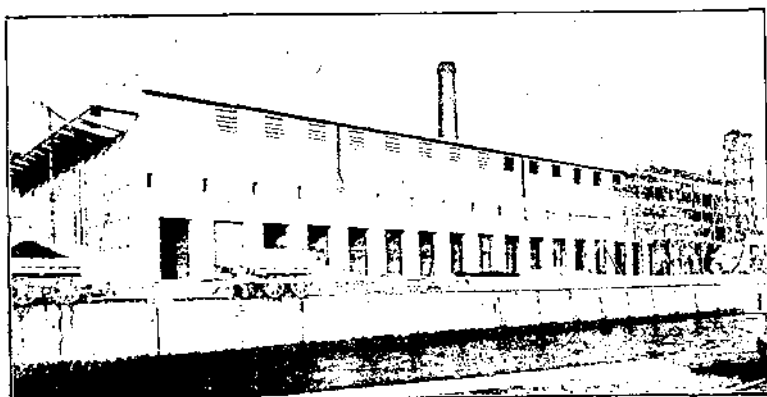
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*Authors alone are responsible for the statements made and the opinions expressed in their papers.*

## A BAMBOO-CABLE SUSPENSION BRIDGE.

BY CAPT. & BT. MAJOR R. L. McCLINTOCK, D.S.O., R.E.

IN the December number of the *R.E. Journal* of 1906, there appeared a description of a sort of trestle bridge made entirely from small bamboos and suitable for carrying infantry in single file.

The object of the present article is to show how complete suspension bridges, *including cables*, can also be made from this useful material.

In an interesting book *The Marches of Hindustan* (David Fraser), the author gives some photographs of what he calls "birch twig" and "cane" suspension footbridges made by the inhabitants of Sikkim and Lahoul, respectively, across local torrents. Although he gives no description at all of these (beyond referring to them as "cane erections less safe than the Bridge of Sighs"), it appears from the photographs that they are ramp suspension bridges, with their cables made from fascine-like bundles of twigs or canes. They also appear capable of carrying one man at a time only.

The above account induced the 10th (Field) Company, 2nd Q.O. S. & M., during its last fieldworks course to devise a similar type of bridge which would at least carry infantry in single file and pack animals. The accompanying photographs show the result over a 120' span. The bridge was constructed with no materials beyond the ordinary small female bamboo (one of the most common objects of the moister portions of the East), a few  $1\frac{1}{2}$ " lashings, some rough pickets such as could be cut in any wood, and some thin wire or even twine.

### CONSTRUCTION.

(1). *Cables*.—The Indian basket maker, or "Chattai-wallah," when conducting the trellis-making branch of his handicraft, is accustomed to split the ordinary female bamboo into 12 strips. First the bamboo is divided longitudinally into six equal segments (ABCDEF, *vide Fig. 1*) by three radial cuts following the longer axis. Out of these six segments two (A and D) are rejected as they carry the



knots, which spring alternately from opposite sides of a bamboo. Although rejected for cable-making these are not wasted as they come in later in connection with the roadway. Each of the remaining four segments (BCFE) is then split into three slats by two longitudinal and tangential cuts, thus :—

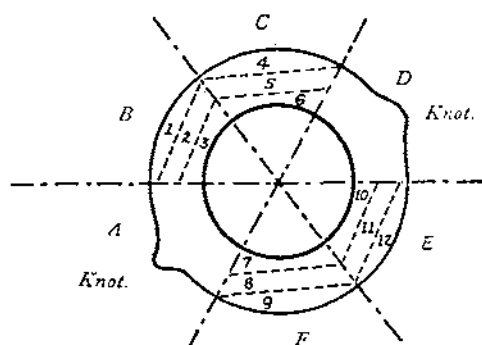


FIG. 1.—*Rough Sketch of Section of Bamboo.*

Each of these 12 slats will be as long as the original bamboo (say 10'—15'), will be  $\frac{1}{2}$ " to  $\frac{3}{4}$ " broad,  $\frac{1}{16}$ " to  $\frac{3}{16}$ " thick and will support over 300 lbs. on a straight pull.

The problem now is to connect sufficient of these slats into a cable of sufficient length and strength to sustain the calculated stress on the bridge. First a joint must be devised for connecting these slats end to end, which joint must be at least as strong as the slats themselves. Experiment showed that if the last 8" or so of each slat was notched with a knife as shown in *Fig. 2* and the notched ends of

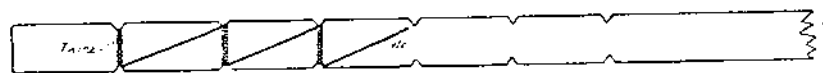


FIG. 2.

two slats superimposed and bound together with thin wire or twine, say 22 B.W.G. iron wire, or even ordinary thin twine, the junction was stronger than the slats themselves. Thus a continuous slat of any requisite length and with a breaking strain of about 300 lbs. could be obtained. This done, it is only a question of calculating how many such continuous slats are required to make a cable capable of carrying any given load. In the bridge shown, a F.S. of 3 being allowed, it was found that 200 such long slats were necessary in each cable to carry infantry in single file over 120' span. The cables

were made like long fascines, the requisite number of slats being first laid parallel, and then choked and bound at intervals of 1' with twine or wire. The resulting "fascine cables" were about 18" in circumference.

Wire and twine are mentioned above as used for joining the slat, but as a matter of fact the latter alone is necessary. In the bridge shown, for purposes of experiment, the junctions in one cable were made entirely with wire and in the other entirely with thin twine. No difference was observed in the efficiency of the two, so it may be taken that twine is amply good enough.

(2). *Anchorage*.—The question of anchorages at first presented a difficulty as the cables, although reasonably pliant, were too stiff to be taken round a sunk log in the usual manner. One thing was plain, that the straighter the pull the less the cables were likely to suffer. Accordingly a separate anchorage was made for each end of each cable, and each consisted of 20 pickets of 4"—6" diameter, 2' apart, driven 3' into the ground. Each cable after crossing each shore transom was first served with a piece of  $1\frac{1}{2}$ " rope and then divided into two halves (A and B, *Fig. 3*), which were taken alternately right and left of each of the 20 pickets. These two halves of the cable crossed each other between every two pickets (CC), and each such crossing was served with a piece of  $1\frac{1}{2}$ " rope, which was then made fast to the picket immediately in rear of the crossing. This anchorage proved quite satisfactory and quickly made.

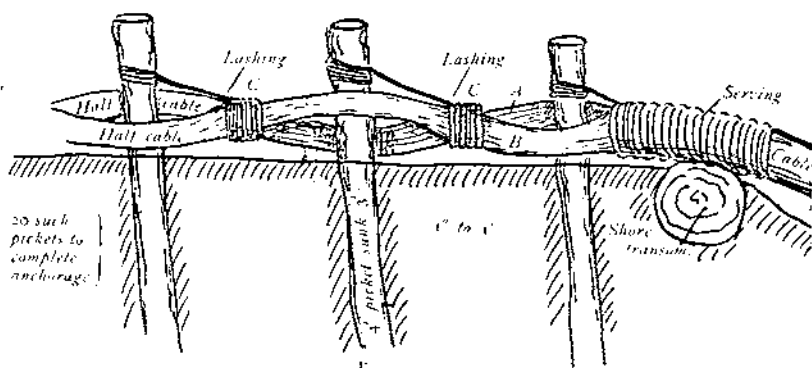


FIG. 3.

(3). *Roadway*.—The first roadway tried was one of ordinary bamboos laid close, side by side, corduroy-wise across the cables, and lashed down with log-line or twine (*Fig. 3*). This carried infantry well enough, but was quite unsuitable for animals. To carry the

latter, the corduroy must be covered with hurdles, which can be made of bamboo also. A hurdle or mat, continuous over the whole length of the bridge and made *in situ*, is convenient and can be constructed largely out of the segments of bamboo rejected from the cables.

### MATERIALS REQUIRED FOR A BRIDGE OF 120' SPAN.

(4). *Cables*.—Two cables, each of 200 slats, each 210' in length, actually consumed 660 female bamboos, averaging 10'—15' in length, and about 1½' diameter at the butt. This was about 60 in excess of the calculated requirements, so it appears that about 10 per cent. should be allowed for waste.

(b). *Roadway*.—1. First, 120' span of corduroy roadway required 710 pieces of bamboo 7' long, or 355 whole bamboos.

2. For 120' span of continuous hurdle, about 1,000 of the segments, rejected when splitting the bamboos for the cables, are required. As there are some 1,320 of these available, no extra bamboos are required for this hurdle roadway.

Total bamboos, therefore, required for cables and roadway amount to :— $660 + 355 = 1,015$ , or about nine per foot-run of span.

(c). *Pickets*, rough wood, 4"—6" diameter and 4' long. Eighty are required for the four anchorages.

(d). *Lashings*, 1½" rope, actually used, but much smaller cordage would probably have done. Number, 80.

(e). *Wire or twine for joining the slats in the cables*.

1. Wire (in one cable), 22 B.W.G. iron wire, 50 lbs. used. This works out to about 15,000'.

2. Twine (in the other cable), thin parcel string, 51 balls. This works out to about 14,000'.

### TIME REQUIRED TO MAKE 120' SPAN BRIDGE.

The bridge as shown was made slowly and experimentally with a small number of men. The following were the observed times of the various operations :—

(a). *Splitting bamboos for cables*. Five basket makers can split 100 bamboos into 1,200 slats in 12 hours. As 660 have to be split, it may be assumed that 33 men could do it in 12 hours.

(b). *Joining the slats*. One man can turn out five complete slats each 210' long in 12 hours. It may be assumed then, that the 400

required for the two cables can be produced by 80 men in 12 hours. This is quite unskilled work.

(c). Choking and binding the long slats into cables. Six men can choke and bind one cable in 6 hours. Therefore they could turn out the two cables in 12 hours.

(d). Anchorages and roadway. Forty men can make anchorages, attached cables, and lay corduroy roadway in 8 hours.

(e). Hurdle roadway for animals. Two men can lay 15' of continuous hurdle roadway in 7 hours. Eight parties can work at once, so 16 men should complete in 7 hours.

If sufficient men are available, (b) can be commenced very shortly after (a) and the two operations then proceed concurrently. In the same way, (c) can be put in hand when (b) is half finished, and much of (d) can also run concurrently with the other operations; (e) must be carried out after the completion of the other work, but is unnecessary unless the bridge is to be used for animals.

From the above it is calculated that about 150 men could prepare their material and erect the above bridge in 35 working hours.

For the sake of clearness, Photo No. 1 was taken *prior* to placing handrails and steadying guys, which are, of course, as necessary for this bridge as for any other. These are shown finally fixed in Photos Nos. 2 and 3, where mules and a cart may be seen crossing the bridge. Both handrails and steadying guys are small cables made from split bamboo in much the same way as the cables carrying the roadway. As, however, great strength is not essential for these, they can be made from the waste segments (A and D, *vide Fig. 1*), bound together as before with wire or twine. The handrail cables are passed over rough props about 3' high at each end of the bridge to raise them above the roadway, hung at about the same "dip" as the main cables, and then connected with the latter by lattice work of waste pieces of bamboo, bound on with spun yarn, twine, grass fibre, or anything available.

As regards the uses of this type of bridge, it is not contended that bamboo cables would be used were any others to be had, or that a hurdle roadway would be laid were chasses procurable. As, however, by the above method a large span bridge *can* be erected in a bamboo-producing country with no imported stores beyond a certain number of small lashings and some balls of twine, a knowledge of its practicability may possibly prove of value.

NOTE.—Since writing the above article, the bridge in question was tested to destruction by piling a concentrated load on the centre till failure resulted. This took place after a little more than 12,000 lbs. had been so placed, and occurred (as was anticipated) in the cable

whose "slats" had been connected end to end with twine, these joints tearing out here and there throughout the cable.

The other cable, whose "slats" were connected end to end with wire, remained unaffected.

As 12,000 lbs. concentrated at the centre is roughly equivalent to a distributed load of infantry in Single file (for which the bridge was calculated), the Factor of Safety allowed of 3 was none too much *for twine joints*.



Bridge under construction showing Cables and Corduroy Roadway.



Bridge with Handrails and Windguys fixed carrying Mules and a Cart.



Bridge with Handrails and Windguys fixed carrying Mules and Cart to show system of Handrails, etc.

## BAMBOO CABLE SUSPENSION BRIDGE



Volunteers' Portion of the Gumti Bridge, Lucknow Brigade Manœuvres.



Part of the Volunteers' Trench, Lucknow Brigade Manœuvres.



Blockhouse of Sleepers and Sand.

## THE OUDH AND ROHILHAND RAILWAY VOLUNTEER RIFLES

*THE OUDH AND ROHILKHAND RAILWAY  
VOLUNTEER RIFLES.*

*By THEIR COMMANDANT.*

ALTHOUGH by title "Volunteer Rifles," a short account of the year's doings of a corps of railway men will probably not be without interest to some of the readers of the *R.E. Journal*. The Indian Railway Volunteers already number many Royal Engineers amongst their officers, and it is heartily to be wished that every Sapper who takes up railways as his "special" line, would do his share in helping the Volunteers of the railway to which he, for the time being, belongs.

Volunteering in India, even if it has hardly made the same strides towards efficiency that the sister service in England seems to have done of recent years, has notwithstanding made considerable progress; and we have advanced a long way from the days when the whole of the totally inadequate time available of the men was expended in vain endeavours to secure clockwork precision in a few more or less useless parade movements, when the camps of exercise were chiefly picnics in the headquarter stations, and police took over guard duties at nightfall!

Progress took a definite shape towards the close of Lord Kitchener's term as Commander-in-Chief in India, when special instructions were issued from Army Headquarters for the training of Volunteers in India. These instructions laid stress on the uselessness of attempting to compete with Regulars in ceremonial movements, and on the importance of training the men in practical measures, more especially for the defence of posts, or such military work for which the civil duties of the men happened to give them special aptitude.

These instructions the Oudh and Rohilkhand Corps had been gradually anticipating for some years past under its late commandant, Lieut.-Colonel Cardew, V.D., and adjutant, Capt. Darley, of the 81st Pioneers; and when the present commandant took over officiating command, all was ripe for a whole-hearted acceptance of the spirit of the new instructions that came out a few months later.

Just over a year ago the corps went into its 1909 camp of exercise at Mohanlalganj, 13 miles from Lucknow. Every European and Eurasian employé of the railway as a condition of his agreement of service undertakes to maintain himself as an efficient Volunteer; and in this way, while it is no more correct to describe them as



"conscripts" than any other body of men bound for military service for a term of years, it is obvious that in the Indian Railway Corps the Empire has the makings of an extremely valuable asset. Under these conditions the strength of the Oudh and Rohilkhand Corps fluctuates between about 575 and 625 men according to whether times are good or bad on the railway, and whether the "powers that be" favour European or Indian labour. But since it is not practicable to check the work of the line for a week, and as moreover the camps of exercise are necessarily at rather a busy time of the railway year, some 200 to 250 are all that can be got together for any one camp.

The first two days at Mohanlalganj were devoted to close order drill to get the men together, after that, while the early mornings were devoted to drill, from 11 o'clock onwards to dusk was taken up by practical schemes based on the supposition of the existence of a state of rebellion, and also largely by railway problems.

Thus one day a party of Volunteers, cut off at an outstation with the railway destroyed, were given the task of escorting some bullock carts supposed to contain women and children into Lucknow.

For the next scheme Lucknow was supposed to have fallen into the hands of the rebels and to be undergoing a siege. An armoured train had emerged from the town and damaged the besieger's parks. The Railway Volunteers were told off to get as close to Lucknow as they could and blow up the track. Explosives had very kindly been supplied for the purpose by the Sappers and Miners at Roorkee, and a length of track had been specially laid for demolition purposes close alongside the real main line of which it was supposed to form a part. This special track was duly blown up by instructional parties of Volunteer officers, while the men received instruction in outposts; the outposts performing the practical duty of keeping a cordon round the site of the explosions.

For the next scheme, news was supposed to have reached the "refugees" of the first day's scheme, that their entrance to Lucknow had been barred by the rebels and they had to prepare themselves for a defence pending the arrival of assistance from inside Lucknow.

A site was selected giving opportunities for different classes of work, the defensive line being composed partly of stockading of old wooden sleepers on edge, with earth between the two "skins" of sleepers, and partly by aloe fence placed in a state of defence, or by trench work. In addition flares, fired either by automatic trip wires or by an electric exploder, were placed outside the perimeter.

On the final day the General Officer Commanding, Lucknow, held his inspection of both the Lucknow Volunteer Rifles and the Oudh and Rohilkhand Railway Volunteers. The Oudh and Rohilkhand men formed part of a force besieging Lucknow, while the Lucknow Volunteers formed part of the Lucknow garrison. "Lucknow" was supposed to have blown up the track at the spot where the railway

men had carried out their demolitions two days previously ; and to the railway men now fell the lot of repairing the track, while the Lucknow men's task was to prevent the operation.

The Railway Volunteers had what was, alas, only a sham armoured train, with beautifully loopholed sides but only of wood ; and with this they ran out as a repair train, unloaded their materials and repaired the line with a working party of 1 officer and 10 men, while the balance of the corps formed the covering party. An interesting little fight took place between the two Volunteer corps, but the Railway Volunteers finished their task satisfactorily after just one hour's work.

At 9.30 p.m. the defences prepared the previous day were occupied as a bivouac, and shortly afterwards the automatic flares went off, exposing targets that had been put up to illustrate the effect of the bonfires in assisting night firing ; successive lines of flares were ignited, two automatically and a third electrically, following up the supposed attack ; and finally the electric explosion of a "mine" (represented by a guncotton slab) ended the night's proceedings.

The next day the corps did its first real march, covering the 13 miles into Lucknow in good time and style and with practically no casualties. The only two men who fell out, did so on account of sore feet of some days' standing. In a country where men walk but little, it was not an unsatisfactory performance especially as, by the middle of February, the sun is hot and the way dusty.

All through the hot weather and rains in India little instructional soldiering in the field, beyond musketry in the early mornings, is possible, but during the past year this was not the entire sum total of the useful work done, for weekly lectures on simple tactics were instituted for the officers, and were well attended throughout not only by the railway men, but also by the officers of the two other corps in Lucknow, and even by occasional visitors. Field Regulations were worked through, and a few simple schemes solved, and on two occasions officers of the Brigade Staff gave lectures which were very much appreciated.

The hot weather had barely ended when opportunity was taken of a brigade route march, to commence a closer alliance with the Regulars by taking part in the march along with them.

When the cold weather returned the "Instructions for Training" had been received giving official sanction to the lines on which we had been working, and after two or three company drills, digging practice was substituted at the weekly parades, and an outpost position entrenched, which when ready was attacked by the Lucknow Volunteers, (who had also done their share of the work in the trenches). After this the Oudh Squadron of the United Provinces Horse held their camp, and at their request a field day was held, the combined Volunteers of Lucknow—viz., the Oudh Squadron, the

Lucknow Volunteers, and the Oudh and Rohilkhand Volunteers—attacking successfully a line of communications which was held by two double companies of the 8th Rajputs.

Finally, after some more weekly parades for ordinary drill, the Corps took on the construction of a blockhouse to cover one abutment of a bridge over the Gumti River. The result, (which with its railway signals close behind the blockhouse bears a curious resemblance to the sketch in the textbook), is shown in one of the accompanying prints, and withstood rifle bullets fired into it at the closest range. When completed a small skirmish illustrated to the men the effects of loopholes both for firing out of, and against.

The Lucknow Brigade had now gone out for its annual training 9 miles from Lucknow, and on the 8th January the Railway Corps, with a small party of Volunteers from the Lucknow Corps, altogether some 200 strong, marched out to join them. That day and the next,—being Sunday,—we were left to ourselves except for joining the brigade at Divine service, upon the conclusion of which the G.O.C. Brigade presented certain Volunteer decorations and medals.

On Monday the fun began, and at 9 a.m. the Volunteer rendezvous was on the right of the brigade and they helped in driving a skeleton hostile rear guard towards the Gumti River. The skeleton was mostly of cavalry, and the flanks found plenty to keep them interested. After some hours of this the whole brigade “went over to the enemy” to help them entrench a position. Part of the railway men’s trench, which came in for special commendation from the G.O.C., is shown in one of the photographs.

Next day a more substantial foe was ensconced in these trenches, where they were attacked by the rest of the brigade. The Volunteers started on the right flank until the enemy had been definitely located, then guarded the left of a flank march round the enemy’s left, and finally followed up as a rear guard; in which latter capacity they kept up an exciting fight for some distance against a hostile squadron which finally charged without success, and was then sent about its business elsewhere.

On the third day work was started on a trestle bridge to be thrown over the Gumti two days later; and a working party of 50 Volunteers and 50 Regulars prepared the 13 trestles that comprised the bridge. To the remainder of the Volunteers were allotted the task in conjunction with two squadrons cavalry and two guns of forming a skeleton rear guard against the brigade. Successive positions were taken up and the fight kept going for some hours.

Next day we had field firing, in which both the artillery and infantry took part; the latter with their machine guns in battery. Some 80 of the Lucknow Volunteers marched out over-night and were put up in the railway men’s camp to take part in this day’s work, which was as realistic as possible the artillery during part of

the time firing over the heads of the infantry. The targets of chatties and falling plates represented three successive lines of defence, the first being the trenches of Monday ; and the last line was carried by a bayonet charge.

After this the whole, with the exception of the Martiniere Boys, went into bivouac, and the Railway Volunteers set to work to cover the frontage of the bivouac outpost line with a line of bonfire flares, alternately automatic and controlled. The flares were purposely ignited by a large variety of means, some being by sandbag drop weights driving a nail into a cartridge, some by rifles with the fuze inserted into the cartridge case, some by artillery friction tubes into which the core of instantaneous fuze had been inserted, some by native "chiraghs," or lamps, at the end of a lever buried in a decked pit. For these latter the bonfire is partly built over the decking, and, on pulling a wire, the lamp lifts into contact with straw, etc., sticking down into the pit between the bars of the decking. Others were fired by electric exploders. As in the previous year the corps was indebted to the Sappers and Miners at Roorkee for much of the stuff employed.

After nightfall the bivouac was attacked by the 74th Punjabis, and a very good idea was obtained of the effect of the flares. They appeared to be a good deal too close together, the glare being excessive except away to the flanks where the country was well lit up for a considerable distance. The bonfires, some of which burnt brightly for 20 minutes or more, were spaced 100 yards apart ; but as only some of the automatics were tripped, (the attack being on one flank of the line) the remaining (controlled) flares were, over the greater part of the frontage, 200 yards apart. Three hundred yards apart would probably have been ample, even allowing for some failures. There were only two failures on this occasion out of the whole lot. Two "electrics" on one circuit went wrong, and the attack started before the fault (which had been discovered in testing) could be located and remedied.

Bivouacking, like the 13-mile march of the previous camp, was a new experience for the Volunteers, and had been somewhat feared by the older hands ; but the new adjutant, Capt. Hutchinson, also a pioneer, had made good provision for their comfort ; and with bamboos and string and railway tarpaulins, *tent d'abris* were fixed up and enabled a comfortable enough night to be passed.

Early next morning a start was made in pursuit of our enemies of the night attack, and they were soon found to be holding a ferry near by, and were driven across the Gumti, after which the construction of the trestle bridge was started. The first three spans made by the railway men are shown in the third photograph. When these had been finished turns at building were taken for instructional and inspection purposes by each of the British regiments and the 8th Rajputs.

This ended the work of the camp for the Volunteers, and on the next day they returned to Lucknow. They had met every possible kindness from the brigade, and special care seemed to have been taken that they should each day have plenty of really interesting work ; and the hope that the General expressed that he would see them again in camp next year is only likely to be frustrated by his just having been promoted to a more important command.

It is hoped that the above account shows that some really useful work is being done among Volunteers in India. If it induces any of our young officers who mean to join "railways" on coming out to India, to also take up "volunteering" keenly from the first, it will have served a useful purpose. Without doubt there are many things that might be improved, but even as it is the Railway Volunteers form a corps to which Royal Engineers may well be proud to belong.

*TWO UNPUBLISHED LETTERS OF THE LATE  
MAJOR-GENERAL C. G. GORDON, C.B.*

THE following letters were written to the D.A.G., R.E., by the late Major-General C. G. Gordon, C.B., R.E., whilst in command of the "Ever victorious" army in China in 1863. They were recently brought to light and have been sent to Chatham for inclusion with the other Gordon relics in the R.E. Museum.

As however they are of special interest, and give an excellent description of the difficulties which he had to encounter with the ill-disciplined Chinese troops under his command, they are published in the *Journal*.

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*7th March, 1863.*

MY DEAR COLONEL,

Very many thanks for your last kind letter and for your kind wishes. I had intended writing you a long letter this mail but have had too much to do. I will however write at length next mail D.V. and give you all details. I have not written to thank Colonel Gordon, but will do so by the next opportunity. I believe the General will put me in command of Ward's force when he returns from Hongkong in 10 days, Mr. Bruce having approved of the same; this however is of course subject to the Duke's and your approval. The fleet is to rendezvous at Yokohama in April to demand reparation for Richardson's murder. If possible, I want to get Sanford here, but I will write more fully next mail when the conditions are settled. War with Japan is merely a question of time I am sure. I have all the plans, etc., ready of the principal towns, etc. The first battle will be serious but after that I do not apprehend they will again meet us. Good-bye and kind regards to Colonel Keame.

Yours very truly,  
C. G. GORDON.

HEADQUARTERS, QUINSAN,

16th July, 1863.

MY DEAR COLONEL,

Very many thanks for your letter of the 25th May. \* \* \* \*  
I hope you do not think I have a magnificent army. You never did see such a rabble as it was, and altho' I think I have improved it, it is still sadly wanting. The decision of the War Office that officers are to go on half-pay if serving out of the radius, has taken two officers from me, and cholera took my best officer (Cookesley) only yesterday. I have now only —, an Assistant Surgeon but very good man, and —, who is an old 67 man, and only good for Garrison duty. The officers I have no reason to complain of. I have had battles enough with them, but they are now subdued, ditto the men, and I think both like and have confidence in me, but with all this they are not in any-ways companions, or very much to be trusted. I have no sinecure, having the payment responsibility with a very unsatisfactory paying treasury who look to every dollar, Mandarin intrigues and jealousies to combat, no interpreters except pidgin English ones, who are not to be trusted, and not a very great supporter in General — who talks immensely but does very little. In spite of what you may think about my saying so, I really am the only stay of this force and on my life hinges its existence, and not only that, but now the English garrison is so diminished, there is nothing but this force to keep the rebels out of the thirty-mile Radius: however thank God I am well and not downhearted although I do feel very anxious at times. When Sherard Osborne comes, I shall have some support from him, but not very much as his force cannot penetrate the country. I now occupy a most commanding position with respect to the Rebels, being able to attack them along a very wide front; but then they have nearly 50,000 men in Soutchow and I have 3,000 and 3 steamers, of which I have to leave 1,000 to garrison this place if I go out, so you see I am not very comfortably situated altogether. We did give the rebels a tremendous defeat here, they lost nearly 6,000 killed and we took over 1,000 Prisoners, losing on our side 2 men killed and 5 wounded. You can imagine what the effect of a 32-pr. playing into a mass of troops for upwards of 14 hours with grape canister and shell at distances varying from 50 to 200 yards, the road being so narrow that only two could go abreast and so located that they could not leave it without going into water out of their depth. The Steamer kept just in their rear. It was very awful this waste of life, but altho at times I was loath to fire I did so, as the Rebels had never had a good lesson before. I send you hand sketches and ask you to excuse my not having written before. I have had to see even to the daily issue of Rations to the

troops, and am even now obliged to look to every minutiae of the Artillery. All the Commanding Officers of Regiments resigned the night before we were to start for Quinsan, because I would not give them higher rank and pay, but I did not care, and altho the men refused to move the next morning, I made them go, and left the disconsolate majors behind: they then came and begged mercy which however I did not grant. This was a nice state of affairs. When we took this place and I changed our Headquarters 1,300 men left, and I had only 1,700 men, but those inclined to mutiny. However the summary execution of a ringleader stopped them, and I can say now that both officers and men altho ragged and slightly disreputable are in capital order and well disposed. So you may see, my dear Colonel, there is some excuse for my not writing to you and to other old friends who have done so much for me. We have now 3 steamers, a heavy Siege and Field Artillery and about 3,000 men, and know something about the country which is worth 5,000 men more. I would like to go into details of our Attacks but the heat and work prevent me from so doing. I therefore content myself with showing our position by map.\* Sanford† would be worth any money out here, but I am so uncertain about money affairs that I dare not write to him to come out. You may rely on Sanford being a capital officer fit for any duty, with a capital head and experience of a man of 35; I would not mind serving under him, so highly do I think of him.

Sherard Osborne has not yet arrived, he will find very great difficulties to contend with as the Mandarins do not care about him over much, and think they can put down the Rebellion without him. You can see by my map how hemmed in the Changhusses are. The Governor of the Province never interferes with the operations, he leaves it all to me and I am therefore enabled to make attacks at any time. I wish I had time to copy the Mandarins' letters I get, some of them are very amusing. The Rebels are now very much better armed than when we met them last year, they have even Deane and Adams revolving Rifles and heaps of muskets, but no Field Artillery. I used Rockets against them, which they did not like at all, the Prisoners said that the soldiers used to go about holding their noses, as they thought the smoke would poison them. It is quite another affair fighting them with Chinese troops, they do not hesitate to attack at night, which is always irritating with any troops, but very bad with Chinamen. We hope D.V. to take Wokong, a walled city south of Soutchow about 12 miles, in about a fortnight, and from this to get the command of the Taho Lake and thus cut Soutchow off from the South and surround it on three sides. Our next move will be

\* Owing to the cost involved, these maps are not reproduced in facsimile.

† Afterwards Lieut.-General G. E. L. Sanford, c.B., c.S.I.



Woosich, North of Soutchow which will complete the circuit, and cut Soutchow off from Nanking. If it does not then fall we must attack it, but this I am anxious not to do as it is 12 miles round its walls and has a very large garrison with but little rice and for me to plunge into that city with 2,000 men would be to run the risk of a serious reverse with nothing to fall back upon. The Rebels are in a great state, and are afraid to come in for fear of their men deserting, which they would do, as they know we did not kill any of the prisoners we took. I have some of these latter in my Bodyguard, they went to fight their old friends about a week after they joined me, and did pretty well. The prisoners tell such extraordinary stories of the proceedings of their Wangs or Kings. The great thing in taking stockades from them is to cut off their retreat, and the chances are they will go without trouble, but attack them in front and leave their rear open, and they will fight most desperately. I am in hopes to be able at some future time to draw up a report on the late operations which I will send you, but you must not be hard on me now, I have no A.D.C. and have everything in the writing way to do myself.

How is Simmons? I have never heard from him. General Stavely was the man for China, if he had kept his health, he had a better eye for country, and hit the weak spots better than anyone I knew, and he thoroughly understood a plan or sketch, which some men do not. This is indispensable for this sort of fighting as the Chinese are most untrustworthy guides.

Believe me, my dear Colonel, with kind regards to all my kind friends and hopes that I may correspond in future more regularly,

Yours truly,

C. G. GORDON.

## WORKS FOR THE TRAINING AND CONTROL OF RIVERS.

By LIEUT. W. HYDE KELLY, R.E.

### INTRODUCTORY.

WORKS for the training and control of rivers divide themselves into two distinct classes—(A) those for the improvement of a river for navigation purposes, and (B) those for checking floods, preventing droughts, or for irrigation. Those of Class A deal principally with the estuary of a river, while Class B works deal with weirs, embankments or locks.

In either class, where the river is of any size, the works are of State importance, and in such countries as India and Egypt they are entrusted to State Departments. They form a branch of engineering in which R.E. officers have, at various times, played a most important part. The pioneers of river engineering in Egypt and India were R.E. officers, and the names of Sir Arthur Cotton, Sir Colin Scott-Moncrieff, and Sir R. H. Brown readily occur to the mind in connection with the great irrigation work in those countries. The works recently carried out on the Nile are already proving how valuable they can be to Egypt; and in America, the works for the prevention of floods along the banks of the Mississippi and for the improvement of its navigable waterway are on a colossal scale, but are also productive of even greater benefits.

In South Africa, where such large rivers as the Orange and the Vaal are nearly dry at some places in the dry season, irrigation works and storage reservoirs would be of incalculable value to the Colonies. Where such works have been carried out on an infinitesimal scale, the increase in the productive powers of the neighbouring land has been remarkable.

The treatment of a river first of all requires an intimate knowledge of its previous history and behaviour under normal and abnormal conditions; a minute survey of its bed and of the sea floor over which it discharges itself; an accurate record of its tides, if it be a tidal river; of its floods; of the neighbouring sea coast, and the prevailing winds, littoral drift, etc. The rainfall over the river basin must be studied, and also its geological formations. Like all important engineering problems, river works need especial study.

### (A). WORKS FOR THE IMPROVEMENT OF ESTUARIES.

The estuary of a river is well described as covering the region inland affected by the sea, and the region seaward affected by the river.—(Cunningham).

The improvement of estuaries is a subject which plays a very important part in the world's development, and many examples can be quoted to illustrate the remarkable change that has taken place in different quarters of the globe as a result of improvements in the great rivers. Many a port would have subsided into insignificance when ships of iron and steel took the place of the old wooden hulks, if it had not been for the assistance of the engineer.

The obstacles which river works design to reduce or remove are the results of a great many years' work by nature uncontrolled, and hence the improvements effected by the training of the river require a considerable time to develop. This makes it all the more necessary for the engineer to look well ahead and weigh the effect his works will have in some five or ten years' time.

There is, even to-day, much discussion among engineers as to the explanation of nearly all the phenomena connected with rivers. But although several matters regarding the formation of bars, the shifting of channels, and the effects of wind and waves, are still unsettled, the general principles are fully acknowledged. Improvements in submarine survey and the lessons to be learnt from former works are now leading to a clearer understanding of rivers.

### TRANSPORTING POWER OF RIVERS.

All rivers carry with them material which they have eroded from their banks or which has been poured into them by floods. The quantity of matter carried along varies very much, but it is always immense, as the following examples show :—

- (a). The Mississippi discharges annually into the Gulf of Mexico 777,805,550,000 cubic yards of solid matter, increasing its delta by over a square mile per annum.
- (b). The Ganges, in the rainy season, carries 300,000,000 tons of solid matter a day.
- (c). The Thames deposits 500,000 tons a year in the sea.
- (d). The muddy colour of the Amazon can be observed at 300 miles distance from the mouth.

This capacity for carrying material depends on the velocity of the river, and when the water is heavily loaded there is always a tendency for the suspended material to be deposited when the velocity receives a check either from the opposition of the tides or from the slackening of the velocity due to a wide extension of the surface. Thus, at river mouths the down-flowing water meets with considerable opposition

when it encounters the sea, and in tideless seas the sediment in the water is deposited freely and continuously, while in tidal seas the deposit still takes place but is subject to a variety of disturbing influences.

Rivers discharging into tideless seas are conspicuous for their large "deltas," always increasing, and over which the river finds outlets wherever it can, *e.g.*, the Nile, the Danube, the Rhone, the Mississippi.

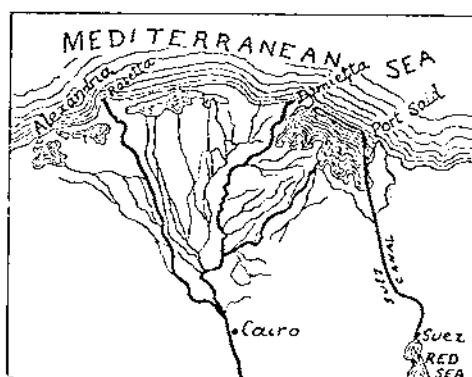


FIG. 1.—Delta of the Nile.

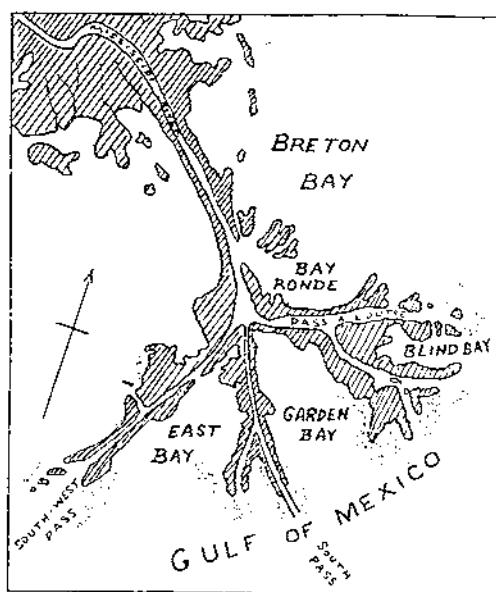


FIG. 2.—The Mississippi Delta.

In a tidal river, there is a constant struggle going on between the river forces and the sea forces. The water flowing downwards by the river is dammed back by the incoming tide, and a great accumulation of water takes place, which, when set free by the turn of the tide, flows to the sea with much greater momentum and carries the

sediment to a much greater distance out than would be the case with a tideless river. The deposit, in some cases, takes place far beyond the limits of the estuary. This increased volume of water also tends to enlarge the bed of the river towards the sea. But if these influences were the only ones at work, the river would be constantly in a navigable state, and nature would not require to be interfered with. There are, however, other influences to be considered, such as littoral drift, prevailing winds, local currents, etc., all of which have their effect on the river bed.

#### TREATMENT OF TIDELESS RIVERS.

There are several very large rivers which discharge into seas which are practically tideless, *e.g.*:—The Volga, into the Caspian; the Danube, into the Black Sea; the Mississippi into the Gulf of Mexico; the Rhone into the Mediterranean.

This class of river is the most unsuited for navigation. It is in most cases hampered by its low-lying delta. It finds its way to the sea by several shallow channels which are constantly changing their positions. As soon as the sediment chokes up one channel, another is formed, and the delta is pushed further out to sea every year. (The rate of increase of the Danube delta before training works were begun was about 200' a year.—[Vernon-Harcourt]).

There are three general methods of improving tideless rivers:—

- (a). Training walls, embankments or dykes.
- (b). Dredging.
- (c). Lateral canals.

(a). *Training Walls, or Dykes.*—These are built with a view to confining the main stream of the river within defined limits, and directing its full energy through one outlet. This confinement of the stream increases its energy and helps to deepen the channel by scouring, and to wear down the obstructing accumulation at the outlet.

As the removal or reduction of the bar is the chief object of the training works, the walls, piers or jetties, must often be prolonged far beyond the actual mouth of the river, for some bars are a considerable distance out. Training walls that are not carried far enough are likely to cause another bar to appear in another place. But it is not necessary that the works should start inside the estuary above the mouth, for some rivers have great depths inside their bars.

Every case must be treated on its own merits, and no hard and fast rule can be laid down. Some jetties have been laid parallel; others convergent; and some again divergent. Some are built to project above high water, others are kept below low water.—(Cunningham). But the latter are somewhat dangerous to navigation.

Again, the works may consist of open timberwork; framed piles;

mounds of chalk, stone or earth; concrete blocks; fascines or mattresses of osiers sunk with stones or loaded with clay. (The latter method has been much used in Holland, the Lincolnshire Fen Country, and on the Mississippi). These works require a vast amount of material, and the best possible use of suitable materials at hand must therefore be made.

Ironwork is not as a rule used, owing to the corrosive action of the salt water. Timberwork does not suffer nearly to the same extent, as the marine growths, barnacles, etc., soon protect it.

Continuous mounds of chalk, stone, or earth faced with stone, are cheap and do not require much maintenance, but they are slow to build, and where strong winds prevail, the facing of the banks must be of stone or concrete, and a good apron of concrete should be laid to protect the bank from the impact of waves. The silt brought up by dredgers has been used for filling at the back of training walls.

Various sections of training walls are shown in the following (Figs. 3, 4, 5 and 6):—

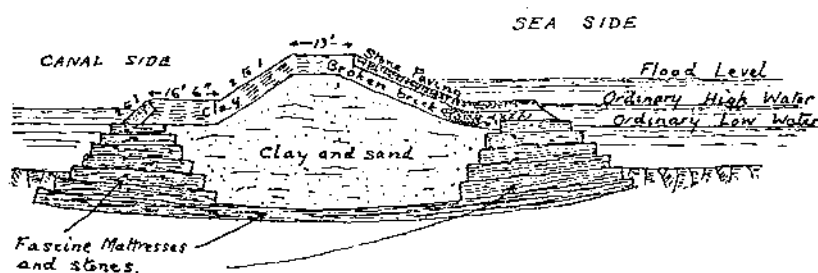


FIG. 3.—Dutch Canal Bank.

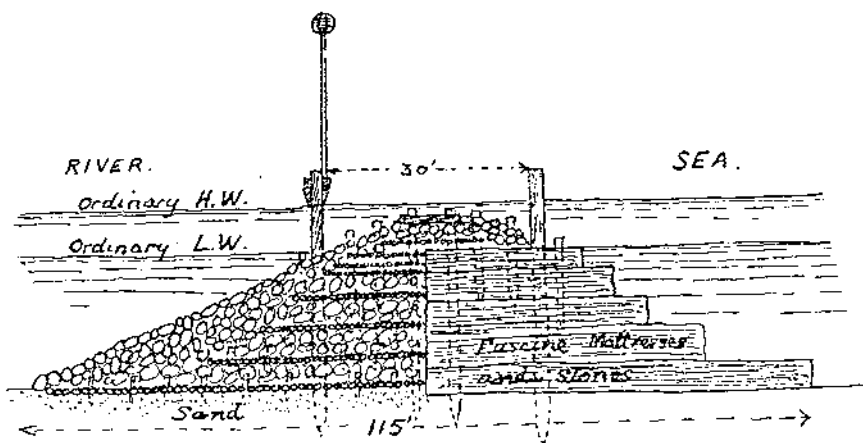


FIG. 4.—Jetty at Hook of Holland.

The principal advantage claimed for the training wall system is that once the walls are built and have directed the river, nature will maintain the improvement. This is not always the result. Sooner

or later the bar reappears; but it may be again removed by a prolongation of the walls, and the deposit carried still further out into deep water.

Training walls have been very successful in numerous cases, and they are the most usual works employed.

*Examples of Training Walls.*—(i.). The Dutch, the greater part of whose country depends upon their dykes, are forced to use fascines made of osiers as foundations for their dykes or embankments. There is an absence of stone and timber in Holland, but osiers are extensively cultivated for the dykes, and large "mattresses" are made of the fascines, and sunk in position with bricks or clay. For sandy bottoms, they are admirable as foundations for the embankments.

(ii.). *The Danube Mouths.*—This great river, 1,725 miles long, flows with a channel 1,700' wide and 50' deep to a point 60 miles from the Black Sea, into which it discharges. But from that point the river breaks up into a number of shallow branches flowing over a large delta. There are three chief branches, the Kilia, the Sulina and the St. George's. About 1853, plans were made for the improvement of one of these branches into a permanent navigable channel, and the Sulina arm was chosen. It already had a navigable mouth and a comparatively slight bar; there was also a strong littoral current which helped to sweep away detritus from the mouth. So that its improvement was expected to be easy.

Work was begun in 1858, and two jetties were run out from the shore on each side of the mouth, extending out to the bar. The jetties are convergent for the first part of their length, then parallel and finally slightly divergent. At the "neck" they are 600' apart. They were built of a rubble mound and piling surmounted by a timber platform 14' wide, strengthened at intervals by strongly built cribs of the same width. The work took three years to complete, and a marked improvement was soon noticed, a minimum depth of  $16\frac{1}{2}$ ' and width of 500' being obtained. The jetties were improved and strengthened in 1868, by a concrete wall on the top of the mound, made by depositing cases of concrete *in situ* along the shore ends of the piers. Along the outer portion, a wall of 18-ton concrete blocks cemented together by concrete filling was built on the levelled rubble base, and the outer slope was protected by concrete blocks weighing 10 to 20 tons, deposited at random on the rubble mounds (see *Figs. 5, 6 and 7*).

In 1873 there was a minimum depth of 20' over the bar. But now the limit of the scouring capacity of the stream had been reached, and the deepening of the channel ceased. Ships went on increasing in size, and soon there were a number of vessels that could not enter the Danube. (In 1893 there were 336 of such ships). Recourse was then had to dredging and a powerful dredger set to work in 1894. At the end of 1895 a ruling depth of 24' had been obtained and this is still being maintained.

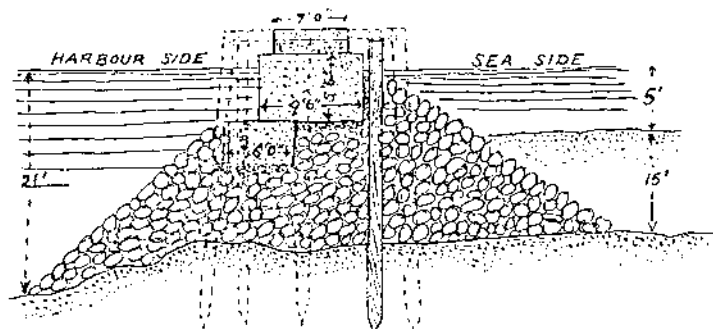


FIG. 5.—Section of South Jetty.

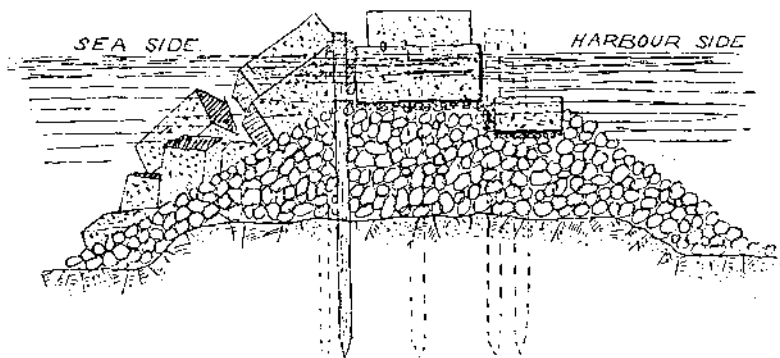


FIG. 6.—Section of North Jetty.

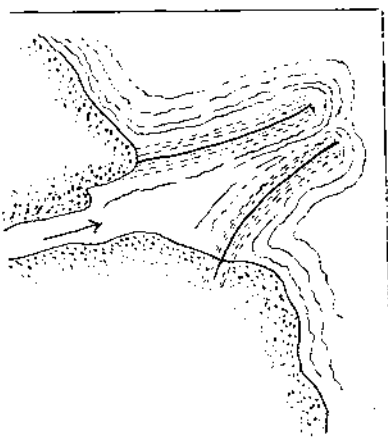


FIG. 7.—Plan of Jetties at Sulina Mouth.

The interesting point in the Danube works is the limitation of the natural capabilities of the Sulina stream to maintain its channel at 20' depth. This practically limits the useful employment of jetty training works, and there is good reason to suppose that such a limit may be reached in other rivers. The depth beyond which the stream will not scour its channel, will not of course be the same in every case.



(iii.). *The Mississippi*.—This huge river, 4,500 miles long, and having a basin of 1,244,000 square miles, has proved a very interesting example of the improvement which may be effected by engineering.

The Gulf of Mexico, into which the river flows, is practically tideless, having a rise of only 14", and there is only one tide a day along the face of the Mississippi delta. The delta has an area of 12,300 square miles, and the river has three principal arms, called "Passes," which have altogether seven mouths. The Passes are the Pass à l'Outre, the South-West Pass, and the South Pass. The two former carry about 45 per cent. each of the total discharge. There were bars blocking all the channels.

The earliest attempts at improvement were made in 1826, when primitive harrows were dragged backwards and forwards through the sand in the hope that the current would carry the stirred-up sediment further out to sea. This was naturally a slow and very imperfect process, and in 1837 some attempts were made with a single ladder dredger. But storms caused the channels to fill up as fast as they were cleared. Several schemes were propounded for an improvement, but nothing was done—chiefly owing to a lack of funds—until 1874 when a very enterprising engineer, Capt. Eads, of the U.S. Engineers, undertook to create and maintain a channel through the bar of the South-West Pass with a minimum depth of 28' by means of parallel jetties. He offered to carry out the work without payment unless it was successful.

The Government, after much opposition, eventually accepted the offer, but insisted that the South, and not the South-West, Pass should be treated; also that the minimum depth over the bar should be 30'. Eads took the work in hand.

The Pass had a width of 600' to 800' and a minimum depth of 25' throughout its course of 13 miles, except for  $\frac{1}{2}$  mile at the junction with the main river, where it had a depth of only 15', and at the mouth, where there was only 8'. The jetties were carried out in prolongation of the natural banks of the Pass, and across the bar, for a distance of  $2\frac{3}{4}$  miles. They were built of fascine "mattresses," made of willow; each mattress being 100' long, and 2' thick, varying from 40' wide at the bottom to 20' at the top of the bank, after the old Dutch fashion. The distance apart of the jetties was 1,000'. To protect the jetties from scour, the inner portions were covered with a layer of rubble stone at the top, and the outer portions have large concrete blocks for a distance of 1 mile along the east jetty, and about  $\frac{1}{2}$  mile along the west jetty. These blocks vary in size towards the sea end, from 3' 6"  $\times$  3'  $\times$  16' to 13'  $\times$  5'  $\times$  55', the last weighing over 260 tons. The jetties are raised above flood-tide level, except the last 1,000'.

The result of these works was the rapid improvement of the channel to more than the stipulated width and depth, and this has since been

maintained by the natural scour of the river.—(Cunningham; Vernon-Harcourt).

It is a splendid example of the value of training jetties properly placed (see *Figs. 8, 9 and 10*).

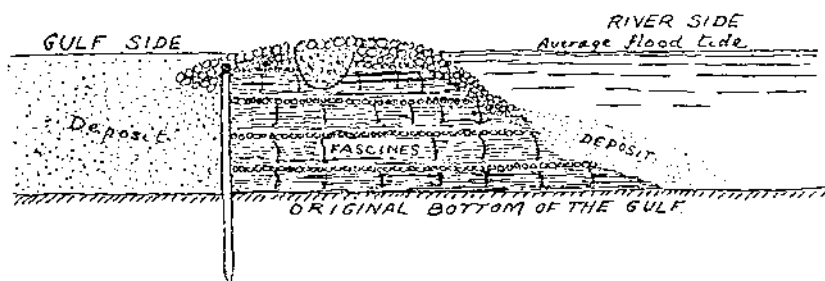


FIG. 8.—Fascine Wall of Mississippi.

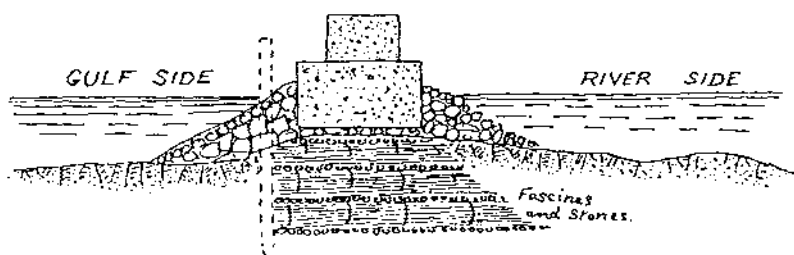


FIG. 9.—Section of South Pass Jetty.

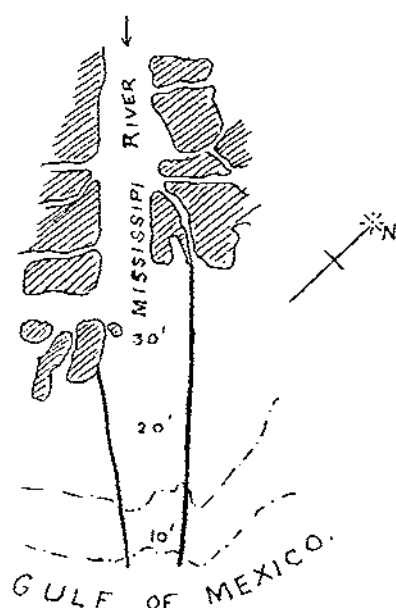


FIG. 10.—Plan of Jetties at the South-West Pass.

(b). *Dredging*.—This can only be a temporary means of improving the estuary. The amount of deposit removed by the dredger is comparatively small compared with the amount which may be removed by the scouring power of the river, and dredging by itself merely removes a portion which may be rapidly replaced.

It is, however, a less expensive and quicker method of improving an estuary, while the cost is recurring—the reverse of the case with training works.

There are several instances where dredging has proved very successful, e.g., on the Mersey; and it has also been employed as an adjunct to training walls, where the channel scooped out by the dredger is maintained and enlarged by the stream itself. Dredging and training walls have been employed together on the Danube and Mississippi.

There has lately been a great improvement in dredgers, and powerful suction is now employed instead of the older and more cumbrous method of bucket dredging. The latest dredger is a huge vessel, the *Leviathan*, built for the Mersey authorities and launched October, 1908. She is capable of carrying 10,000 tons of sand, and has a length of 487', and a depth of 30' 7". She has pumps capable of dredging the 10,000 tons of sand in 50 minutes from a depth of 70', and when fully loaded, she can steam at 10 knots. She has a mean draught of 23' when loaded.

(c). *Lateral Canals*.—This method is not much used now. Formerly it was very commonly adopted. Its chief drawback is that it abandons the natural bed of the river. The canal has to start above the delta, and enter the sea clear of the delta area. This means a series of locks, and the accompanying loss of time for traffic. The mouth of the canal itself has to be kept clear of sediment by dredging.

#### TREATMENT OF TIDAL ESTUARIES.

There is a broad distinction between tidal and tideless rivers. The latter have usually a considerable delta and a number of outlets into the sea. The former have usually a single channel, expanding, as it approaches the sea, into a broad estuary.

Most tidal rivers are troubled with bars, but they are not formed in the same way as bars in tideless rivers. There is a constant disturbance of the tendency to deposit, and the sediment carried down by the river becomes more or less uniformly deposited throughout the estuary. But the sea in certain places tends to accumulate material along the shore, causing a continual advance of the coast line while it is elsewhere eroding it. This accumulation, when carried on across a river mouth, is interfered with by the scouring action of the tides, until at last a state of equilibrium is reached, and the deposit is kept at a fairly uniform level. Wind and waves also assist the movement of deposit along the shore.

In some cases, where this silting action tends obliquely across a

river mouth, the natural outlet of the stream may become completely blocked, and the river course diverted, as in the cases of the Yare, and the Adur (in Sussex).

An estuary may be funnel shaped or bottle necked. The Thames and Severn are examples of the former; the Mersey an instance of the latter. The funnel-shaped estuary is less likely to have a bar than the bottle necked. The Severn has no bar, and the Thames, although it has a slight bar and shifting channels, has a navigable waterway out to sea; but the Mersey has a very serious bar, and the Tay has two.

The funnel-shaped estuary allows the tidal flow to penetrate higher up the river, thereby increasing the volume of water returning with the ebb. But there must not be too sudden an enlargement of the mouth or the flow will not prevent silting, *e.g.*, the Seine.—(Cunningham).

A bottle-necked estuary, by offering obstruction to the tidal flow, loses the chief advantage of a tidal river, and shoaling takes place inside the estuary.

"The objects to be aimed at in designing works for improving tidal rivers are :—

1. To facilitate the entrance of tidal water, and remove all obstructions which tend to diminish the volume of water entering the estuary from the sea.

2. To confine the low-water channel within definite limits of such a form that the stream is gradually enlarged and widened in accordance with its natural proportions."—(Cunningham).

Training walls and dredging are the two methods employed for improving tidal estuaries, and as some remarks on these methods have already been given under "tideless estuaries," they need not be repeated here, but some instances of their use may be quoted :—

#### EXAMPLES OF WORKS ON TIDAL ESTUARIES.

(i.). *The Seine*.—Prior to 1848 the estuary of this river was choked with enormous banks of sand and mud, which were constantly shifting and causing trouble to navigation. Vessels of 200 tons, drawing 10' or less, could only reach Rouen, 74 miles up, by moving with successive flood tides. At low water, they grounded.

From 1848-51, two dykes were built between Villequier and Quillebœuf, one along the right bank, 11 miles long, and the other on the left bank in two lengths of 9,000 and 1,500 yards. The result was very satisfactory. The depth of the channel was increased from 11' 6" to 21' 6". This successful treatment led to an extension of the dykes during the years 1859-1867. They were at first built of chalk rubble from the cliffs bordering the river, and the material was deposited at random below low-water level, and protected above that by stone pitching, the toe of which was supported at wide intervals

with rough timber. But after 10 years' experience in maintenance, the authorities decided to strengthen the dykes, and a facing of concrete from 7" to 15" thick was put on the inner slope, to cover the rubble from the wearing away by the rise and fall of the tides. A concrete apron about 3 yards wide was also added to the toe of the slope to protect it from the scouring action and waves. The apron was prevented from slipping by a row of sheet piling (see Figs. 11 and 12).

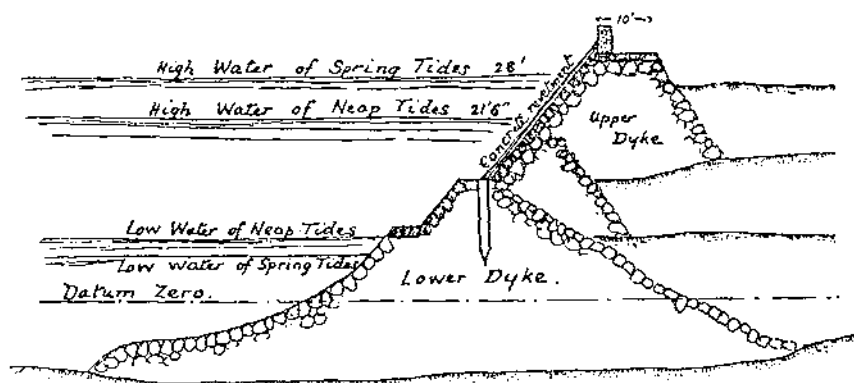


FIG. 11.—Section of Southern Dyke in Outer Estuary.

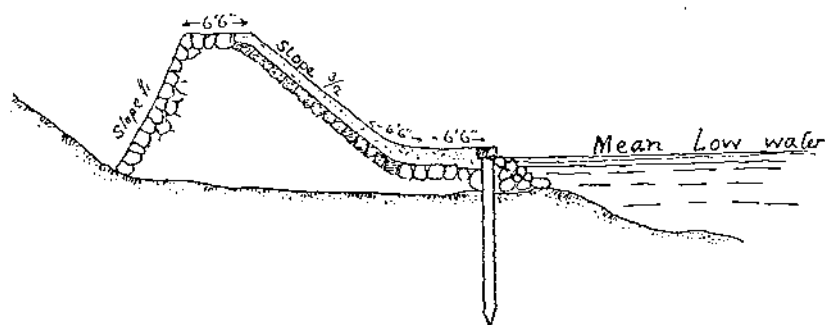


FIG. 12.—Section of Dyke in Inner Estuary.

Although these works were eminently successful in deepening the channel, the results still proved to be behind the growing requirements of navigation up to Rouen, and in 1890-96, the dykes were still further extended towards the sea.

But these improvements in the Seine estuary resulted in seriously obstructing the entrance to Havre Harbour, and eventually, in 1895, a new approach to the harbour from the English Channel had to be made.

Further works were carried out in the Seine during 1898-1905, and on the north dyke the extension was carried 7,150 yards, and on the south dyke, 5,200 yards, towards the sea. The distance apart of the dykes at their seaward ends is 1 mile.

There are proposals for more extensions in the near future.

(ii). *The Mersey*.—The estuary of this river is of the peculiar bottle-shaped type. Halfway between Runcorn and Birkenhead, the estuary is over 3 miles wide; at Seacombe its breadth is scarcely 1,000 yards. It covers an area of 22,500 acres, but four-fifths of this is one large sandbank which stands above low water of spring tides. The bed of the river is ever varying and is said to change its position every week. It has been known to change entirely from the Lancashire to the Cheshire side within a year.

The river discharges into the Irish Sea by three channels—the Rock Channel, turning sharply to the west past New Brighton; the Crosby Channel, which is the main one, keeping the general north-westerly direction of the river until it approaches Formby Point, where it turns sharply westward to the sea, and becomes Queen's Channel; and thirdly the Formby Channel which keeps on in the north-westerly direction.

The central, or Crosby Channel, is the one used for ocean-going traffic; and in 1890 there was only 12' at low water of spring tides over the bar. This bar is constantly altering in position, height and extent; and during the past 40 years its crest has advanced a mile further into the sea.

Training works in this case would be very much hampered by the ever-varying conditions, and the channel has been maintained entirely by dredging. The Mersey Dock and Harbour Board have very powerful dredgers at work, including the new *Leviathan*, and have so far been able to cope with the demands of the immense shipping entering the Mersey. Since 1890, 38,000,000 tons of sand have been dredged from the bar, and there is now a minimum depth of 28' at low water of spring tides.

The sharp bend at Taylor's Bank is constantly becoming sharper, and it is proposed torevet the bank on the northern side with stone for a length of  $2\frac{1}{2}$  miles. The stone is to be allowed to find its own slope, and afterwards to be consolidated (*Fig. 13*).

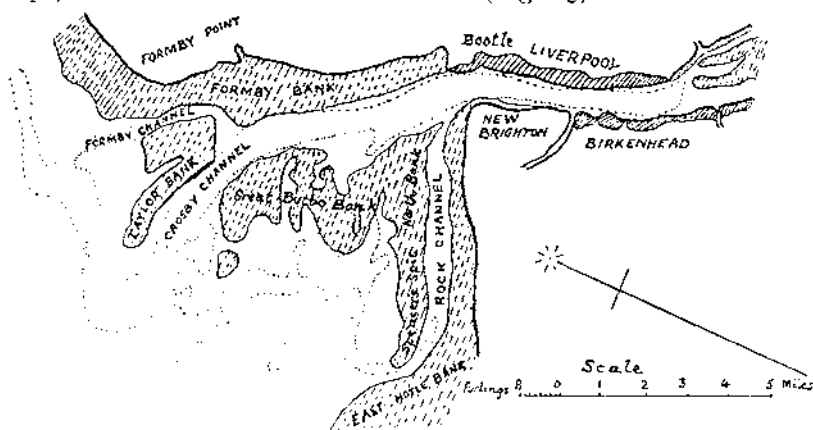


FIG. 13.—Plan of Mersey Estuary.

(iii.). *The Thames* is one of the few important rivers that is practically unobstructed by a bar, but its course is not ideal for the huge amount of traffic passing along it. The bends are too sharp and frequent for the river to be perfect. There are also patches of shoal water between London and the Nore which add to the risks of navigation. Between the Nore and Gravesend there are the Leigh Middle shoals, extending for a distance of 7 miles from Shoeburyness to Canvey Point, and having only 24' of water at low water. Dredging is going on under the Thames Conservancy (or under the new Port of London Authority) for the improvement of the channel to a minimum depth of 30' and a width of 1,000'. Outside the Nore there are several channels, all of which are maintained at an average depth of 40' to 60' without dredging.—(Cunningham).

#### TIDAL MODELS.

With a view to the close observation of the effect of various currents during any state of the tide, and of the motion of sand under water, models have been made which faithfully reproduce the natural conditions in a river. An estuary can be modelled with great accuracy, and the tidal flow produced by a "tide generator," which tilts up the water and lets it run back at periods proportional to the periods of the natural tides. The floor of the estuary is made of sand.

"The discrepancy between the vertical and horizontal scales does not materially affect the disposition of the currents or their effect on the movement of the sand."—(Wheeler, p. 327).

The "tide generator" is worked by a water motor, or by electricity, and the period of its "tides" is calculated from the following formula :—

$$X = \frac{\sqrt{H \times P}}{L}.$$

Where X is the period required.

H „ vertical scale of the tank (natural).

L „ horizontal scale of the tank (natural).

P „ natural period of the tides.—(Wheeler, p. 328).

As an example, if  $P=12$  hours 25 minutes = 44,100 seconds (a usual tidal period) and the vertical scale of the model be 12' to the inch, or 144 to 1, and the horizontal scale  $\frac{1}{4}$ " to 1 mile, or 1 to 15,840, then the tidal period for the model will be

$$\frac{\sqrt{144 \times 44,100}}{15,840} \text{ or } 33.4 \text{ seconds.}$$

The model is made in a tank of suitable size, and the same tank will answer for a number of different estuaries.

Most interesting results are obtained from these models, and they are invaluable to the river engineer.

## (B). WORKS FOR CHECKING FLOODS, ETC.

These principally comprise dams, weirs, and locks—necessarily above the tidal portion of rivers.

In districts suffering from prolonged droughts, the most economical use of whatever rivers are available becomes the chief care of the State.

In those unfortunate districts, when the inhabitants are not suffering from drought, they are generally suffering from floods, and it is necessary to provide works for the conservation of a sufficient quantity of water to cover the period of drought while ensuring that the excess of water in the rainy season shall be quickly disposed of.

There is no space here for a description of the many flood and irrigation works that are in operation throughout numerous countries, but brief notes on some of the most important kinds of weirs are added.

(i.). The *Assouân* Dam is the most important "barrage" constructed in recent years. It is designed to impound 1,000,000,000 cubic metres of water for the development of Lower Egypt. It is part of the scheme for obtaining an annual supply of 6,000,000,000 cubic metres for the proper development of the country, and preparations are being made now to increase the height of the dam by some 29', and the storage capacity to twice its present amount.

The dam stands 130' above the bed, and the final head of water will be 85'. There are 140 under sluices each 22' 6"  $\times$  6' 6", and 40 upper sluices, 11' 6"  $\times$  6' 6", capable of discharging the muddy flood waters, which can pass without parting with their silt, while the surplus of the comparatively clear winter supply will be stored for use in summer. If the flood waters were obstructed, the reservoir would soon be choked up with mud and silt, and obliterated. The discharge is regulated by well-balanced roller gates.

(See *Corps Papers*, Vol. XXVI. 1900. Article by W. Willcocks, Esq., C.M.G., also *Proceedings of the International Engineering Congress, Glasgow, 1901*: report of Section II. Waterways and Maritime Works).

(ii.). *The Assiout Weir*.—This is some 300 miles below the Assouân Dam, on the Nile. It was built in conjunction with the dam in order to provide means for utilizing the discharge, and diverting the water into the canals and branches below it. It is rather a regulating bridge than a weir. It has a masonry platform 10' thick, 90' wide, and laid flush with the river bed. This floor has iron sheet piling 16' deep as up and downstream curtains.

The weir is capable of sustaining 10' head of water in flood, and 14' head in summer. It has 111 openings 16' wide and 29' high; and the piers are 6½' wide.

(iii.). *Weirs Generally* may be classified as follows:—

- (a). Overfall weirs.
- (b). Draw-door or sluice-gate weirs.
- (c). Movable weirs.



(a). *Overfall Weirs* are barriers placed across a river to hold up the water until it has risen above their top or "sill." Not a suitable kind for the rapid discharge of flood waters, they diminish very much the original waterway. To obviate this drawback, they are sometimes placed obliquely across the stream, and the section of waterway over them made equal to the section of river channel above. But these oblique weirs tend to "divert the main current and consequently the deepest channel towards the bank against which the upstream end of weir rests."—(Vernon-Harcourt).

The weir may be made in two straight lines, meeting in the centre of the stream and the angle pointing upstream. Or the weir may be curved, with the convex side upstream.

Anicuts, or weirs on Indian rivers, very commonly employed, are overfall weirs.

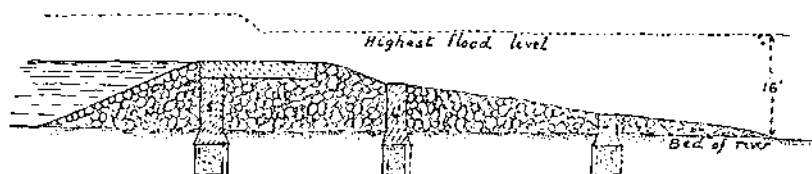


FIG. 14.—Section of Anicut.

(b). *Draw-Door Weirs*.—These have a series of panels or doors sliding in vertical grooves formed in a row of piles or piers. In order to reduce the power required to raise heavy draw-doors, iron rollers are hung in a recess at the side of the door.

Teddington weir is a good example.

(c). *Movable Weirs*.—Capable of being lowered on to the bed of the river, or otherwise removed, so as to prevent obstruction to the discharge in flood time.

Four different types—

- (i.). Movable frame or "needle" weir.
- (ii.). Movable shutter.
- (iii.). Drum weir.
- (iv.). Segmental gate weir.

(i.). Movable frames serve to support the "needles" or stanches when upright; and can be lowered to bed of river in flood. The frames are of light construction, generally wrought iron, placed end on to the current at regular intervals, connected together, when vertical, by movable horizontal iron bars, and hinged to the apron of the weir.

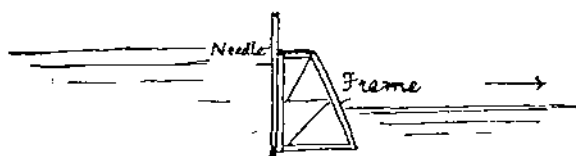


FIG. 15.

The needles rest against a sill in the apron, and against a horizontal bar between the frames at the top. The frames can be lowered by chains.

This kind of weir is a simple and comparatively cheap one.

(ii.). *Movable Shutter*.—Simplest form is a gate or shutter hinged horizontally at bottom supported by a prop which may be lowered and raised hydraulically.

(iii.). *Drum Weir* consists of an upper and lower iron paddle revolving on horizontal axis through  $\frac{1}{4}$  circle. Upper paddle forms the weir which it closes when upright, and under one (slightly larger than upper) revolves in closed recess below sill of weir.

The weir is closed by raising sluice gate in abutment at end of weir, which lets the water from the upper pool press on the upper face of the under paddle and this, by overcoming pressure of water on the upper paddle, swings it into vertical position and closes weir. The weir is opened by lowering the sluice gate; this removes the pressure on the upper face of lower paddle, and the current pushes down the upper paddle.

*Ex.*—Weir on Marne at Joinville. 42 paddles 3' 7"  $\times$  4' 8" can be completely opened or closed in three or four minutes by one man.

Drum weirs are only suitable for overfalls: for they require too much depth of foundations below sill.

(iv.). *Segmental Gate Weir*.—Series of segmental gates between masonry piers. Gates are cellular, and of cylindrical segment form. They are made of wrought iron or steel and revolve on horizontal axis to which they are attached by six radiating rods at each side. The axis turns on pivots fixed in each pier. The gates are counter-balanced by weights in a hollow in the piers, and are easily turned through a small arc by chains worked from the piers.

#### COMPARISON OF VARIOUS FORMS.

*Overfall Weirs* are economical; require little maintenance and no expense in working.

*Draw-Door Weirs*.—Cheaper than movable weirs, and easier to manage; afford freer flow than solid weirs; admit regulation of the discharge, and consequently, the levels of a river.

*Drum Weirs*.—Theoretically almost perfect; practically, unsuitable for navigable rivers.

*Segmental Gate Weirs*.—Expensive and complicated. Not much used, but strong, and can be made of large dimensions.

Inland river traffic in England is too small to justify heavy expenditure on improvements, and railways have cut out river traffic except for a very few items, such as ballast, stone, in some cases coal, hay, etc.

On the Continent, however, the improvement of rivers has been, and is, much studied.

## APPENDIX.

## LIST OF SOME BOOKS, ARTICLES, Etc., ON RIVER WORKS.

## PROFESSIONAL PAPERS OF THE CORPS OF ROYAL ENGINEERS.

"Barrages and Collateral Works on the Nile." By W. Willcocks, Esq., C.M.G. Paper 7. Vol. XXVI. 1900.

Includes an account of Assouân Dam and Assiout Weir.

"On the Method employed in keeping the Nuddea Rivers open to Navigation during the Season of Low Water." By Major R. H. Brown, R.E. Paper 4. Vol. XV. 1889.

Gives an account of training jetties or spurs used on some Indian rivers to prevent silting up of navigable channels. A useful paper for the principles of river training with scanty materials.

"On the Mouths of the Danube and the Improvement of the Mouths of Rivers in non-tidal Seas." By Major Stokes, R.E. Paper 5. Vol. XIII. New Series. 1864.

Contains some account of the Danube mouths at time when the improvement scheme had just been started.

## ARTICLE IN "ENGINEERING."

"Estuary Channels and their Treatment." By Brysson Cunningham. *Engineering*. Oct. 30, Nov. 20, Dec. 4, and Dec. 18. 1908.

## BOOKS.

*Tidal Rivers. Their Hydraulics, Improvement and Navigation.* By W. H. Wheeler, M.Inst.C.E. Longman's Civil Engineering Series. 1893.

An exhaustive work containing many examples of river improvement; also chapters on Tides, and Tidal Models. Mr. Wheeler has much experience of the rivers in the Fen Country.

*Rivers and Canals.* A Treatise relating to the Control and Improvement of Rivers, and the Design, Construction and Development of Canals. Vol. I. Text; Vol. II. Plates. By L. F. Vernon-Harcourt. Oxford: Clarendon Press. 1882. 21s.

Contains useful information on different forms of training works, with several examples and some excellent plates.

*Proceedings of the Waterways and Maritime Works Section of the International Engineering Congress, Glasgow, 1901.* Published by Wm. Clowes & Sons, 32, Cockspur Street, S.W. Price 6s. 6d.

Contains interesting papers on:—

"Irrigation in the Nile Valley and its Future." By W. Willcocks, Esq., C.M.G.

"The Improvements of the Lower Mississippi River." By J. A. Ockerson, Esq.

"Recent Improvements effected in the Navigable Condition of the Sulina Branch and Outlet of the Danube." By C. H. L. Kühl.

"The River Clyde and Harbour of Glasgow." By W. M. Alston, Engineer-in-Chief to Clyde Navigation Trustees.

"Improvement Works on the Clyde Estuary." By D. and C. Stevenson.

"Works for the Improvement of the Bilbao River and Making an Outer Harbour." By Señor don Avaristo de Charruca.

MAJOR-GENERAL SIR WILLIAM REID, R.E., G.C.M.G.,  
K.C.B., F.R.S.\*

(Continued).

By COL. ROBT. H. VETCH, C.B., LATE R.E.

Shortly after the Battle of Vittoria Napoleon sent Marshal Soult back to the south to replace Joseph Buonaparte as his lieutenant. In a marvellously short space of time he reorganized the beaten French forces as the "Army of Spain." While Reid was at the first Siege of St. Sebastian and afterwards laid up with his wound, Soult made a determined effort to relieve Pampluna. For nine days he fought an obstinate and bloody battle with the allied army among the mountains of the Lower Pyrenees, but was eventually forced back by Wellington early in August. Not discouraged he again crossed the Bidassoa at the end of the month to endeavour to relieve St. Sebastian, and on the 31st, the very day in which the town was successfully stormed, he was once more defeated by the allied army and forced to retrace his steps to his position behind the Bidassoa River.

On recovering from his wound Reid joined the Light Division again as senior officer of Royal Engineers under Major-General Count Charles Alten. So long as Pampluna held out it was impossible for Wellington to act on the offensive on a large scale, but he decided to improve the position he held by crossing the Bidassoa River into France. His project was a bold one. He proposed to seize the Great Rhune Mountain and its dependencies on the French side of the river, and to drive Soult's forces from the strong position they held from the mountain to the sea. By the possession of the Rhune Mountain he would menace the centre of the French line and at the same time obtain possession of the port of Fuenterrabia. Since the fall of San Sebastian nearly a month had gone by without any hostile movement on the part of either army. The weather was cold and wet, and while the officers were able to amuse themselves the men were having a bad time and were discontented.

\* Articles on Sir Wm. Reid appeared in the April and May *Journals*, under the title of "The Fyers Family." As however they deal entirely with the life of Sir W. Reid—whose career has never yet been fully chronicled in the Corps History—in future they will appear under the above title.

The dispositions for the attack were made on the 6th October, and at 3 a.m. on the 7th the troops were under arms. Every precaution was taken to prevent discovery by the enemy. The troops moved in silence. The night had been dark and stormy; a thunderstorm which rolled over to the French side of the river in the early morning served to prevent the noise of the artillery and of the pontoon train being heard by the enemy, and the troops succeeded in gaining the different fords of the river without being discovered.

The Light Division, supported by Longa's Spanish Corps, crossed the river to attack the enemy holding the Bayonette Mountain of La Rhune, and the position of Vera.

The French were as unprepared here as on the other flank. The attack on the Puerto de Vera was peculiarly brilliant. The approach was narrow and completely commanded by several strong redoubts on the acclivities and summits of the steep mountains above the village of Vera. But nothing deterred the advance of the Light Division, which crossed the river at the Salinas ford; one brigade attacked the right of the position and drove the enemy from their entrenchments; and another brigade attacked the pass of Vera and carried it. A French brigade was cut off and a mountain battery and 400 men were captured. Having possessed themselves of the Bayonette and Commissari Valleys and the Puerto de Vera, their Spanish supports assailed the Rhune Mountain at 3 o'clock in the afternoon, but the French held on to the post on the summit of the mountain until the morning, when it was surrendered. The allied army was now encamped on French soil, occupying a series of commanding positions ready at any moment to continue its advance.

That moment came when Pampluna capitulated on the 31st October. But delayed by bad weather it was the 10th November before Wellington attacked Soult's strongly fortified position covering St. Jean de Luz and extending from the sea across the Nivelle to the heights behind Ainhoe. Of this position Wellington himself said he had never seen anything more formidable. Again the advance was made at night and in silence. By early dawn the whole force was in position at the verge of the line of out-piquets, the troops lying extended on the ground awaiting the order to move. A false attack was to be made on the French right wing while an endeavour was made to penetrate the centre of the enemy and separate the wings. The left column of the centre of the allied army consisted of Alten's Division, supported by Longa's Spanish Corps. This column advancing with the greatest impetuosity forced the entrenchments on Petite La Rhune and, having driven the enemy from their redoubts, formed up on the top of the hill. Then, continuing their advance with the other column against the heights in rear of Sarre under a heavy fire, the enemy fled in disorder towards the bridge over the Nivelle. While the Light Division was attacking a redoubt, the other column

of the centre intercepted the retreat of the garrison, and an entire French battalion 600 strong was captured.

The French General Clausel seeing the retreat of the French left wing tried to retrieve the day, but Alten, having descended the Rhune by a ravine on Ascain, drove the enemy through the ravine and beyond the bridge, so that the rout became general; the works and position in front of St. Jean de Luz were abandoned, and Soult fell back on a prepared position between the village of Anglet and his entrenched camp in front of Bayonne. The result of these operations was the capture by the allied army of 50 guns, 1,500 prisoners and a considerable quantity of stores and ammunition.

For nearly a month the allied army settled down in cantonments on the hills it had conquered. The country people brought in supplies freely, and the officers added to these by shooting cock and snipe, hares and rabbits. Wellington's foxhounds were unkennelled, he himself took the field regularly twice a week, and a crowded field attended the meets.

Reid, with the Light Division, occupied the church and village of Arcangues, situated upon rising ground and of considerable natural strength, to which, by his advice, were added fieldworks to still further strengthen it. This precaution proved of inestimable value.

The enemy in the meanwhile guarded the right bank of the Nive and communicated with a division under General Paris at St. Jean Pied de Port. Thus the allies occupied only the confined space between the sea and the Nive, and were cut off from the productive country beyond the river which afforded large supplies to the enemy. Wellington decided therefore to cross the Nive and drive back the French outposts from the strong ground between the Nive and the Adour. The 9th December was fixed for the advance. The evening before, the pontoon train passed through Arauntz as quietly as possible, and the troops were under arms some hours before daylight on the 9th. The right wing of the allied army, under Hill and Beresford, crossed the Nive at Cambo and Usteritz and dislodged the enemy, while Hope and Alten, on the left, advanced and drove the French into their entrenched camp before Bayonne. When darkness came on the enemy withdrew within the lines of Bayonne, and Hope and Alten returned to their former cantonments. On the 10th Soult seeing that the two wings of the allied army were separated by the river directed a powerful attack on the left of the allies covering St. Jean de Luz. The fighting was very severe. A French column drove the outposts of the Light Division within the village of Arcangues, which as we have seen, thanks to Reid, had been strongly entrenched. Repeated efforts were made to drive the Light Division from their defences, but these efforts were always repulsed with great loss. At the close of the day the French retained possession of the plateau of Bussussary in the immediate front of Arcangues.

During the night Soult withdrew the bulk of his force from its position in front of Sir John Hope, intending to attack the Light Division in overwhelming numbers. As soon as a thick fog cleared off on the 11th about 10 a.m. the French divisions moved to the attack with loud cries of "En avant, en avant !" but were again repulsed. At the close of the day both armies remained in the same positions they had occupied the previous night. On the 12th Soult altered his plans. Foiled in his attack on the allied left, he withdrew his own right wing through Bayonne with the intention of throwing his whole weight on Wellington's right, commanded by Hill.

On the 13th was fought the Battle of St. Pierre, the last day of the fight on the Nive, which was begun on the 9th. The force under Sir Rowland Hill was about 13,000 men. They were attacked by 30,000 under Soult. The French were completely defeated, and escaped with difficulty within their lines, leaving 5,000 men on the field. Soult then crossed the Adour, D'Erlon's three divisions remaining in front of the camp of Mousserolles. On this last day Reid was not engaged, as the Light Division was still posted on the heights of Arcangues. The extreme severity of the weather now induced Wellington to place his army in cantonments for the remainder of the winter.

I have thought it well to narrate the doings of the army in the field, having special reference to the Light Division to which Reid was attached. Unfortunately there are no records available of the part he took in it as senior officer of the Royal Engineers to the Division. Judging from his activity in the field in the previous June we can well understand that he was no less active in the passage of the Bidassoa, and the Battles of the Nivelle and of the Nive. In fact when we know how well the Light Division had entrenched their position at Arcangues it is not difficult to see in it the directing mind of Reid. Probably there are despatches of Alten's which mention his name but I have not been able to ascertain.

During the winter of 1813—1814 Wellington matured his plans for carrying the war into the interior of France. But first Vauban's fortress of Bayonne must be invested and besieged. The city stands on the left bank of the Adour at the confluence with the Nive about 4 miles above the sea. Wellington boldly proposed to hold Soult in check with his right on the *gaves*\* of the Pyrenees, while a bridge of boats across the Adour, near its mouth, was constructed, and a force moved across it to besiege the citadel of St. Esprit, on that side of the river, the place itself being blockaded. In this way, if he succeeded in passing the Adour as he proposed, he would interpose

\* The torrent streams which flow into these rivers are known by the vernacular name of *gaves*, and are distinguished by the name of the principal town on them: thus the *Gave d'Oleron*, *Gave de Mauleon*, *Gave de Pau*, etc.

between Soult and Bordeaux and, whether he succeeded or not, he determined to push Soult further into France with his main army.

Reid was one of the Engineer officers detailed for the bridge under the direction of Lieut.-Colonel Elphinstone, the Commanding Royal Engineer. The place selected for the bridge was in the bend of the river,  $2\frac{1}{2}$  miles below the permanent wooden bridge between the town and the citadel, and  $1\frac{1}{2}$  miles above the sea. In the latter space 200 or 300 transports in attendance on the army would find secure anchorage. The Adour at the point selected was bounded on both banks by high retaining walls, and the breadth of the stream was about 300 yards. There was a rise and fall of tide of 14', and on the right bank the high tide flooded the country to some extent. The ebb tide ran out at about 7 miles an hour.

Forty-eight decked vessels of from 30 to 50 tons burden, called *chasses-marées*, were hired in the ports of St. Jean de Luz, Passages, and Socoa. They were assembled at Socoa, where the bridging superstructure was collected. Timber was difficult to get and therefore 13" cables were substituted for wooden balks. The vessels were to be anchored head and stern, at 30' distance from centre to centre, in a direct line across the river. Five cables were provided to pass over, and be supported on, the deck of each vessel so as to extend from bank to bank. The cables were at 2' intervals, being kept apart by means of grooves cut in a stout sleeper spiked to the deck of each boat. The ends of the cables were to be fixed on the right bank, each to an 18-pr. iron gun let down over the wall into the marsh beyond, and on the left bank attached to a loaded frame and tackle so that the cables could be stretched taut and regulated for the height of the tide.

The Royal Sappers and Miners, artificers from the Guards, and from the Royal Staff Corps, with large parties from the Navy worked incessantly, under the direction of the officers of Royal Engineers, at Socoa. Orders to begin were issued on the 7th February and by the 19th the preparation was complete. The *chasses-marées* were told off into five divisions; the centre under command of Capt. Slade, R.E., the two right divisions under Lieuts. Savage and West, R.E., and the two left under Lieuts. Robe and Rivers, R.E. Lieut. Reid was charged with securing the ends of the cables to the guns and hoisting them over the wall of the right bank into the marsh; while to Lieut. Melhuish was committed the duty of securing the purchases and hauling the cables on the left bank.

Fortunately it was the conviction of Marshal Soult that Wellington could never cross the Adour anywhere, least of all near its mouth. The river between Bayonne and Toulouse receives several tributaries such as the Gaves of Oleron and Pau, torrential streams descending out of the Pyrenees, very abrupt in their banks and not easy to bridge, and Soult had taken precautions to guard all the passages by troops



placed in entrenched positions. He entirely disregarded any idea of the river being bridged near its mouth, as it would require pontoons of considerable size and the great and dangerous sandbanks of the estuary, forming a bad bar, presented difficulties which he was led by the local authorities to regard as insurmountable in the presence of the powerful flotilla of French gunboats in the river and the large garrison of Bayonne. Moreover he considered that the most obvious strategic reasons would lead Wellington to threaten him in the direction of Pau. It was, therefore, a surprise to him to find that his adversary not only pressed him strongly with his right, but, crossing the Adour near its mouth, outflanked him with his left.

The right and centre of the allied army, by a series of manœuvres and small affairs between the 14th and 17th, had driven the French behind the Gave d'Oleron, and obliged Marshal Soult to give up his communications with Bayonne. They were now in march for further triumphs in the direction of Orthes. The left wing comprising the 1st and 5th Divisions under Lieut.-General Sir John Hope was left to deal with Bayonne.

On the evening of the 22nd February the *chasses-marées* put to sea from Socoa, escorted by Admiral Penrose with the *Porcupine*, frigate, the *Lyra*, brig, and five gunboats. The command of the flotilla and the nautical arrangements of entering the Adour and bringing the *chasses-marées* to their anchorage were under Capt. O'Reilly, R.N. To ensure the unmolested entry of the flotilla into the river, it was arranged to gain possession of the right bank the same night by means of troops to be ferried over in jolly boats and on pontoon rafts.

Part of the 1st Division moved at 1 a.m. on the 23rd February from their cantonments to establish a post on the further bank of the Adour before daylight. The troops with a battery of four 18-pr. guns, the rocket batteries, some pontoons and jolly boats marched along the high road to Bayonne till near the village of Anglet; they then turned to their left into a cross-country way and, with some difficulty, reached the left bank of the Adour near its mouth before daybreak. It was found that the pontoon train from Bidart had not arrived and the troops were halted behind the sandhills to wait for it. During this halt the French were driven out of Anglet and of the great pine wood which stretches along the left of the river, and confined within their entrenched camp. This action left free space for the operation of throwing over the bridge, to protect which the 18-prs. and rocket batteries were put in position on the sandhills opposite Boucaut and, on opening fire, obliged the French gunboats to retire from the anchorage to a position higher up the river.

As slack water approached and there was no sign of the pontoons, at 11 a.m. on the 23rd, Hope decided to commence the passage.

Fifty men were soon rowed over in the jolly boats, and a hawser was stretched across the river and made fast on the two banks. In the course of the day about 800 men had been passed over. These men were attacked by a superior force from Bayonne, but were so well placed and so well supported by the guns and rockets on the left bank of the river that their assailants retired again to Bayonne. The pontoons having arrived from Bidart, pontoon rafts were substituted for the jolly boats, and by the evening of the 24th the whole of the 1st Division was on the right bank.

When the flotilla put to sea from Socoa on the evening of the 22nd the wind was fresh but contrary, on the 23rd it was light and variable, and on the afternoon of the 24th it set direct on land, driving a heavy sea before it. Led by the brig, *Lyra*, the flotilla ran for the mouth of the river. The brig was engulfed in the surge and all on board her, including the chief pilot, were drowned. The gunboat, *Woodlark*, Lieut. Cheyne, then struck the right course. The high surf on the bar and the uncertainty of hitting off a shifting channel dismayed the native crews of the *chasses-marées*, but on board of each was either an officer of R.E. or one or two sappers, who compelled them to follow the men-of-war's boats. Thirty-four entered the river without accident. Of the other 14, one grounded on the bar, one was driven ashore and 12 returned to St. Jean de Luz. The *chasses-marées* on reaching the spot for the bridge were anchored head and stern by the Navy, and the Sappers working through the night completed the bridge by noon on the 25th February. Then the rest of the infantry with the cavalry, artillery, and baggage, etc., passed over.

Admiral Penrose in his despatch of this date says: "That so many *chasses-marées* ventured the experiment I attribute to there having been one or more sappers placed in each of them, and a captain and eight lieutenants of Engineers commanding them in divisions. The zeal and science of these officers triumphed over the difficulties of the navigation, and I trust that none of their valuable lives have fallen a sacrifice to their spirited exertions." The bridge from this time to the end of the war formed uninterruptedly the principal communication of the army before Bayonne with France. All historians agree with Napier in considering the passage of the Adour "a stupendous undertaking which must always rank amongst the prodigies of war."

I cannot conclude this account of the celebrated passage of the Adour without a reference to the gallant Capt. Pitts, whom I have several times quoted, and who was always a great friend of Reid. While Reid was busy at Socoa his friend was with the army on the Gaves. On the very day, the 23rd February, when the first British force crossed the Adour in boats and on pontoons, Pitts was killed

before Hastings, on the Gave d'Oleron, while accompanying his General in a reconnaissance of that place.\*

On the completion of the bridge of boats over the Adour River, Lieut. Reid was ordered to rejoin the Light Division. He had missed the Battle of Orthez, which Wellington won on the 27th February, defeating Marshal Soult, who retreated on Toulouse followed by the allied army. There is no document to show precisely at what date Reid joined Wellington's Army again, but as he was present at the Battle of Toulouse, and was not required at Bayonne after the end of February, it is most probable that it was about the middle of March. For when Wellington despatched Marshal Beresford with 12,000 men to Bordeaux on the 8th March, he had ordered the Spanish Reserve at Irun under General Freyre and every other disposable body to join his army without delay to replace the force sent to Bordeaux. On the 16th and 17th of March Wellington halted to allow the Spanish Reserve, Ponsonby's dragoons, and other details to come up, and we may assume that Reid joined the Light Division at that date. Considering that a smaller force than Beresford had taken to Bordeaux would suffice to overawe the city, Wellington recalled Beresford with the 4th Division and Vivian's cavalry, leaving Lord Dalhousie with the 7th Division and three squadrons of cavalry to keep an eye on Bordeaux.

When Wellington moved on Vic Bigorre Reid was engaged in the turning movement of the Light Division on the 19th March and at the combat of Tarbes on the 20th, when Alten attacked Clausel's centre on the heights of Orliex. The struggle there was wonderfully fierce and violent, the men fighting muzzle to muzzle, but at last the French gave way. Hill's Division drove them out of Tarbes on the right while Clinton's artillery thundered at them on the left until dark. During the night Soult retreated rapidly towards Toulouse, which he reached on the 24th, having destroyed all the bridges behind him.

The wet weather and swollen streams made it necessary to repair the broken bridges and make temporary ones, as the fords were not available. Reid and the other Engineer officers worked hard, but the army was delayed and did not reach the Garonne until the 27th. It halted on that day in front of Toulouse and found the French Army entrenched around the city to the best advantage.

Toulouse is a fortified town whose position on the right bank of the Garonne is naturally a very strong one. It stands to the east of

\* There is a memorial tablet over the entrance to the nave of the English church at Biarritz, on which are inscribed the names of three officers of the Corps of Royal Engineers, who were killed after the allied army entered France. The inscription is as follows:—"Lieut. Geo. Power, Nivelle, Nov. 10 (1813), Capt. T. J. H. Pitts, Gave d'Oleron, Feb. 23 (1814), Capt. Edwd. Parker, Orthez, Feb. 27 (1814)."

the elbow of a sharp bend in the river which here flows from south to north. Opposite the town, on the concave side of the bend to the west, is the suburb of St. Cyprian covering a fine bridge which connects it with the town. In front of this suburb was an ancient brick wall, 3' thick, flanked by two massive towers. Outside this wall Soult had thrown up flanked entrenchments running across the loop from the river above the town to the river below. It was on this side of Toulouse that the allied army arrived.

The east and north sides of Toulouse were covered by the canal of Lanquedoc as it passes to join the Garonne below the town. The suburbs of St. Etienne and Guillermerie furnished outworks on the east, as they were entrenched and connected with the fortified hills of Sacarin and Cambon, which covered them and flanked the approaches to the canal above and below. Half a mile beyond these hills was the ridge of Mount Rave with a fortified position on the top. The ridge is parallel to the canal, and lies between it and the river Eers. On the south is the suburb of St. Michael, and beyond it a hill called the Pech David.

An attack on the suburb of St. Cyprian in front of the allied army could only have been successful by an enormous sacrifice of men. Wellington at first crossed the Garonne above the town, as the south side was by far the weakest, but finding the country unsuitable for the movement of artillery, he withdrew to the left bank again. On the 3rd April he threw a bridge across the river on the north side, some 15 miles below the town. Marshal Beresford with three infantry divisions and three brigades of cavalry crossed, but the rise of the river damaged the bridge and communication ceased till the 8th. Beresford was isolated, but Soult lost his opportunity making no attempt to attack him; all this time he was busy strengthening his field of battle about Toulouse. Although he heard on the 7th that the allies had entered Paris, the news only strengthened his determination to fight on such favourable ground as he then occupied.

The waters of the river having subsided the bridge was again constructed on the 8th April, when Freyre's Spaniards and the Portuguese artillery crossed over; but the situation was found inconvenient and the bridge was moved on the 9th to a place 5 miles higher up the stream and nearer the town. Here the Light Division crossed on the 10th and took up a position on the north side of Toulouse, across the road to Montauban.

Soult's position covered three sides of Toulouse. His left defended St. Cyprian on the west; his centre the canal on the north; while his right held Mount Rave on the east. For the attack Sir Rowland Hill was in front of St. Cyprian, the 3rd and Light Divisions, under Picton and Alten respectively, on the north of the town, and Beresford on the east of Mount Rave. The plan of battle was that Hill should confine the enemy within his entrenchments on the west; Picton and Alten

keep him in check on the north, threaten the *têtes de pont* in front of the canal bridges, and also attempt that part of the town near the river; while Beresford on the left was to cross the bridge over the river Ers at Croix d'Orade, which had been carried by the 18th Hussars, and drive the enemy from the village of Monblanc, then move by the left bank of the Ers till he gained the enemy's right, and attack his right flank; simultaneously Freyre's Spaniards were to attack the French left flank and effect a junction with Beresford.

The position of Mount Rave was a very formidable one. Every point of vantage was crowned with redoubts; all the bridges across the canal and the Ers stream were mined and covered by *têtes de pont*; and the banks of the Ers were inundated from the Croix d'Orade to the Porte les Bordes.

Beresford carried the village of Monblanc and proceeded along the Ers, flanked by skirmishers, until he gained the point of attack, when he advanced in line against the enemy's right. At the same time Freyre moved forward and drove a brigade of the enemy before him. On nearing the entrenchment, however, the Spaniards were received with so heavy a fire of grape that they were driven back with great slaughter. To cover the retreat of the Spaniards the Light Division was ordered to move to its left and Freyre rallied his men, and drove back the enemy. In the meantime Beresford was more successful. The principal redoubt was captured, and two divisions established themselves on the top of the hill. Beresford had then to wait until his artillery came up.

The Light Division had made a false attack on the *tête de pont* in their front with a trifling loss, while the 3rd Division had been repulsed. Across the Garonne Sir R. Hill drove the enemy within their works in front of St. Cyprian and alarmed them by threatening a powerful attack in that quarter.

Beresford's artillery having arrived, he continued his movement along the ridge. The division of the French General Taupin was completely routed and Taupin himself killed. Pack's Brigade carried two redoubts and the fortified houses in the centre of the ridge. A great effort was unsuccessfully made by the French to regain these works and their loss was great. Then Soult fell back to a new position in front of the canal on the east side of the town, but was forced to retire across it.

Hill, on the west, had compelled the enemy to abandon the whole of the advanced line of entrenchments, and to retire within the walls of St. Cyprian. Then Soult withdrew his army into the town and prepared to defend it. Wellington invested the place, and Soult, knowing it to be untenable, left it with his army on the night of the 11th, and hastened by forced marches along the road to the south as far as Carcassonne, pursued by Hill's troops.

Toulouse surrendered and Wellington entered it at noon on the 12th. The same afternoon news was brought from Paris by a French and an English officer of the abdication of Napoleon. When the French officer reached Soult the following day the Duke of Dalmatia demurred to his authority, and proposed a suspension of hostilities until he had received authentic instructions from the Emperor. Wellington refused to accede to the proposal and marched against him. On the 17th the outposts were on the point of engaging when Soult notified his adhesion to the new state of affairs in France. A convention was agreed upon and the war was at an end. It is sad to think how many lives were unnecessarily lost on both sides at Toulouse and elsewhere, on account of the delays in transmitting the news that peace had been declared.

Reid returned to England in June, 1814. He had left it a subaltern early in 1810, he returned still a lieutenant in 1814. These four years had been years of constant fighting, in which he had as constantly distinguished himself, and the officers under whom he had served had one and all recommended him for promotion. His case was so striking that nearly half a century later when discussions arose in the House of Commons upon the system of purchase in the Army, the late Lieut.-General Sir Frederic Smith, Colonel Commandant of Royal Engineers and Member for Chatham, referring to it, told the House how Sir William Reid, who had then quite recently died, was, as a young lieutenant of the Royal Engineers, the senior of his corps with the Light Division in the Peninsular War, while under him was a young lieutenant of the Line, acting as Assistant Engineer. Reid was so satisfied with his subordinate's conduct that he strongly recommended him for promotion to the rank of Captain. His recommendation was approved and his assistant was promoted. Before the war was over the Assistant Engineer had become a Lieut.-Colonel, while Reid, who had been engaged in 30 affairs with the enemy, including seven sieges and five general actions, who had been three times wounded, and had three times had his horse shot under him, returned to England, as he had left it, a simple subaltern.

After many years had passed he received in recognition of his Peninsular services a silver medal with eight clasps.

Reid had not been a month at home when he was placed under orders to go on an expedition. This was in July, 1814, but for some reason or other his services were not actually required until several months later. He had well earned a rest and no doubt he spent some part of his leave in visiting his parents in Scotland, and perhaps also his uncle in Dublin.

During the preceding two years this country had been at war under many difficulties with the United States of America, but the termination of the European War rendered the whole military power of England available to prosecute the war with that country. A

large force of Peninsular veterans under Major-General Ross, and a naval force under Rear-Admiral Cockburn had sailed from Bordeaux in June, 1814, for the Chesapeake. The Battle of Bladensburg was fought and won on the 24th August, and the capture and destruction of Washington followed. Then in September came the unsuccessful attempt on Baltimore, when General Ross was killed. The troops were withdrawn on board ship and proceeded down the river to join the rest of the fleet. In October they sailed for Negril Bay in Jamaica under sealed orders. On the 24th November reinforcements arrived with Vice-Admiral Sir A. Cochrane and Major-General Keane who took command of the troops, and two days later the expedition sailed for New Orleans. On the 10th December the fleet anchored off the Chandeleur Islands near the entrance of Lake Borgne. After the enemy's gunboats had been all captured or destroyed the troops were landed by boats upon a small desert island, called Pine Island, some 30 miles up the lake. The disembarkation was completed on the 21st December. On the 22nd General Keane sent an advance force of 1,600 men under Colonel Thornton to land at Isle aux Rois, a marshy spot at the mouth of the Pearl River. A sharp skirmish took place on the 23rd, in which the Americans were defeated. The whole of Keane's force arrived by the 24th.

In the meantime, when the death of General Ross became known in England Sir Edward Pakenham was appointed to succeed him, with Major-General Gibbs as his second in command. Reinforcements, as we have seen, under Major-General Keane had been sent to Jamaica for the expedition; and a further reinforcement was despatched from Plymouth, consisting of 2,000 men under Major-General Lambert, in November, 1814. A week later Sir Edward Pakenham sailed from England in the *Statira* frigate, with Colonel Burgoyne as his Commanding Royal Engineer, and made a very rapid passage to Jamaica; I have been unable to ascertain whether Reid sailed with Lambert, or with Pakenham. I am inclined to think with the latter, because his record of service shows him "at sea and in America from December, 1814, to May, 1815."

(To be continued).



**THE LATE MAJOR C O C BOWEN DSO RE**



*MEMOIR.*

*MAJOR CHARLES OTWAY COLE BOWEN, D.S.O., R.E.*

*By E.N.M.*

THE cablegram announcing the death of Major Bowen on the 18th of March at King's Hill, Orange River Colony, will have given profound grief to his many friends in the Corps.

He came of an Irish family, which had long owned and lived at Bowen's Court, Mallow, County Cork. Here he was brought up in the midst of his beloved Duhallo country and, long before he grew up, was an all-round sportsman; in such surroundings too the seeds of his future illness were probably laid.

In September, 1885, Bowen joined the R.M.A., Woolwich. During his second term there he contracted inflammation of the lungs, had to drop into the term below and passed out in February, 1888. After two years at the S.M.E. he joined the 12th (Field) Company at the Curragh in April, 1890, and soon afterwards went with his company to Aldershot, where he remained till 1893. In that year he was first sent abroad as a subaltern of the 36th (Fortress) Company in Bermuda.

During his time at that station a bit of bad luck befell him. By some chance he did not get the usual tour of duty at Halifax and, as he never in his life complained of his lot or sought officially to improve it, he served four years in Bermuda, the climate of which is not favourable to real lung trouble, such as by this time Bowen well knew he had. The result was that, though he served out his time, he had to be invalided home in 1897, when he was again sent to Aldershot.

He joined the 1st Field Troop (then the Mounted Detachment) as subaltern, and, at the beginning of 1899, took command of it. These were apparently years of progress in health, but he was never quite so well after his two months' leave at his Irish home. He had also become quite deaf in one ear, though he scarcely ever let his friends know how much real trouble he had.

In October, 1899, the South African War broke out. As the war strength of his troop included a major, he met with what must be a trial to the best of soldiers, the loss of the command of his unit just as it was ordered on service, and after he had been the helmsman through the very critical early life of the mounted Engineers. No man living could have risen to the occasion and done his duty more

manfully. He loyally accepted the new conditions and during the campaign, until he regained his old command, he set officers and men a great example of gallant service and willing co-operation.

In the South African War Bowen served with French in front of Colesberg, and subsequently under the same general saw Kimberley relieved, Cronje taken at Paardeberg and the surrender of Bloemfontein. With the Cavalry Division he marched on Pretoria and was present at the Battle of Diamond Hill.

At the beginning of 1901 he resumed the command of what was now the first of four Field Troops. After the usual wanderings over the Transvaal, a *dépôt* for mounted Sappers was formed at Middleburg, Transvaal, where Bowen remained while his subalterns with their sections accompanied the various columns.

At the conclusion of peace Bowen brought his troop home to England. His own well-deserved rewards included two mentions in despatches, the Queen's S.A. Medal with clasps for Paardeberg, Driefontein, Johannesburg, Belfast, Diamond Hill and the Relief of Kimberley; the King's S.A. Medal with two clasps and the D.S.O.

His long spell of active service in the field in all weathers had worn him greatly, and it was sadly necessary for him to try to recoup his strength. He spent some time at a sanatorium for consumptive cases, and, when allowed to return to duty, he had to recognize that service anywhere but in the dry climate of South Africa was no longer possible for him. So in May, 1903, he was appointed Division Officer at Bloemfontein as well as O.C. 38th (Field) Company, R.E.

The last seven years of his life Bowen spent at Bloemfontein. All these years he felt himself losing strength and as, one by one, his sports and games were taken from him, he could not but realize how near the end was drawing. Yet he never lost heart. His letters to those who knew and loved him always breathed the spirit of confidence and cheerfulness, and, to the end, his Irish humour stood by him. Twice during these last years he came home on leave and we saw the old flame burning as brightly as ever. In him, at least, the spirit was the master of his body and the ruler of his destiny.

One of his best and oldest friends writes of Bowen:—"I hold him in my mind as the best friend I ever had. . . . He was one of those you could always take up where you last left him and always find him the same. Always a leading spirit in every summer game and devoted to hunting; so keen indeed at games that he played through a tennis tournament with whooping cough, the game having to be adjourned occasionally for him to get over his coughing fits. In Bermuda, where we served together, he was the life and soul of the Happy Valley, and equally as a sailor, a cricketer and as an actor he was always working his hardest. . . . Again at Bloemfontein after the war I found him doing most of the work in connection with

the cantonments at Tempe. He had the most indomitable pluck and, however ill he may have felt, he was always working like blazes. . . . A true Christian, in the highest sense of the word and, I think without exception, the finest character I have ever met. How many of us could live for years under the curse of a disease which he knew must prove fatal sooner or later and still retain the strongest sense of duty, always sacrificing rather than sparing his strength, making light of all his difficulties, and always cheerful and sympathetic. . . . He was a firm friend, a thorough sportsman, a first-rate officer and an example to be followed."

Some aspects of a man's character are best and perhaps solely known to those who have served under him. To one such, and indeed to all his subalterns, he has ever been a true influence and teacher. By his example he always led us the right way and he possessed in full the rare and difficult art of compelling enthusiasm for the work of the unit, and for the soldiers who composed it. Nor did anyone know better than he how greatly its games contributed to the efficiency and comradeship of a unit, and he would give up every private pleasure to attend and, while he was able, to join in his company cricket match. All those who have served under him owe him much which they can now never repay.

A good deal of Bowen's service was spent in close contact with officers of other corps and regiments; with these he was always great friends and he was fond of impressing upon us how necessary it was to make efforts to be friendly with every branch of the Army. He will not be forgotten by those of the Berkshire Regiment with whom he lived in Bermuda, nor by the numerous officers of cavalry whom he used to teach at the Field Troop Instructional Camps near Christchurch.

Perhaps it will not be out of place to quote a few sentences from letters written whilst in South Africa, as they give a good idea of the character which this Memoir has attempted to portray :—

PRETORIA, *June 16th, 1900.*

. . . We do not know if the end has come yet and I am busy as a matter of fact in refitting the wreck of the troop for another four months' campaigning. . . . I thought the Vaal River would be the end of me—I spent hours wading about it—I was seedy for a few days then, but actually had not time to go sick. The result is that I recovered and am now in the best of health and spirits. I am rather too cold, although it is 12 noon, and the nights are too awful sometimes. . . .

WONDERFONTEIN STATION, *August 22nd, 1900.*

. . . As for myself, as you express it, I am (thank God), a hardened old ruffian and smoke my pipe of peace as usual in order to keep my

temper unruffled. I felt a bit seedy at one time but some unexpected and unwelcome night marches and drifts to make good gave me no time to think of my ailments. When we came to a rest camp, I found I was not so bad after all. . . . We are not yet calculating on our rewards. We are waiting to get out of reach of shot and shell before we do so. You say "I ought to get something good." Well, even if I get nothing, it is a source of great satisfaction to me that my unit, which was supposed to be doomed before I took it over, should have done itself justice and that it has been found necessary to add two or three other field troops to the Army. . . .

BARBERTON, *September 26th, 1900.*

I suppose all things have an end and that some time or other our "trekking" will be a thing of the past. Well I have brought my field troop through to this. We are again suffering from the heat. Owing to the indomitable perseverance of the Post Office people, parcels are coming through. What do you think they contain? Jerseys and warm clothing! I am horrified. . . . I think I shall bury them. . . .

The troop is going strong. I was ordered to form four field sections out of it. I scratched my grey head a bit but I did so. Then they bagged two of the sections and proclaimed them as "The 4th Field Troop." As both these sections were on detachment from me at the time, you may imagine the glorious confusion it has brought my pay lists and store ledgers into. . . . Very grey, rather thin, and somewhat more lugubrious-looking than of old. . . . I am interrupted by the arrival of a train. I am general manager of a railway. . . .

VENTERSDORP, *December 24th, 1900.*

. . . As you see from my address, I have changed my locality. I have been on the trek for 18 consecutive days—as hard a three weeks as I have had in the campaign. I have now got my whole troop together with a force of four cavalry regiments, two batteries, R.H.A., a battalion of Scots Guards and some field guns. We have been hunting the Brother, but have again failed to catch him. I am not only C.R.E. to this big army but also Intelligence Officer; this means a lot of work and much riding. I provide guides for every cavalry patrol and question all prisoners brought in. I am hard at it night and day and really am beginning to feel the need of a rest and some relaxation. I have put in a hard 14 months. . . .

We are now in the open veldt, 25 miles from the railways. We get no mails and no news. We have overtreked and have *many* sore backs. Horse sickness is appearing and the cavalry are dropping horses daily. Life is only relieved from utter monotony by such misfortunes. . . . The weather is very hot and our marches and work so boring that I am really surprised at my remaining in the most vulgar good health. I think constant little worries keep me from feeling any complaints. . . .

PIET RETIEF, *February 19th, 1901.*

. . . Our convoy is 24 hours overdue and has not been heard of yet. If it does not come in to-morrow, we shall have to feed on meat and mealies—as Brother Boer has done the same for some months I suppose we can subsist for some days on this fare. Of course our mess stores are at a low ebb and we do not live luxuriously even when on full rations. I am very contented and happy at present notwithstanding four consecutive wet days and with no (officially but not practically) tents to get shelter in. I have plenty of work to do as Intelligence Officer and at fortification of posts, drifts and water supply. . . .

STEYNSDORP, *May 27th, 1901.*

. . . This is a collection of about a dozen ruins and a dozen corrugated iron shanties. It is not even favoured with a church, but it has beautiful water about it, and water is, in my opinion, the only thing that differentiates a good place from a bad place in South Africa. We struck a beautiful garden of orange trees on our arrival this morning. There are no oranges now. . . . I wonder when I shall get home. There seems to be no end of it for me. My troop is a most useful one, under present conditions, and is bound to be kept at it as long as there is an enemy to be hunted down. I want to see it out and to bring home my men, but I feel just a little sick of it. . . .

NEAR CAROLINA, *June 30th, 1901.*

. . . We still “trek, trek, trek.” Boers in small parties are always in sight but, out of range and there seems to be no ending to their infernal obstinacy. We have now been on the march continuously for two months. Our horses are worn out and our mess stores very scarce. We long for a short rest on the railway to enable us to refit and recoup a bit. . . .

My time in the field troop is nearly up. I have certainly had the honour of bringing it from a very humble position, threatened with abolition, to an important place in our Corps. Of course luck favoured us well and it only wanted good fortune to bring the troop into notice. I am glad I had the command of it through this critical time of its career, although I take no credit for its success.

MIDDLEBURG, TRANSVAAL, *February 2nd, 1902.*

. . . I have (thank God) stuck to it so far and I will bring the old field troop home if I am allowed to do so. . . . I have just lost my old pony from horse sickness. If I mistake not he had six clasps and Sapper Parsons won his D.C.M. on his back, so I am sorry for him.

MIDDLEBURG, TRANSVAAL, *April 12th*, 1902.

. . . I now lead a sedentary life. . . . I still have the success of the troop at heart and do my utmost to work it up, but I have not sufficient scope for my energies under present conditions.

Now we hear rumours of probable peace. I wish we could believe them. We have heard them ever since our arrival in Pretoria in June, 1900. Driver Rose used then to inform me that "Old Kroojer had giv' in," when I inquired the cause of cheers in the camp. The latter was generally due to an issue of rum being made to some corps. Since that, rumours of peace are always flying about but they have never led to any substantial improvement in affairs.

MIDDLEBURG, TRANSVAAL, *May 22nd*, 1902.

. . . We are still in the throes of excitement as to whether it is to be peace or war. It quite reminds me of the old days in September and October, 1899. Now however our wishes are entirely for peace. Then some of us had a lurking desire for war. We have had about enough of the latter. . . . Are we to stay out here another eight months or shall we see the Duhallows next season? . . . It is hard even for you to appreciate the hardness of over two years on the veldt, living on plain fare, up at daylight, always worried with heat and rain, monotony only broken by bullets and mails at long intervals. Add to this the care of horses, the keeping of returns, the making up of equipment and the life of a trekker is complete. It is a grand life for six months or perhaps 12. I never thought that when we landed here at the end of 1899 I should be putting 1902 at the top of my letters before leaving the place. . . .

(AFTER THE WAR). BLOEMFONTEIN, *October 18th*, 1903.

. . . The doctors mark me "Unfit for Active Service," so that I feel that my field troop days are over and that I must be content, for a few years, at any rate, to enjoy a quiet life. I would retire if I could afford to quarrel with my bread and butter, and settle down by a trout stream in the Duhallow country. . . .

BLOEMFONTEIN, *September 28th*, 1906.

. . . I have lost most of my ambition, although I still do my job to the best of my poor ability. . . . I am very fit. Wonderfully so, considering the conditions. I "make a noise," and do not pass the vet., but I hope that I am still a fair hack in H.M.'s Service. . . . We have a good company here and excellent cricket and football. They are too much for me now, but I make a good armchair critic of the performance of my subalterns. . . .

Few officers have more bravely lost their life in the service of their country than did the author of these letters. Such careers as Bowen's, equally with those of men better known to fame, are to be treasured as landmarks of the past and examples for the future.

## TRANSCRIPT.

### GENERAL REPORT ON THE ENGINEER TROOPS OF THE ITALIAN ARMY.

By CAPT. DON RAFAEL MARÍN DEL CAMPO.

(Translated from the *Memorial de Ingenieros*, January, 1910).

THE author was attached to various engineer units of the Italian Army from July, 1908, to the end of June, 1909, and the following report is the result of his observations.

#### I. MISSION AND EQUIPMENT OF THE ENGINEER TROOPS.

*Sappers.*—Each company possesses the following articles of field equipment:—

1. One sapper field park, composed of five 4-wheeled wagons with entrenching, mining and office equipment.

This park is to be abolished and is to be replaced by one consisting of six Alpine carts, small carts which offer many advantages, the principal of which are the following:—Suitability for all kinds of ground; in case of need the load of each cart can be transferred perfectly and entirely to the backs of two pack animals; and lastly in case of requiring to retreat in difficult ground the shafts can be unshipped and fitted again to the back of the cart so that it is unnecessary to turn.

2. A bridging section of 7 wagons, viz.: 4 pontoon wagons, 2 trestle wagons and 1 field forge, sufficient to form 44 yards of bridge with four fixed and two (four halves) floating points of support. Its duties are identical with those of a Spanish sapper company; but, in addition, advanced guard bridges are made with the material just described.

A part of the portable technical equipment is carried by the men. It is divided into 17 groups, to each of which there corresponds one or more tools or instruments (levels, telemeters, tape measures, wire, shovels, picks, mauls, etc.), which can be carried by a single individual, and which are provided with cases, straps and other requisites necessary to facilitate their convenient transport and to avoid damage.

In all, a company carried 98 articles of technical equipment in peace and 196 in war.

Lastly, and apart from all the above-mentioned stores, the Italian Army possesses a certain number of yards of Eiffel metallic bridge for highways and ordinary roads, which the sappers erect with extraordinary rapidity, and which will probably soon be replaced by another pattern due to Engineer Lieutenant Sr. Genesio.

*Miners.*—The Italian miners form the true Alpine engineer troops.

Formerly the engineer commands were charged with the duty of preparing or inspecting, in time of peace, projects and works for destroying lines of communication on the frontiers, which the sappers had to carry out in time of war. Taking into consideration, however, that there were many independent engineer commands, and that therefore they were unable to comply with this duty in a uniform manner, and besides that, as they were engaged with the construction of many important fortification and barrack works, they gave only a secondary place to these demolition projects, and further that as the regiments of sappers had numerous tasks to perform and more especially to deal with all bridging matters it was practically impossible for them to receive the training required by mountain engineers, for all these reasons, it was decided to form the Regiment of Miners, and this was done in the year 1895.

The writer expresses great pleasure at the forethought and care with which this regiment carried out the very difficult duty of interrupting lines of communication.

The Italian frontier is divided into two main parts, the Eastern or Austrian, and the Western or French. As far as the miners are concerned, each of these parts is divided into 12 zones, assigned respectively to the 12 technical companies of the regiment. Each company is in charge of two zones, one on each frontier, and in them year by year it studies the works which must be made in peace time, maintains and visits the numerous magazines of demolition stores, about 100 in number, which are established there, lays down the defensive conditions required for the communications, and proposes such new interruptions as are deemed necessary, variations in the existing ones, etc., etc.

All this work is examined, co-ordinated and centralized in the regimental office, which is perhaps the busiest and most responsible of all in the Corps of Engineers.

When war is declared or expected, the companies of miners at once start off without waiting to complete their strength from the reserves, and, with the stores which are contained in the small magazines above referred to and with those in their wheeled parks, they charge the mines and get everything ready for firing them as soon as orders are given to that effect.

The wheeled park of each company consists of six Alpine carts, similar to those of the sappers but with an equipment not altogether identical.

The officers are always studying, experimenting, modifying and inventing various kinds of explosives, exploders, fuzes, detonators and other stores connected with their duties.



*Pontooners and "Lagunari."*—Apart from the two companies of "lagunari," which the writer did not visit, and the duties of which are to provide the transport services in the fortress of Venice, the eight remaining technical companies of the regiment are pontoneers, similar in every way to those of the Spanish Army, except for the fact that the sappers have the advanced guard bridging trains.

The train of each pontoon company is capable of making 220 yards of bridge. In all, the regiment has 12 of these trains, *i.e.* 2,640 yards, which combined with the 1,760 yards held by the sappers gives a total of 4,400 yards of bridge in possession of the whole army. The existing type is the well-known Birago, which, though old, is so well used that extraordinary results are obtained from it.

The regiment has been experimenting for some years with a new pattern of bridge, of Italian origin, of which they speak very highly, and which it appears will offer two striking and characteristic qualities, namely:—first in the material itself by the introduction of a very ingenious and practical trestle, and secondly in the organization of the train, in which each wagon will transport the stores necessary for the construction of one bay.

This is not the only experiment that is being carried out by the regiment; trials are also being made with a modification of the existing bridging section of a sapper company and the production of another much lighter to accompany the cavalry.

*Railways and Motors.*—The brigade formed by these troops is really a regiment, which includes absolutely the whole of the military railway and motor services of the nation. These troops, since their formation, have never ceased training, and have constantly transformed their *matériel* and instruction in consonance with the new principles which have been evolved in regard to military transportation.

Originally the Italian railway troops devoted themselves to laying normal lines of railway, working them, and constructing platforms and bridges. Some time ago they acquired a quantity of Eiffel metallic bridging material, and in consequence have added to the above-mentioned duties those of erecting and dismantling this class of bridge.

Later on, in view of the great waste of time which takes place in the field in constructing platforms, they commenced to study the question, and after many attempts produced the type of portable metal platforms, now adopted in the service, which are exceedingly practical, convenient, light and even elegant. Fifty men can construct 100 square metres of these platforms in three hours.

At the time when portable railway lines were much talked of, the brigade acquired a certain quantity of material of the kind, but it was found of no use owing to the heavy gradients of the Italian high roads on the frontiers.

Recently some Wells lights have been obtained for illuminating

stations made from the portable platforms referred to above, and for all kinds of night work.

Finally the appearance of the motor has solved a problem, which portable railroads were unable to do, and every day adds to the importance of the motor car.

Each railway company has its park, composed of 4 store and 1 supply wagon the object of which is to transport the tools and materials required when they cannot be taken by rail. They are approximately similar in design to the 4-wheeled wagons of the sappers.

In addition to these parks, the brigade is in possession of the under-mentioned stores, which are ready to be sent wherever required: 5 Eiffel metal bridges, 550 yards of portable metal platform, 30 Wells lights No. 3, metal bridges for portable railways, 27 motor lorries of 15, 18 and 24-H.P., 24 motor cars of 16 to 24-H.P., 7 motor cycles, 2 steam wagons. The brigade works 2 standard gauge lines which belong to the State Railways, of a total length of 50 miles.

*Telegraphists and Specialists.*—This regiment is without doubt the most important of the Corps of Engineers and perhaps of the whole Army, not only on account of its strength (more than 2,300 men) but also on account of the variety and importance of the duties assigned to it.

Its companies are divided into three groups:—Specialist Brigade, Fortress Brigade, Field Companies.

The Specialist Brigade consists of 2 balloon companies, 1 photographic and 1 wireless section. The writer did not visit it, so confines himself to saying that in the autumn of 1908 it acquired its first dirigible which has proved most successful.

The Fortress Brigade is composed of 3 strong companies, in all 750 men on a peace footing. It is charged with the duty of providing the telegraph services of the land and coast fortresses in war time, and is organized in a manner somewhat similar to the Regiment of Miners.

The 9 remaining companies are field companies, and are destined to accompany the field army. The park of a company consists of 6 vehicles with electrical stores, 3 for air line and 3 for cable, 4 optical signalling vehicles, 1 reserve vehicle, 1 field forge, and 2 supply vehicles, 8 bicycles and 50 horses. It contains altogether 27½ miles of line, 12 telegraph stations, 12 telephone stations, 5 optical stations, with 8 spare telephones, 1,100 yards of wire, 1,320 yards of submarine cable, besides posts, insulators and everything necessary.

This park will soon be replaced by another composed exclusively of Alpine carts similar to those of the sappers and miners.

The Morse station is very like the Spanish one. The battery used is the Marie-Davy in boxes of eight cells, which is soon to be replaced by a dry battery designed and constructed in the central engineer workshops, and which possesses many advantages. The existing telephones will also

be replaced by the new micro-telephone apparatus which has also been designed and made at the central engineer workshops. This, like the new battery, is excellent as has been proved both on manœuvres and in the shops. The reel for laying out the line is so simple and so convenient as to deserve mention. The really interesting and characteristic part of the equipment is the optical material. It is purely Italian and is due to the Engineer General Sr. Faini.

The heliograph and dioptric are enclosed in the same box, and both are worked by the same key. The dioptric apparatus is provided with both acetylene and oxy-hydrogen lights. A compass and prism serve to set the apparatus. The box is of aluminium sheet, varnished black. Its size and weight are insignificant, so that a complete station can be carried in two knapsacks of ordinary size, one containing the apparatus itself, the other the accessories.

The optical cart has 2 wheels, and is drawn by 1 horse. It gives to the station, together with the 2 telephones which it carries and the 2 cyclists who accompany it, a mobility and utility, the advantages of which are so great that it is useless further to dwell on them. In fine, optical telegraphy has reached an enviable standard in Italy.

The Alpine troops are not the only ones that possess telegraph and telephone instruments, and the present tendency is to disseminate these means of communication amongst all the troops, though the Telegraph Regiment will remain with its special functions and as the centre of instruction and experiment.

The military pigeon lofts are also on charge of this regiment.

Since the writer left Italy the Specialist Brigade has been taken away from the Regiment and formed into an independent unit.

*Train.*—Each engineer regiment has, in addition to its technical units, one or more companies of train (10 altogether for the engineers) charged with the care of all the animals, vehicles and transport. These companies disappear on mobilization, and are divided up into sections which are attached to the technical companies, the captains of which become responsible for all services.

*Engineer Workshops.*—The central workshops are at Pavia, and are in no way remarkable in appearance. Their output however is most praiseworthy.

With the exception of motor cars, balloons, photographic apparatus, wireless installations and explosives, practically all engineer stores are made there. They turn out sapping, mining, bridging and railway material, very delicate telegraph and telephone apparatus, the Faini optical instruments, Morse stations, micro-telephones, dry batteries, etc. In addition bicycles are made there for the whole army, a most important undertaking in view of the great development of this means of locomotion.

Each regiment has its own regimental shops, where stores are repaired.

In spite of the modest character of these shops, many trials and experiments are conducted in them. The Specialist Brigade also makes its own dirigibles.

*General Observations on Technical Material.*—Pack transport is only employed exceptionally.

The regulation pack saddle which is always carried in the parks of the sappers, miners and telegraphists is of a single type and serves for every kind of load. It is very simple and practical and many valuable lessons may be drawn from an examination of it.

The amount of engineer field material which Italy possesses consists of:—One park for each company of the permanent army and mobile militia; the army corps parks, each composed of 13 vehicles; the army parks of 35 vehicles.

The organization of the parks has been studied with the greatest care and in the smallest particulars. More than one detail can be cited to confirm this statement. The Alpine carts are specially worthy of notice.

The quality of the material is always good, in many cases excellent, sometimes perfect.

One of the most noticeable points is the tendency to make the supply of material quite independent of foreign aid, this is a faithful reflection of the spirit of private industry, which becomes every day more prosperous and more national.

The Genesio Bridge, the new pontoon material, the universal fuze and other inventions of General Spaccamela, the Cantono exploder, the Faini optical signalling apparatus, the battery and micro-telephone, the metal platforms, the military dirigibles, etc., etc., are examples of regulation equipment due solely and exclusively to the officers of the engineers. This is without counting the work of many officers, which is being brought to a satisfactory conclusion at the present time, and the valuable co-operation of private industry. Thus within a very short time there will be almost no article of engineer equipment which does not satisfy the two requisites of being made and invented in Italy.

## II. LIFE IN THE REGIMENTS.

I now propose to explain certain details which are apt to be overlooked amidst those that are more striking, in order that the reader may form a general idea of how the engineer troops employ their time, and what they look like.

*General Distribution of Time.*—The year is divided into certain seasons, which vary according to the special functions of each regiment, but the general lines of the distribution are always the same.

The following is the usual division of the year:—

1. November to January: separate training of the recruits and trained soldiers.

2. February to the end of winter: general training and elementary technical work.

3. Spring and summer: training reaches its maximum development, and the great engineer exercises take place.

4. August and the beginning of September: general manœuvres, at the end of which the senior draft of the regiment is discharged.

5. Middle of September to end of October: training of the recruit instructors and ordinary training.

The companies train independently of one another, and their respective captains are actually responsible for the instruction.

The majors act as inspectors of their commands, and the colonel supervises the whole of the instruction and marching of the regiment, for which purpose he makes occasional visits to the permanent detachments.

Thus the general time table for the regiment, which is drawn up by the colonel, merely indicates the hours of reveille, retreat, meals, etc., without specifying the hours of drill or training. These are fixed fortnightly by each captain according to his own judgment, a detailed programme for each day of the two weeks being drawn up by him on a half sheet of foolscap.

The general training manual for the army deals solely with matters common to the whole of the engineers and with those proper to its various branches. In addition there is a separate manual giving all kinds of data, such as the more important formulæ, and in a word all that is required in a work of this kind.

Thus, for example, there are manuals for the use of cordage, for the construction of improvised machines, for the passage of small water courses, for roads and camps, etc., etc. In the Italian Army there is a manual for every subject, however unimportant it may seem.

The colonel of the regiment draws up an annual programme of instruction, in which the work that is to be done in each period is noted. The captains are required to ensure that their companies shall have attained the necessary proficiency in each subject by the end of the period allotted to it, but they are left the greatest freedom in employing whatever means they may consider most suitable for gaining that end.

The following characteristics of the Italian Army should be noted:—

(1). The scrupulous pains with which the training manuals are edited and constantly brought up to date, those that are now in force are based on the lessons of the Anglo-Boer War, and new editions are being prepared which embody the lessons of the Russo-Japanese War.

(2). The freedom of initiative and the consequent rational devolution of responsibility.

*Recruits' Training.*—As indicated above, the month and a-half which intervenes between the passing to the reserve of the senior contingent

and the entry of the recruits, is devoted to the training of the recruit instructors.

It is unnecessary to say anything here either about this training, or about that of the recruits themselves. It is sufficient to say that it is based on the principles which have been adopted by the German Army, which in this, as in so many other matters, is copied for better or worse by all the world. The reader is therefore referred to the excellent work of Capt. Don Carlos Requena entitled *Nine Months in the German Army*, of which the first part is devoted to the training of the recruit.

At the end of this training the Italian engineer recruit possesses :—A knowledge of the rules of discipline, of interior economy, of garrison duties, of hygiene and of the penal code, of uniforms and equipment, of military and civilian rules of courtesy and conduct ; he has been instructed in gymnastics, in tactical movements in close and open order, in marches and in elementary duties in the field, and in care of arms, aiming drill and the firing exercises. The special technical training of the regiment is begun a few weeks after the recruits have joined, but very little attention is given to it during the recruit period, and only the elements are dealt with, such as, for instance in sapper units, knotting, use of tools, and a little about boating, camping, etc.

At the end of the course the colonel carefully examines the recruits, company by company, in presence of the officers, in all that they have learnt, except technical subjects. This examination serves as a means of forming a judgment on the efficiency of the captains.

*Training and Life of the Soldier.*—The Italian soldier is smart in appearance ; he always holds himself erect, and even when standing in the middle of the street, he seems as though he were awaiting the word of command "quick march."

This is due to the following causes :—(1), He spends the whole day under instruction and leads an active life in the open air, which tends to strengthen his body : (2), he is constantly engaged in gymnastics either with or without apparatus, and in the regulation gymnastic games which make him strong and well set up : and (3), the preliminary tactical movements, such as changes of front and of formation, make his step light, and accustom him unconsciously to be always ready to march to his front in a resolute and energetic manner. The correctness and elegance of his appointments must also be noted, and the simplicity and practical nature of his uniform. In a word, in these regiments everything is subordinate to training, which in itself constitutes the real life of the soldier.

It may be said that of the 24 hours of the day eight are devoted to instruction, nine to sleep, and seven to meals, rest and recreation. The distribution of time is not the same in winter as in summer.

Taking the 1st Regiment of Sappers as an example, let us see how the day is apportioned in the summer.

The men proceed to the drill ground at 5 a.m., where they remain under instruction until 1 p.m., with an hour and a-half (from 9 a.m. to 10.30 a.m.) for breakfast and rest. Afterwards the companies return to barracks, and are allowed to take a short siesta. The evening instruction is from 3 to 5 p.m., either in the barrack square or on the drill ground as in the morning. Dinner is then served, and the men are free until retreat.

In winter the first instruction, up to breakfast time, takes place in barracks, as the drill ground and the neighbouring river are generally covered with a thick mist. At about 11 a.m. the troops go down to the drill ground and remain there till dusk.

At the close of the recruits' course, the various subjects of training are taken up gradually and simultaneously, that is to say the soldier is trained equally in gymnastics, tactics, marches, technical subjects, etc.

The regiments are provided with beautiful and adequate drill grounds in the environs of the barracks, where they can be trained in all subjects except musketry and marching, but inclusive of bridging.

On Saturdays training ends a little after midday, after which the troops are engaged on fatigues, cleaning their equipment, and kit inspection.

On Saturday evenings or Sunday mornings, according to the garrison, conferences are held under the captain of the company on the moral education of the soldier, and last one hour. The captain always commences by making a sort of balance sheet of the work of the past week, points out the faults which have most displeased him, and expresses an opinion either favourable or the reverse on the progress made by the unit in general and by individuals in particular. After that he relates stories of war or of national history, or gives a discourse on moral, social or military questions, always with a highly educative object.

Within the last few years recreation rooms have been established in all the barracks in Italy. They consist of one or more rooms, larger or smaller, better or worse furnished according to circumstances, but which are always much appreciated.

They contain books of various kinds, games such as chess, draughts, dominoes, etc., writing tables, ink and paper, and are lighted and warmed. In summer they are but little used by the troops who prefer to go out in the cool of the evening, as is only natural, but in winter they are always filled during the hours of leisure.

How many benefits, these recreation rooms confer on the army! I remember that the one belonging to the Regiment of Miners impressed me most favourably with its order, perfect cleanliness and good taste, and with the relative luxury with which it was equipped, and in which one could see the hand of its former colonel, now General Spaccamela, whose devotion to the service is so well known.

The regimental band plays for a long time every Sunday morning in the barrack square. On the mornings of holidays soldiers' sports are

held with gymnastic competitions, races, jumping, bicycle races, and various games. These are quite apart from the regular gymnastic competitions which are held annually.

Besides the national festivals, the engineers celebrate the feast of Saint Barbara, their patroness as well as that of the artillery, and the 13th February, the anniversary of the taking of Gaeta.

On both of these days and on some of the others, the sports or gala dinners are opened in a manner which deserves attention. After the review and march past, an officer with a loud voice ascends the tribune which has been specially prepared for the purpose and gives a lecture on the feat of arms that is being commemorated, or if the holiday is not such an anniversary he describes some other warlike episode. Thus by the end of his three years' service the soldier has listened to the narration in solemn fashion of a number of events calculated to awake in him a love of his country and of the army.

*Officers and Non-Commissioned Officers.*—It will not be necessary to say much now about the officers, as the third and last part of this paper will be entirely devoted to them.

Special and separate schools of instruction for officers and N.C.O.'s are held in barracks and garrisons during the autumn and winter.

The following is a programme of the instruction given to the officers of the Telegraph Regiment during this period in 1908-9, and which was attended by the writer. Similar courses are held in other regiments.

1. Conferences and lectures on technical military subjects for all officers (two hours a week).
2. War games, also for all officers (two hours a week).
3. Fencing and gymnastics for captains and subalterns (one hour a day).
4. Practice in the transmission and reception of telegrams (one hour a week).
5. Special instruction on the mobilization of the regiment given by the colonel in person on certain days.
6. Revolver practice and competitions on certain days.

The daily fencing and gymnastic exercises take place during the time of rest given to the men in the mornings, and the remainder of the instruction after the troops have finished their work in the evening.

This alone will give a sufficiently clear idea of the Italian officer who, let it be said to his honour, consecrates himself body and soul to his profession.

The N.C.O.'s receive instruction in an analogous manner, the subjects being map reading, accounts, fencing and gymnastics, study of the chief regulations, revolver practice, and competitions.

In addition there is a weekly conference at the Garrison Military Club for all officers, from the General Commanding the Army Corps to the



last-joined subaltern. It usually takes place on Saturday evening, but if on a different day, then at the conclusion of the work of the units at which all are bound to assist.

When I was in Italy, a short time after the first trials of the Italian military dirigible, the commander and several officers of the Balloon Corps travelled to all the principal cities and gave lectures to the officers of the garrisons on the results obtained. I had the pleasure of attending the one given in Florence which, in spite of its lasting two hours, was most instructive and was received with great enthusiasm.

There are Officers' and N.C.O.s' Messes in all barracks consisting of mess, billiard and other rooms.

No soldier is permitted to wear plain clothes: all officers of the same rank, no matter their seniority, *tutoyer* each other: the possession of a bicycle is very common amongst them: they are very frugal and abstemious in their habits: the bachelors usually take their meals at the regimental mess, or at the garrison clubs, these latter being very numerous, and kept up with care though no game of chance is ever played in them: it should be remarked that there is nothing frivolous or vicious about these clubs, which are in reality centres of culture, as well as very practical and well-organized restaurants.

Both the general and professional culture of the officers merits high praise. They are very skilful in map reading, as one of the subjects to which most attention is given is knowledge of ground and facility in the use of maps. In this connexion I would mention the excellent impression which I have gathered of the Italian Military Geographical Institute, which produces an extraordinary amount of useful work, and to which is due the large number of editions of the map of Italy, on various scales, which are constantly used by officers and men.

The appearance of the officers, like that of the men, is smart and soldierly: they always wear uniform, whatever their employment: they ride much on horseback and on cycles (all combatant officers, except infantry subalterns are mounted): they are devoted to all kinds of physical exercises: they rest but little; they rise early; and in fine live the splendid active life which is so well suited to the soldier.

Space prevents me from giving any more details concerning the lives of the officers whose first and foremost virtue is the assiduity with which they work at their profession, for both in the regiments, in the General Staff and in the War Office, the Italian officer spends the whole day in his professional duties, as has been indicated before. I shall not tire of repeating this lesson, for it is the principal one that I have brought back from Italy, and it alone is the secret and panacea whereby a commencement may be made in the conversion into great and strong nations of those which are otherwise.

I will say, however, before going on, that there is one appointment which is considered as an easy one, and is so when compared with others. I refer to the appointment of A.D.C. to a General. These appointments are, however, very few in number, as a General of Brigade does not have

an aide-de-camp, whilst other general officers, including the Minister of War, have only one each, always a lieutenant of cavalry, who cannot hold the appointment for more than two years consecutively.

*Manœuvres.*—The annual manœuvres are of different classes, viz. :—

- Garrison manœuvres.
- Exercises of the separate arms.
- Staff rides.
- Field manœuvres.
- Grand manœuvres.

It will suffice to give a few details of each in order to indicate their scope.

Garrison manœuvres take place in spring and summer. One day a week is devoted to them, and all arms take a part.

I have assisted at them in 1909 in Florence, where they were well conducted by General Della Noce, who commanded the division. At the time when they are begun, the recruits have between five and six months' service. They are intended chiefly for the instruction of the field and subaltern officers, whilst the field and grand manœuvres are chiefly for the instruction of field and general officers.

I remember that reveille was sounded a few hours after midnight, and that the troops returned to quarters at midday or in the afternoon. The picturesque and broken country round Florence is admirably adapted to the purpose.

Half-way through the first day of the manœuvres the halt was sounded, and the action of the artillery of one side was criticized on account of its having revealed its position by opening fire on the adversary, that is to say, attention was chiefly fixed on the scheme, on the general dispositions and on the choice of positions. During the other half, the action was allowed to develop and the work was more practical than in the first half, and the various phases of the fight could be studied better.

Field officers of different arms took turns in commanding the sides. Special ideas were issued to commanders on the previous night, a general officer acted as director, and the commander of the division, who was, as is always the case in Italy, also the military governor, supervised the whole of the exercises.

Regarding the exercises of the separate arms, I will say a few words about those of the engineers.

Their object and development are quite different from our annual courses of instruction in Spain. These latter do not exist in Italy, and, as has been already explained, it is considered that they are unnecessary, as the technical instruction of the troops continues all the year round.

Thus, for example, in the sappers, the tactical factors are given the most important place in these exercises, as works are executed and problems solved, not merely in accordance with technical requirements, but with special regard to the supposed tactical situation. The necessity

and value of such exercises is fully understood, as they fill a gap which cannot be filled in any other manner, as means are lacking in the ordinary garrisons, and time is insufficient during manœuvres.

Every year the sappers hire a different training ground containing a stream and various hills, where these exercises are carried out for about a month, and the degree of instruction imparted during the previous months is ascertained.

The miners spend 90 days in the mountains.

The bridging troops spend their time in navigating a network of rivers on which they carry out manœuvres. It is regretted that space does not permit of a description being given of the very practical and curious way in which the two months which are devoted to this training are employed.

The railway, telegraph and special troops require no particular mention, as they can all practise their various duties as well at manœuvres as at other times and they therefore do not require special exercises, or at any rate not to the same degree as the other branches of the arm.

*Staff Rides.*—I attended the staff ride of the 8th Army Corps, which took place in Tuscany, when some 70 officers were present, the majority being general or field officers. There were two sides, each commanded by a lieutenant-general: major-generals and colonels were respectively in command of divisions and brigades, and the Commander-in-Chief acted as director of the ride, which lasted a week. Horses, carriages and trains were used, as required, for getting about the country.

I will say nothing about grand manœuvres as I have not taken part in them.

The field manœuvres which I have attended were those of the 3rd Army Corps, in which its two divisions took part on opposite sides, complete in themselves and with the corresponding administrative services.

I would call special attention to the ease with which the Italian Army marches, camps and manœuvres.

Those who have lived in that army attribute this fact to various causes such as the atmosphere of mobilization which exists, as everyone down to the captain of a company is constantly preoccupied with his schemes of mobilization; the constant life of practical training which is passed in the garrisons; the importance given to map reading and to study of the ground; the portable shelter tent which is carried in this as in almost all armies; the custom of carrying out all tactical training and marches, however insignificant, in full marching order; these are reasons which are sufficient to ensure that this or any other army shall not tire itself when on the march, camp under bad conditions, or manœuvre sluggishly.

At manœuvres all officers always carry a wallet hanging from the belt. It is a very practical and useful means of carrying plans, drawing materials and various papers.

Conferences are held each day at the close of garrison manœuvres. At field and grand manœuvres they cannot be held in the same manner, owing to the impossibility of collecting daily the officers of both sides.

The conference on the manœuvres of the 3rd Corps, already mentioned, took place only at their conclusion. It lasted four and a-half hours, and I shall never forget the solemn impression it made on me. The director of the manœuvres, General Mainoni, showed clearly on this occasion that however great were the liberty and initiative which he had conceded to the generals in command of the two sides, he knew well how to express his opinions with absolute frankness, whether they were favourable or the reverse.

At the end of the manœuvres and as a consequence of them, the confidential reports of officers are revised and brought up to date.

‘M.’

## RECENT PUBLICATIONS OF MILITARY INTEREST.

APRIL, 1910.

(Published Quarterly).

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

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### PART II.

#### SECTION I.

#### AERIAL NAVIGATION.

DIRIGIBLE BALLOONS (Les ballons dirigeables). By Lieut. Archer. 40 pp. 8vo. Paris, 1908. Chapelot. 1s.

This pamphlet is worthy of study. The author shows by calculation that an ordinary spherical shell, 33 centimetres in diameter and weighing 60 kilogrammes, falls 1,500 metres through the air in 19.5 seconds and that the lateral pressure of a wind blowing at the rate of 22 miles per hour will only cause a deflection of 10 metres. He also states that it has been proved by actual experiment that a weight of 750 kilogrammes can be discharged from a balloon of the "La Patrie" type without endangering its stability.

From a height of 400 or 500 metres, 50 per cent. of the projectiles discharged have actually been placed in a square of 25 metres side.

Artillery fire at a balloon is also discussed. The author underestimates the damage which might be inflicted by shrapnel bullets, and is of opinion that ordinary field guns will be of no use against dirigibles owing to the flatness of their trajectories.

A HISTORY OF AVIATION (Histoire de l'aviation). By M. Turgan. 280 pp., with numerous diagrams and illustrations. 8vo. Paris, 1909. Geisler. 4s. 2d.

A very complete history of aviation from the times of Icarus to the present day.

It should be explained that the term "Aviation" in France is strictly limited to flying machines which are heavier than air. Unfortunately in this country the word has been adopted to describe aerial locomotion of all kinds.

The first three chapters bring the history of the subject up to A.D. 1850.

The fourth chapter deals with the period 1850 to 1900, and mentions no less than 93 different inventors. It is divided into three parts dealing respectively with Ornithopters, Helicopters and Aeroplanes.

Chapters V. to VIII. deal with the period 1900—1909. This portion of the book contains much useful information relating to successful aeroplanes, and is therefore of interest to the designer as well as to the student of history. Some particulars are also given of 25 aeroplanes and 10 miscellaneous machines, which, at the time of publication of the book, had not been tried.

An appendix gives short descriptions of the best aviation motors.

**THE ELEMENTS OF AVIATION** (*Éléments d'aviation*). By Victor Tatin. 70 pp., with illustrations. Svo. Paris, 1909. Dunod & Pinat. 3s.

A good book for anyone who contemplates designing an aeroplane. The laws of air resistance are explained, with the use of the most elementary mathematics, sufficiently clearly to enable the reader to design an aeroplane that will fly.

The author is not without his prejudices, but his views are, on the whole, orthodox.

The short chapter dealing with the early history of the subject is interesting chiefly on account of the appreciation it contains of the work of Sir George Cayley.

**ALL THE WORLD'S AIRSHIPS.** By F. T. Jane. 374 pp., with numerous illustrations. Fol. London, 1909. Sampson Low. 17s. 6d.

This is the first issue of a publication which is intended to be for the air what "Fighting Ships" is for the sea.

Part I. contains a record and description, so far as is known, of all aeroplanes and dirigibles completed and under construction, and is arranged by nationalities in alphabetical order. Where possible, illustrations are given and details with regard to construction and method of propulsion, etc. Representations in silhouette of the various dirigibles are also included, and are drawn at a uniform scale, but the characteristic features of each are slightly exaggerated in order to facilitate recognition.

Owing to the secrecy that is maintained by inventors this Part is necessarily very incomplete, but it is useful for reference, and the value of subsequent editions will increase as the science of aviation develops.

Part II. contains articles on aviation, and includes one by Mr. C. de Grave Sells on aerial engineering which describes the progress in this branch from 1852 up to the present date.

**DETERMINATION OF CONCEALED OBJECTIVES BY MEANS OF THE CAPTIVE. BALLOON** (*Détermination des objectifs dérobés aux vues au moyen du ballon captif*). By Lieut. H. Chaumont. 70 pp., with 20 figures. Svo Paris, 1909. Berger-Levrault. 1s. 8d.

This book shows the methods by which telephotography from a captive balloon can enable siege artillery to fire on concealed targets. Since a captive balloon has to be at least 5,400 yards from the enemy's battery, the photographic apparatus must be capable of obtaining images of objects from 5,400 to 7,500 yards distant, and it is absolutely necessary that the exposure should be as short as possible, at any rate not more than  $\frac{1}{25}$ th of a second.

The author then explains his own methods of fixing on a map the object disclosed by a photograph taken from a captive balloon. He discusses, with diagrams and mathematical calculations, various cases: (a) when the photographic plate is vertical at the time of exposure; (b) when it is inclined; (c) when two photographs from different places are taken; (d) when only one photograph is taken. Then he explains how telephotography can show the elevation of an object. Finally he points out that only an artillery officer can observe artillery fire, so that artillery officers must be trained in balloon work and telephotography.

**CAVALRY STUDIES** (*Kavalleristische Studien*). By Major-General M. von Czerlien. 77 pp., with sketches in the text. 8vo. Vienna, 1909. Seidel & Son. 2s.

The author of this pamphlet is well known in Austria-Hungary as a writer on cavalry subjects, contributions from his pen having appeared from 1880 onwards.

The present publication contains four separate studies :—

(1) Cavalry machine guns at the 1908 manoeuvres in Austria-Hungary. (2) Modern artillery in conjunction with cavalry. (3) A cavalry attack upon infantry at the German manoeuvres in 1908. (4) The German Cavalry Regulations, 1909.

Of the above studies the first is of little importance as it is merely based upon far fuller articles by Capt. Viktorin which have appeared in *Streitkraft's Magazine*. The second occupies more than half the pamphlet and is perhaps the article most worthy of study. The third describes an occasion in the German Manœuvres of 1908 when an opportunity was offered for a cavalry attack upon infantry on a large scale. The fourth study contains merely a few notes and comments.

## FORTIFICATION AND MILITARY ENGINEERING.

**REGULATIONS FOR SIEGE OPERATIONS** (*Instruction générale du 30 Juillet, 1909, sur la guerre de siège*). Official. 92 pp. 8vo. Paris, 1909. Lavauzelle.

These new Regulations which supersede those of the 4th February, 1899, are divided into two main parts, viz. :—Attack and Defence. Each part is further subdivided into (a) General Principles ; (b) Organization of the Army and duties of the various branches ; (c) Operations.

The opening chapter of Part I. lays down that the supreme Commander-in-Chief decides on the nature of the operations to be undertaken against a fortress. If this blocks the communications of the field army, if it contains resources the loss of which would vitally injure the enemy, or if its military or political importance is such that its fall would have a great moral effect, then it should be attacked. Otherwise it can be masked or invested. In discussing the various methods of attacking a fortress the Regulations state that a bombardment should not take place until the regular supply of ammunition is assured.

The commander of a besieging army has the status of a general commanding an independent army. His Chief of the Staff not only superintends the Staff but is responsible for the telegraphic, aeronautical and topographical services. The artillery is under the control of the artillery commandant and is grouped in the "front of attack." The artillery commandant is directly responsible for such narrow gauge railways and telegraph lines as are necessary for the working of the batteries. On the other hand, the Engineers, although under the technical control of the C.R.E., are allotted to the various sections of investment. As soon as the attack is in touch with the principal line of defence of the fortress the Engineer commandant of each section of the front of attack details a field officer who acts as an intermediary between the Engineers and the troops furnishing working parties.

The chapter on siege operations gives regulations for the investment, the driving in of the enemy's advanced troops, the selection of the "front of attack," the scheme of attack, the construction of the siege batteries and the protective infantry line, the advance by sap and mine, and finally the assault. The besieging batteries are to open fire simultaneously and when all preparations have been made for the regular supply of ammunition.

Part II. opens with a description of the duties of the governor of a fortress on the outbreak of war and approach of the enemy. The principles of defence are laid down and special attention is drawn to the necessity for offensive operations and the preparation of advanced positions, which should, however, be within the range of the heavy guns of the principal line of defence. The organization of the defending army is based on the

necessity of having :—(a) Garrisons for the outer sections or sectors ; these troops are responsible for the defence of the various advanced positions ; (b) Garrisons of the *points d'appui* of the line of forts ; (c) Garrison of the fortress proper ; (d) General reserves.

As soon as the enemy's "front of attack" has been opened, the governor nominates a commander of the zone of attack (*terrain des attaques*). The duties of each arm are much the same as those laid down in Part I. for the Attack. It is distinctly ordered that an ascent of a free balloon is only to take place by the governor's order.

The operations of the defence comprise the defence of the advanced positions, which must not be held too obstinately, the organization of the principal line of defence (consisting of forts, batteries for heavy guns, and infantry trenches), rallying positions in rear of the main line, which are to be made as soon as the enemy's "front of attack" is known, and the defence of the centre of the fortress. The artillery may be divided into two categories, viz. :—that which is completely defiladed and that which is only partially defiladed. In addition, there are the mobile and reinforcing artillery, the latter being principally obtained from that part of the line not directly attacked. Finally, instructions are given for the protection of a town or place against bombardment.

## HISTORICAL.

FIFTY YEARS OF NEW JAPAN. By Count Okuma. Two vols. 1,242 pp. 8vo. London, 1909. Smith, Elder & Co. 25s.

These volumes are intended to serve as a record of the progress made by Japan in various directions during the fifty years 1854—1904. The various sections of the history have been prepared by well-known men, specially qualified to write on their particular subjects, as they have in many cases taken an active part in the development of the country. For instance, the history of the army is the work of Field Marshal Prince Yamagata, while that of the navy has been written by Admiral Count Yamamoto. There are fifty-six chapters in all, dealing with every branch of the national development, whether military, commercial, educational or religious. In every case a brief *résumé* of events since the earliest times is given, and in some chapters this *résumé* is not the least interesting part. There is an excellent large scale map of Japan.

Although the point of view throughout is exclusively Japanese, the volumes contain a quantity of useful information and form a valuable work of reference.

THE WAR OF 1870—1871. THE INVESTMENT OF PARIS. II. CHÂTILLON (La Guerre de 1870—71. L'investissement de Paris. II. Châtillon). By the Historical Section of the General Staff of the French Army. Text 534 pp. 8vo. Appendix of documents, 406 pp. 12 maps, in separate cover. Paris, 1909. Chapelot. 16s.

This is Volume II. of the Section of the French official account of the war of 1870—1871 dealing with the Siege of Paris. Volume I., "The Organization of the Fortress," appeared in 1908 and was reviewed on page 63 of No. 9, R.E.M.I. ; April, 1909.

This instalment contains two sections : the "Guarding and Destruction of the Communications" and the "March of the German Armies from Sedan on Paris" ; it concludes with the action of Châtillon on the 19th September, 1870.

AUTOBIOGRAPHY OF SIR HARRY SMITH—1787—1819. Edited by G. C. Moore Smith, M.A. 333 pp. 8vo. Portraits and maps. London, 1910. Murray. 2s. 6d.

This is a cheap edition of a portion of one of the most fascinating of military autobiographies. It contains the period of Sir Harry's life of most interest to soldiers :—The



Peninsular War, the Washington Expedition, the New Orleans Expedition, and Waterloo and closes in 1819 when he was a lieutenant-colonel, and the occupation of France after Waterloo came to an end. For those who would follow his career through the Kafir War of 1815, the War in Gwalior of 1843, the first Sikh War of 1845-6, and his governorship of Cape Colony 1848-52, during which he defeated the Boers in Boomplaat, the larger work is still available.

OFFICIAL HISTORY OF THE RUSSO-JAPANESE WAR. Part IV. Liao-Yang. Prepared by the Historical Section of the Committee of Imperial Defence. 120 pp. 8 maps. 8vo. London, 1909. H.M.S.O. 4s.

The fourth part of this work deals with the Battle of Liao-yang, and the events preceding and following it from 23rd August to the 10th September, 1904. On page 7 the immediate defences of the city of Liao-yang are described as "permanent works" and "forts."

This is an error; the works were, in reality, "provisional defences" and consisted exclusively of strong fieldworks.

IMPRESSIONS OF SOME OF THE MANCHURIAN BATTLEFIELDS. Lecture by Lieut.-Colonel W. D. Bird, D.S.O. 15 pp. 8vo. 8 maps. London, 1910. Rees. 6d.

Lieut.-Colonel Bird was one of a party of officers from the Indian Staff College sent on a tour round the Manchurian battlefields in 1907. The lecture gives his impressions and contains some topographical descriptions of the country, which will be found of considerable use by officers studying the campaign.

RUSSO-JAPANESE WAR MONOGRAPHS. Vols. XVI.—XVII. (Einzelschriften über den Russisch-Japanischen Krieg. 16 u. 17 Heft). 110 pp. Table of contents, 6 maps. Two Orders of battle. Five sets of photographs and panorama sketches. 8vo. Vienna, 1909. Seidel. 5s.

This is one of a series of monographs issued as supplements to *Streffleur's Militärische Zeitschrift*. The volume under review describes the actions of Yu-shu Ling and Yang-tzu Ling. The narrative is based chiefly upon the reports of various foreign attachés to whom the authors (Colonel v. Habermann and Capt. Nowak), acknowledge their obligation. The writings of Capt. Swejtschin (*sic*) who fought on the Russian side at Yang-tzu Ling are freely quoted, and reference is also made to von Tettau's book and Kuropatkin's "Report" to the Tsar.

The actual account of the fighting is preceded by character-studies of Generals Keller and Sluchewski, who commanded the two chief groups into which the Russian forces were divided. The orders issued to the troops on the Russian side and their movements before the actions are summarized and discussed. The last twenty-two pages are devoted to criticisms. The appendices include: a general map showing the situation on the 30th July, 1904; three maps showing phases of the fighting at Yu-shu Ling and Pien Ling; two illustrating the fighting at Yang-tzu Ling; orders of battle of Russian and Japanese forces engaged; table of Russian losses; table showing the expenditure of ammunition by the Japanese; sketches and photographs of the country and positions around Ta wan, Pien Ling and in the Hsi Ho valley.

The various episodes of the fight are described in great detail. Especially interesting are the very full account of the fighting and movements of several artillery units, and the graphic story of Keller's death and of the numerous mishaps, misunderstandings and omissions on both sides. The ill-success of the Russians is attributed to:—(1) constant changes of plan, and hesitating attitude in high quarters which affected the *moral* of the troops, (2) want of precautions, (3) lack of unity in command, (4) the holding back of many guns and the premature withdrawal of others that were engaged, (5) the non-employment of a whole (3rd East Siberian Rifle) division. The Japanese plan is

praised, but its execution is criticized; its chief faults are alleged to have been:—Employment of too many troops to guard flanks and communications, slow movements of troops, lack of co-operation by some commanders, unduly wide extensions, half-hearted attacks. The transliteration, which differs from ours, must prove a stumbling-block to British readers. In some cases the nomenclature differs, e.g. the Fu-chia Shan of our official history is termed Makurayama, General Gerschelmann is called Herschelmann, etc. The maps of the battles are a little confused owing to the great detail in which movements and positions of small units are shown. Despite this the book is full of interest and instruction.

**A SHORT HISTORY OF THE CHIEF CAMPAIGNS IN EUROPE SINCE 1792.** By General A. von Horsetzky. Translated by Lieut. K. B. Ferguson. 493 pp., with index, 6 maps and numerous sketches. Svo. London, 1909. Murray. 18s.

This translation is an abridgment of the Austrian original, but the utility of the work as a manual of military history does not appear to be affected thereby.

In the first chapter the translator has summarized the author's introduction, his remarks on tactics, organization, armament, etc., at successive stages in the development of military science, and his concluding remarks.

The remaining chapters consist of short summaries of the various campaigns in Europe, up to and including the Graeco-Turkish War of 1897, arranged in chronological order. The main facts of each campaign are given, but no remarks or comments are offered.

The original German version contains 38 large maps, which are replaced in the present abridged translation by 6 maps and numerous sketches.

**GERMAN EAST AFRICA IN REBELLION DURING 1905-06 (Deutsch-Ostafrika im Aufstand, 1905-06).** By Graf von Götzen. 274 pp., with 6 coloured illustrations and 5 maps. Berlin, 1909. Dietrich Reimer. 12s.

This book is of special interest as the author was Governor of the Protectorate in 1905.

It will be remembered that on the 7th August, 1905, a native rising commenced in the Matumbi Mountains, north of Kilva-Kivinje, between the rivers Rufiji and Mandandu. This rising spread gradually, involving the districts in the centre, south, south-west and on the coast as far north as the district of Dar-es-salaam. In numerous small engagements the Protectorate troops were everywhere successful, but reinforcements were found necessary, and marines were sent from Germany for the purpose. Early in 1906 the rising was officially announced as at an end.

The book gives an interesting account of the native tribes and their manners and customs. A detailed account of the military operations follows; the conclusion is arrived at by the author that a stronger garrison is required than existed at the period in question.

**A HISTORY OF MALTA, DURING THE PERIOD OF THE FRENCH AND BRITISH OCCUPATIONS, 1798-1815.** By William Hardman. 648 pp., with an index and two illustrations. 4to. London, 1909. Longmans, Green & Co. 21s.

This interesting and valuable history of Malta is due to the zeal of the late Mr. Hardman of Valetta. The sole object of his deep research and infinite labour "has been to learn the truth" for those interested in the events of the years 1798-1815, as far as they concern Malta's relation to the British Empire.

Mr. Hardman died before his material was prepared for the Press, and the work was, at the request of his executors, edited by Dr. Holland Rose, by whom an exhaustive introduction has been written.

The history contains exhaustive accounts of the attack and capture of Malta by the French, and of the French Government of the Island. The British blockade leading up to the capture of Valetta forms the subject of six chapters. In the 21st and 22nd chapters will be found interesting discussions and correspondence relating to Malta, which show in correct perspective the place and influence of the Island in the war waged by Great Britain between the years 1803--1815.

THE LIFE AND LETTERS OF JAMES WOLFE. By Willson. 511 pp., with illustrations and index. 8vo. London, 1909. Heinemann. 18s.

A considerable number of biographies of Wolfe have already been published, but the present volume cannot fail to take its place amongst standard works on the subject, in view of the number of his letters it contains which have not hitherto been published. Some of them might have been omitted without detracting from the clear impression of the hero which the book enables the reader to form, but nevertheless little fault can be found with it on this account owing to the admirable manner in which it has been put together.

The life of Wolfe is closely followed from his earliest infancy up to the day of his death at the early age of thirty-three. Being an indefatigable letter writer, the perusal of his numerous letters gives a good insight into his somewhat complex character, and this is further elucidated by information derived by the author from other sources.

The story of the taking of Quebec is clearly and succinctly told and forms by no means the least interesting part, from a military point of view, of an interesting book.

SOUVENIRS AND OBSERVATIONS OF THE CAMPAIGN IN 1870 (*Souvenirs et observations sur la guerre de 1870*). By General Devaureix. 740 pp., with 3 maps. 8vo. Paris, 1909. Charles Lavauzelle. 6s.

The author, at the time of the war a subaltern in the line, has been enabled, owing to the fact that he kept a diary, to give in this interesting volume a realistic and absorbing account of the early part of the campaign in which he took part. Taken prisoner at Metz, he was able to amplify during his captivity his daily notes, and in reading the souvenirs thus noted down while still fresh in the author's memory, vivid pictures are evoked of the numerous battles and engagements in which he took part.

There are also many valuable criticisms, emphasized by accounts of the faults committed, which render the volume worthy of close attention from a purely military point of view. Like all those taken prisoner at Metz, the General bitterly criticizes Marshal Bazaine.

The author also took part in the recapture of Paris by the regular troops from the Communists, and his description, also based on a diary, throws an interesting light on the various phases of the civil war, the more interesting because no account of the Commune has yet been written by an officer who took part in the second investment of Paris.

## ORGANIZATION AND ADMINISTRATION.

THE GARDE MOBILE OF 1870 (*La Garde Nationale Mobile de 1870*). By L. Thiriaux. 252 pp. Small 8vo. Brussels, 1909. L'Expansion Belge. 2s. 1d.

The author, who is aide-de-camp to the Commander of the Garde Civique of Brussels, describes his work as a contribution to the study of improvised armies. His object in writing it is that his countrymen in their choice of a defensive force may have the benefit of the sad experience which France suffered 40 years ago. The narrative is founded entirely

on official and historical records, to which reference is given in footnotes, and forms a most useful and valuable summary.

From 1815 up to 1866 public opinion in France as regards the army was crystallized in the following sentence:—"The army is only necessary for the maintenance of order and the established power, and for expeditions beyond the seas: as regards the defence of the country, the nation suffices; a Frenchman is a born soldier, and when the country is threatened, everyone will take his rifle from the wall like his ancestors in 1792."

Of course military officers, and notably Marshal Niel, the War Minister, did not share this illusion, but it was so strong that even after the success of Prussia against Austria in 1866 the Marshal did not dare attack it directly and demand universal service. In March, 1867, he proposed, as a half measure, a "garde mobile," which should consist of men who would receive the training of reservists of the regular army and then be liable for service for five years. It was expected to provide about 500,000 men.

M. Thiriaux traces the course of the Bill in Parliament. "The opposition to it was terrible," and only paper schemes emerged from the conflict. "The law refused training to the gardes mobiles, the Budget refused them clothing and arms"; power was only given to enrol the cadres on paper, and even this was only done in certain departments.

When the call to arms came in July, 1870, except for 20 battalions and 35 batteries, a total of 40,000, organized in the eastern fortresses, "the mobilization was a creation pure and simple." For the thousands called out there were no arms (except 30,000 "chasse-pots" at Strasburg), no clothing, no equipment, no transport; all had to be purchased or improvised for 400,000 men. "Training was carried on with fury; certain battalions had as much as nine hours drill a day." It is pointed out that lack of uniform resulted in many "gardes mobiles," who were captured by the Germans, being shot as marauders not entitled to the rights of combatants.

A certain amount of order had been instituted when, on the 19th September, the Government of National Defence revoked the commissions of all the officers and ordered the units to proceed, as right and proper in a republic, to the election of others, "*même sous le feu d'ennemi*." Some battalions, notably those of the West, "wiser than their great leaders," renominated their officers; but others, notably those of the Seine, elected, in order to have an easy time, "the adversaries of all discipline and confirmed drunkards." The "mobiles" were then placed on the same footing, as regards pay, promotion, etc., as the regular army, and "the suppression of permanent armies was advocated by the men in power."

"Some officers who had not been re-elected for the reason that they took the service seriously were appointed sergeants-major."

The military value of the "mobiles" is investigated by the author in sections dealing with the Siege of Paris, the war in the provinces until December, the winter campaign and the sieges. Nearly every action of importance is dealt with separately, and reveals nothing but failure.

The conclusions of the author are, "as a consequence of the improvidence of the Chamber and of the Ministry, not only was there nothing ready, but the belated effort required of the 'mobiles' was useless and cost an enormous amount. The contracts made for their clothing and armament were ruinous, but nevertheless the men underwent unheard-of sufferings during the rigorous winter of 1870."

"It may be regarded as a principle, that henceforward no useful effect in war can be expected except from forces which have been minutely prepared during peace."

Such units as distinguished themselves were found to have had sufficient retired regular officers and non-commissioned officers to commence instruction and provide experience. In many cases these trained men were too old to stand the strain of a campaign for more than a few weeks, but the good work they did remained, for "nothing can replace ex-officers, because they are professionals."

"The fact alone that they were, or imagined they were, armed with an inferior weapon, had a disastrous effect on *moral*, and affected some battalions for the whole of the campaign."

An appendix gives the original Bill of March, 1867, the counter-project of the Parliamentary Committee and the law of February, 1868.

## POLITICAL.

THE VALOUR OF IGNORANCE. By Homer Lea. 344 pp., with portrait and map. 8vo. New York, 1909. Harper. 7s. 6d.

This work deals with world forces and the very humble part the United States are destined to play amongst them, if they do not quickly awaken to a sense of their present state of military helplessness. The book is divided into two parts, the first of which is in the nature of a philosophical study of the causes which lead to the rise and fall of nations. The author in this part devotes himself to showing that national greatness is inseparable from military progress, and that, where wealth and luxury are allowed to sap the military strength of a people, the time for its downfall draws near. The second part is the application of these ideas to the concrete case of war between the United States and Japan for the mastery of the Pacific.

Some of the language employed may appear somewhat extravagant; but, in spite of this, the book is one which it would be well for every Englishman to read; he can then consider to what extent the warning here conveyed to the United States might not equally well be addressed to his own country.

It has been stated in some periodicals that the author is a general; this is not the case, he has never served in the Army or militia.

## TRAINING AND EDUCATION.

ARE WE READY FOR WAR? (Sind wir kriegsfertig?) By Major Hoppenstedt. 234 pp. 8vo. Berlin, 1910. Mittler. 4s.

In this work the well-known author discusses various military questions in the form of a diary. The opening pages are devoted to a consideration of the use of military studies in general, and of military history in particular. Napoleon's words, that in studying campaigns the why and the wherefore must be sought for, are quoted. Warnings are uttered against superficial study of campaigns, generalizing from single events, and disregarding factors such as surprises, outside influences, personal relations, etc. Passing on to the Jena Campaign, which is discussed "from the Mene Tekel standpoint," the author gives its tactical and strategical outlines, quotes from narratives of participants, and adds extracts from various documents to illustrate the lamentable state of the Prussian Army on the eve of the campaign. The regeneration period of Prussia's forces, between 1807 and 1813, is examined by allusions to the three leading personalities, Gneisenau, Yorck, and Scharnhorst, whose writings are quoted. The main tactical and strategical features of the wars of 1813-1815 are discussed and criticized. Commenting on a correspondence between Blücher and Yorck, in which the latter is blamed by Blücher for slowness in pursuit, the author points out that defective orders were partly responsible, and adds, "even the projects of genius do not produce successful results without schooling and experience (of staffs)." A description of the pursuit after Waterloo is followed by a discussion of Blücher's career and character. Reflections follow on Napoleonic methods of warfare and on the operations of modern "mass-armies." The author quotes a saying that every officer should have an insight into the complicated mechanism of big armies, and adds that this requires careful study of military history combined with power of imagination. He reproduces in outline, and discusses a study by General von Falkenhäusen dealing with the strategic deployment and initial action of mass-armies facing each other on the Franco-German frontier. Noteworthy is the conclusion that mountainous country is ill-suited to enveloping tactics of large bodies of troops, as they (especially the artillery) cannot make their influence felt. The opinion expressed by the author, that a war of revenge offers no prospects of success for France, is also of considerable interest. "Mass-armies" in general are held to necessitate a return to "rougher" tactical methods, owing to want of deploying space and difficulties of subsistence. Regarding marches the author estimates a loss of from 8 to 12 per cent. due to

falling out at the outset of a campaign. To prevent this he proposes: removal of boots during railway journeys; doubling drill at halting places; massage; preliminary enquiries into marching capacities of reservists (bad marchers to be relegated to fortress troops) and occasional severe tests in peace time. The depth of marching columns must, he maintains, be diminished; reconnoiters must report when troops can march off the roads; advanced parties must prepare and indicate routes for advances on broad fronts, and mark crossings over water, etc.

Examples are given to show the capabilities of close billets. The following is worthy of note:—"What about the inhabitants?" he asks. "There must be no nonsense about humane dealing where so much is at stake; the smallest space must suffice for them." Of subsistence he says: "Two grand inventions are field kitchens and motor vehicles; 550 motors with 2,200 men now accomplish what 4,050 vehicles and 4,900 men did before."

Succeeding pages are devoted to physical fitness, the Prussian parade step, manual exercises, garrison duties, saluting, and theoretical instruction of soldiers. The author considers guard duties of value as awakening a sense of responsibility. The influence of strict ceremonial drill on *moral* is happily illustrated. The remarks on individual bayonet fighting contain a warning against undue vigour in the assault entailing a loss of control. After a plea for more variety in garrison training grounds, wood fighting is considered, and examples are given and extracts quoted from the writings of an officer who fought at Würth. The author quotes and endorses the opinion of several well-known writers, that colours should accompany a unit into the field and be placed well forward in action. He advocates practice in the rapid assembly of improvised units, instead of marching complete units on markers.

Other sections deal with the Russo-Japanese War, co-operation of the three arms and night operations. (Instructions issued by Sir J. French regarding the last named are quoted verbatim). The author suggests that at field exercises, on a signal from the directing authority or by order of an umpire, a flag should be hoisted on a position to indicate that it is under artillery fire; further, that some indication regarding the nature of the (imaginary) projectile used and the tactical situation of the artillery should be given where possible. A picture illustrates entrenching by skirmishers during an attack. The use by attacking infantry of sandbags (*a*) as screens from view, (*b*) as cover from fire, is also discussed. The author advocates constant practice for infantry in destroying wire entanglements.

A passage dealing with "Training for action" pleads for practice in fighting at close ranges, greater depth (*i.e.*, smaller frontages) at peace manoeuvres and training of officers and non-commissioned officers in close reconnaissance.

## STRATEGICAL AND TACTICAL.

INDIA IN IMPERIAL DEFENCE. A Lecture by Capt. D. I. Macaulay.  
23 pp. 8vo. London, 1910. Central Asian Society.

The lecturer begins his subject by a survey of Indian military policy with regard to the great Asiatic Powers. These comprise Russia, Afghanistan, China, Persia, Turkey and Japan, and the peculiar circumstances of each and the manner in which these act and react upon one another are succinctly described and discussed.

Attention is drawn to the influence on Indian defence exerted by the rise of the German Navy combined with the disappearance of Russian naval forces from the Pacific, and the lecturer proceeds to take a wide and comprehensive view of the entire naval situation in the East.

Upon the deductions drawn from this survey he bases his recommendations as to the policy best calculated to safeguard British interests in Asia.

Briefly stated, Capt. Macaulay's proposals are:—(1) India should assume complete responsibility for the defence of Colombo and Singapore. (2) The East India and China squadrons should be definitely incorporated as one fleet. (3) Port Darwin should be fortified and made an alternative base of Sydney for the Australian fleet unit so as to

bring the latter into touch with the Singapore system. (4) India should take over the maintenance of the East India and China fleet units. (5) The self-governing parts of the Empire should consider the question of constructing at least four *Dreadnought* battleships to be eventually handed over to the Indian fleet: and (6) the expenditure for this purpose should be met by a loan, the sinking fund and interest charges to be met by the self-governing nations on a fixed basis.

The lecturer concludes with a criticism of the results attained by the Defence Conference of 1909.

**TACTICAL EXERCISES WITH SOLUTIONS (Thèmes Tactiques).** By Lieut.-Colonel Egli, of the General Staff of the Swiss Army. Translated from the German by Major Morier, Military Attaché to the French Embassy in Switzerland. 143 pp., 2 maps. Svo. Paris, 1909. Chapelot. 2s. 6d.

This French translation renders available the first collection of tactical problems published by a Swiss officer to a large circle of British readers. The book is of special interest, as it gives the ideas of an officer who for many years has been one of the staff of permanent instructors of a Militia Army. The orders will be found considerably longer and more detailed than those usually issued in the great continental armies. The fact that the subordinate commanders in the Swiss Army are only able to give a comparatively small portion of their time to military study and training is probably accountable for the necessity of issuing orders in considerable detail.

During the latter phases of the Franco-Prussian War of 1870 the same difficulty as regards the avoidance of detail in orders was experienced by General Chanzy. He found that it was impracticable, when dealing with the *mobiles*, to issue orders in the same brief and succinct form which can be adopted in the case of highly trained staffs and regular troops.

**THE REALITY OF WAR.** By Major S. L. Murray. 118 pp. Svo. London, 1909. Rees. 2s. 6d.

This book is written with the two-fold object of inducing the readers of it to study the writings of Clausewitz and to give those who are too busy to study the original writings some notion of that author's leading ideas on policy and war. It commences with a short account of the life of Clausewitz with the object of showing what exceptional opportunities he had during the wars of 1793-1815 of studying in the field the methods adopted by the great commanders of that period, and of developing in a practical manner the theories he formed as a result of these experiences.

It then proceeds to show how the influence of the writings of Clausewitz has been steadily growing, and now may be said to permeate modern military and political thought in every nation with the exception of Great Britain, notwithstanding the fact that "it is admirably adapted to form a main stem in the military culture of British officers."

Major Murray next selects a few of the leading ideas from Clausewitz "On War," and concentrates his attention on impressing the soundness of them on his readers by means of numerous quotations from the original and from later authoritative writers.

Amongst the subjects selected are "Theory and Practice in War," "Public Opinion in War," "The Nature of War," and "Strategy," and these are briefly and ably dealt with from a political and military point of view.

Throughout the book Major Murray insists on the necessity of both statesmen and soldiers studying the famous work of Clausewitz "On War."

**NIGHT COMBATS AND NIGHT MANŒUVRES (Nacht Gefechte und Nacht Übungen).** By Lieut.-Colonel Balck, German Infantry. 302 pp., with 22 diagrams in text and 3 appendices. Svo. Berlin, 1910. Eisen-schmidt. 8s.

The book commences with a historical review of night operations with descriptions of some typical instances prior to the Russo-Japanese War, and a summary of the regulations of the British and other Armies on the subject. The war in Manchuria, 1904-5, is next dealt with. The opinions of the Russian and Japanese staffs are stated to be as follows:—"General Kuropatkin holds that the best means of meeting night attacks is to keep the troops nearest to the enemy fresh by frequently relieving them. He is averse from night attacks on the large scale. On the other side, the Japanese Staff lay down that the advance is to be continued systematically by day and night, entrenching the ground gained, till on the third night the infantry arrive within 300 or 400 yards of the position. Three or four sham attacks are to be made, and the real night attack is then to be delivered."

The third portion of the book deals with night operations in field and fortress warfare, with historical examples. Colonel Balck pleads for the more careful training of troops in night work; his views on this subject are briefly as follows:--

"Nowadays night training is no less necessary than day training."

"In Japan, since the war, night manoeuvres have been constantly carried out. The Japanese recruits go through a 12 weeks' course of training, of which the last fortnight is devoted to night work."

"Night manoeuvres must be carried out on dark nights and under a full moon, in summer and when the ground is covered with snow."

"Attention must be devoted to maintaining direction by the stars. Little time should be devoted to individual instruction, and manoeuvres with formed bodies should be commenced as early as possible, first by companies and then by battalions and brigades. Particular attention is to be devoted to night outposts, sentries, and patrols."

"Night rides should be carried out, preferably in the dark winter months. In these, troops must be posted to represent the enemy. Maps for these rides must be specially prepared, the route being marked by a broad black line. Wind-proof matches are to be used for reading maps."

"The winter campaign of 1807 forms a good basis for night schemes."

"If two opponents meet, and one is thoroughly trained in night work while the other is not, the first will have an immense advantage."

The work is written with Colonel Balck's usual clearness and directness.

THE TACTICS OF THE THREE ARMS (*La Tattica delle Tre Armi*). By Capt. Luigi Giannitrapani. 165 pp. 8vo. Rome, 1910. Voghera. 2s. 6d.

This book is a reprint of a number of articles which appeared in the *Rivista d'Artiglieria e Genio*. Their object is to show how the tactics of the future are likely to be affected by the lessons of recent campaigns. A brief historical retrospect is first made of the chief lessons of the Franco-Prussian, Russo-Turkish, and Anglo-Boer Campaigns. The Russo-Japanese Campaign is then treated in considerable detail, the questions of machine guns, of heavy artillery, and of quick-firing field guns being especially considered. In the second part the author devotes 50 pages to the probable tactics of the future.

In the first portion of the book, which is chiefly devoted to minor tactics, there is nothing remarkably new, but the deductions from the wars in South Africa and Manchuria are very clear and well arranged, while there are ten interesting pages on the different methods of employing Q.F. artillery in France and Germany respectively.

The author emphasizes the fact that many of the incidents in recent campaigns were due to abnormal local conditions, which would be impossible in a war on the continent of Europe. He then proceeds to describe the various phases of an action in the next "normal" war. The following are some of the more interesting conclusions arrived at:—(a) The great principles of tactics remain unchanged, but it is doubtful if the pure offensive still maintains its superiority over the defensive-offensive. (b) In the attack, successive waves of infantry only increase the depth of the target without increasing the fire power of the infantry; consequently, supports should not be employed, but two out of the three battalions in a regiment should be deployed as a firing line, the third (reserve)



battalion being sent forward between 1,000 and 400 yards from the point of assault. (c) Actions will be slower, and the fronts occupied will tend to increase in the future. (d) All units have now an increased reserve of destructive power; they can utilize this to repel attack or counter-attack, consequently it will be unnecessary to lock up so many troops in local reserve, and in future these may be employed in the decisive attack.

No mention is made of the method of employing a general reserve or of delivering a decisive counter-attack.

## TRAVEL AND TOPOGRAPHY.

**A GERMAN STAFF OFFICER IN INDIA.** By Count Hans von Koenigsmarck. 340 pp., with numerous illustrations and an index. 8vo. London, 1910. Kegan Paul, Trench, Trübner & Co., Ltd. 10s. 6d.

The translation of the book, which originally appeared in German, contains a series of vigorously drawn word-pictures of the various places visited by the author. The scenes depicted include many of the most characteristic spots of India, and convey a realistic idea of the country and the manners and customs of the population, official and non-official. To the military reader the author's impressions of the north-west frontier, the British and Indian soldier, and the life led by the Anglo-Indian official in India, will be of most interest. Without any pretensions to being a book of reference with regard to the subjects dealt with, the volume contains a considerable amount of useful information conveyed in an attractive form. The attitude of the author throughout the book is that of an enthusiastic admirer and, at the same time, an intelligent critic of the work undertaken by Great Britain in India.

**TO ABYSSINIA THROUGH AN UNKNOWN LAND.** By Capt. C. H. Stigand, F.R.G.S., F.Z.S., Royal West Kent Regiment. 346 pp., with illustrations and 2 maps. 8vo. London, 1910. Seeley & Co. 16s.

Capt. Stigand in this book gives an account of a journey through British East Africa to Lake Rudolph, and thence to Addis Abbaba, the capital of Menelik's kingdom.

Leaving the Uganda rail at Gilgit, the expedition marched to Rumuruti, on the edge of the Laikipia Plain country, where the administrated part of British East African territory was left. A route due north was then taken to Rendile, thence N.E., skirting the Boran country and back west to Lake Rudolph. This portion of the journey, through tracts of our territory but little known, occupies the first half of the book.

As regards the second portion of his journey, *i.e.*, from Lake Rudolph to Addis Abbaba, Capt. Stigand's route lay to a great extent through the country east of Lakes Margherita and Zwai, surveyed in the same year by Major Gwynn's Anglo-Abyssinian Boundary Commission on its return from demarcating the southern boundary. Capt. Stigand's remarks, added to Major Gwynn's work, add very considerably to our knowledge of the localities in question. The remarks and observations on the methods of Abyssinian administration are interesting, and the establishment of telephonic communication in Abyssinia, as far south as Dalbo, is noteworthy.

**ZAMBEZIA.** By R. C. F. Maugham, British Consul for Portuguese East Africa. 408 pp., with 1 map and numerous photographs. 8vo. London, 1910. John Murray. 16s.

This book forms a companion volume to the author's *Portuguese East Africa*. Mr. Maugham, who has been fifteen years in the country, has not only acquired a knowledge of it that is encyclopedic, but has the power of imparting that knowledge in a most readable form. The country described is that of the Zambezi valley from the sea to the

town of Tete. Its history, past and present systems of administration, commercial possibilities, flora and zoology, are in turn described, while three most interesting chapters are devoted to an account of the customs and characteristics of the native tribes.

Emphasis is laid on the great agricultural potentialities of the country, the slowness of its progress being attributed to : (a) the existence of under-capitalized land companies who take up more land than it is possible for them to develop; (b) the lack of communications: almost the only means of communication is by the uncertain and shallow waters of the Zambezi; roads and railways are practically non-existent; (c) the difficulties of the native labour question.

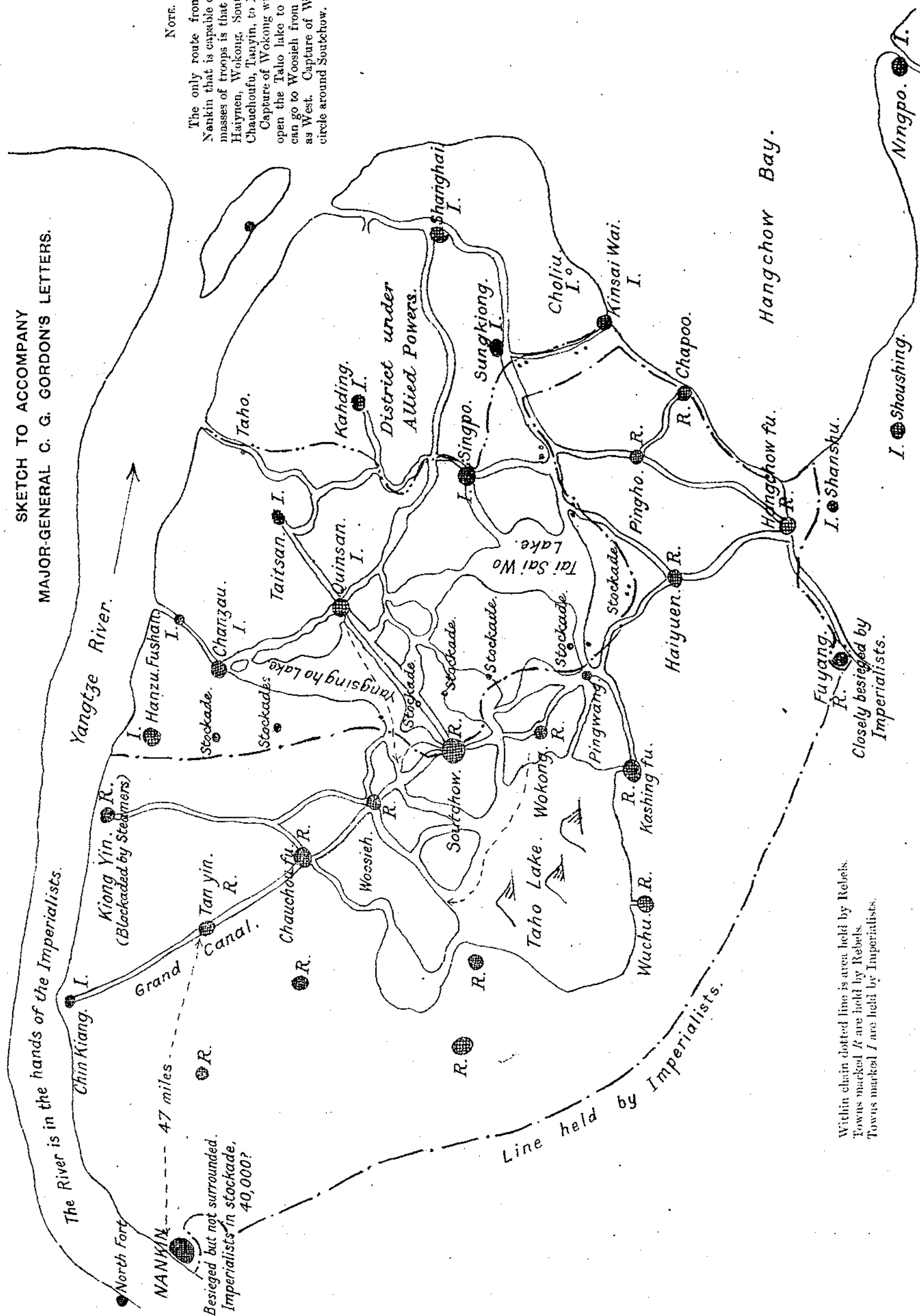
The present-day Portuguese officials are reported to be of a more energetic and resourceful type than their predecessors, and Mr. Maugham considers that if they are given support the country has a great future.

**SKETCH TO ACCOMPANY**

### NOTE

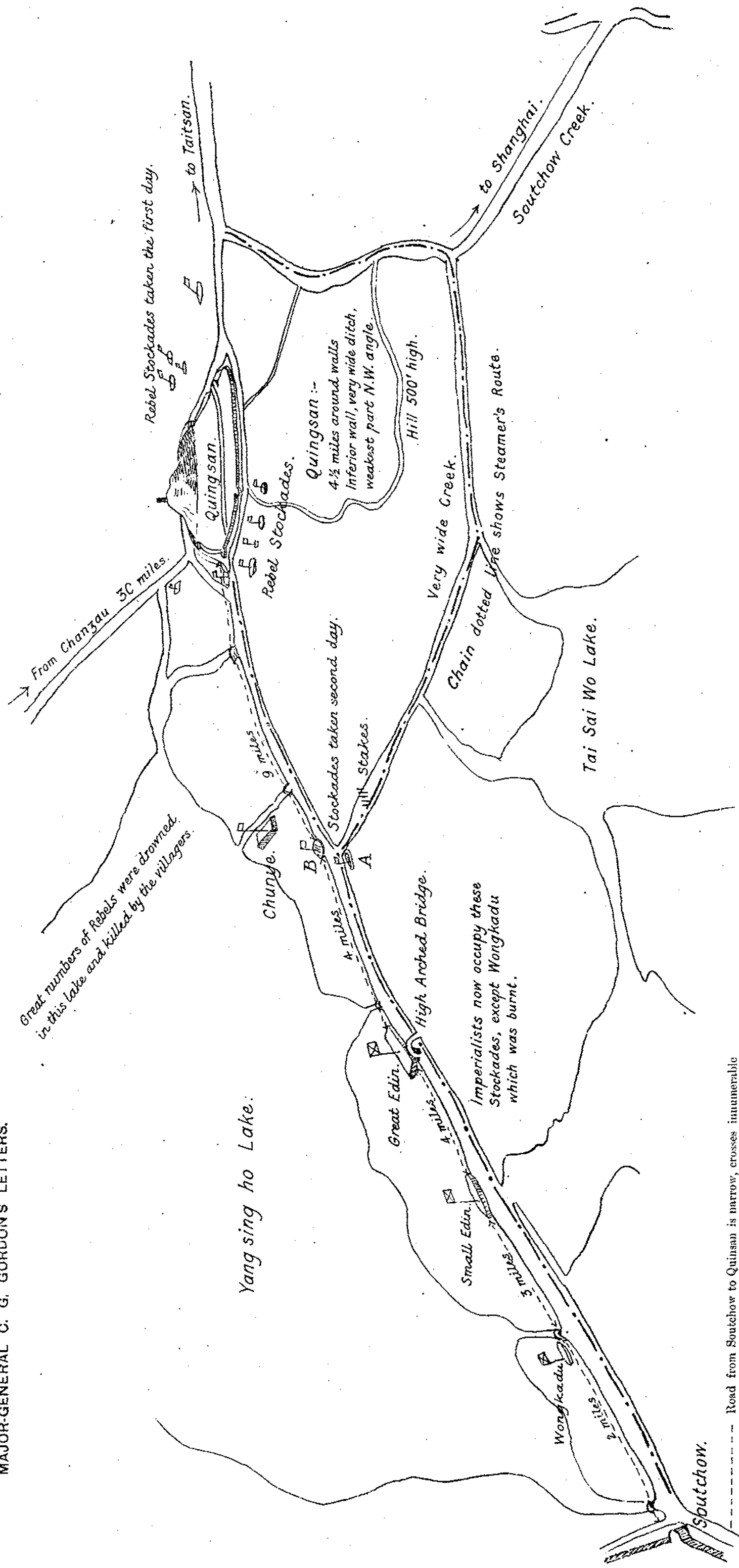
The only route from Hangebow to Nankin that is capable of being used for masses of troops is that leading through Haiyuen, Wokong, Soutchow, Woosieh, Chachoufou, Tanyin, to Nankin.

Capture of Wokong will cut this route, open the Taho lake to steamers, which can go to Woosieh from the East as well as West. Capture of Woosieh completes the circle around Southow.



Within chain dotted line is area held by Rebels.  
Towns marked *R* are held by Rebels.  
Towns marked *I* are held by Imperialists.

SKETCH TO ACCOMPANY  
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--- Road from Soutchow to Quinsan is narrow, crosses innumerable creeks (leading from lake to creek) by small bridges. Sometimes road is only 3' wide for 100 yards deep water on either side of it. Stockades A and B were mud forts. C and all the others between Quinsan and Soutchow were granite (walls some 15' high). No other road for miles between Quinsan and Soutchow, and then only through Chanzu, an Imperialist town.

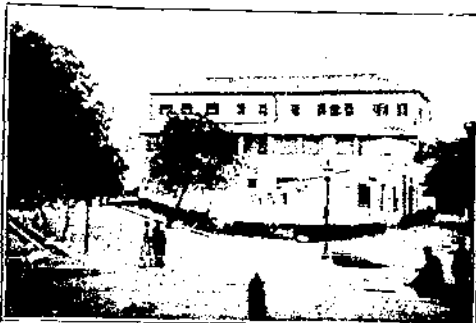
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