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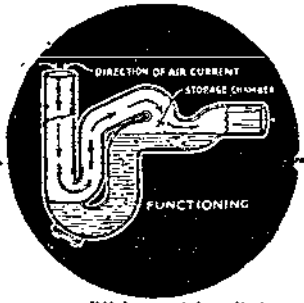

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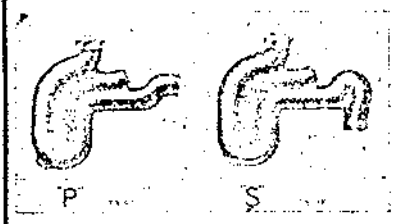

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"Q" IN THE EAST AFRICAN CAMPAIGN, 1941.*

A Second Episode.

By MAJOR-GENERAL A. C. DUFF, O.B.E., M.C.

THE December, 1942, issue of *The R.E. Journal* contained an article describing an episode of the campaign in East Africa in 1941. The episode in question covered the period of January and February of that year, when a British force, based on railheads in Kenya, began the spectacular advance which took it first to Kismayu and the line of the River Juba, and thence for another three hundred miles on to Mogadiscio. In that article an attempt was made to describe the major problems which confronted the "Q" Staff in maintaining our troops over hundreds of miles of waterless and almost roadless desert.

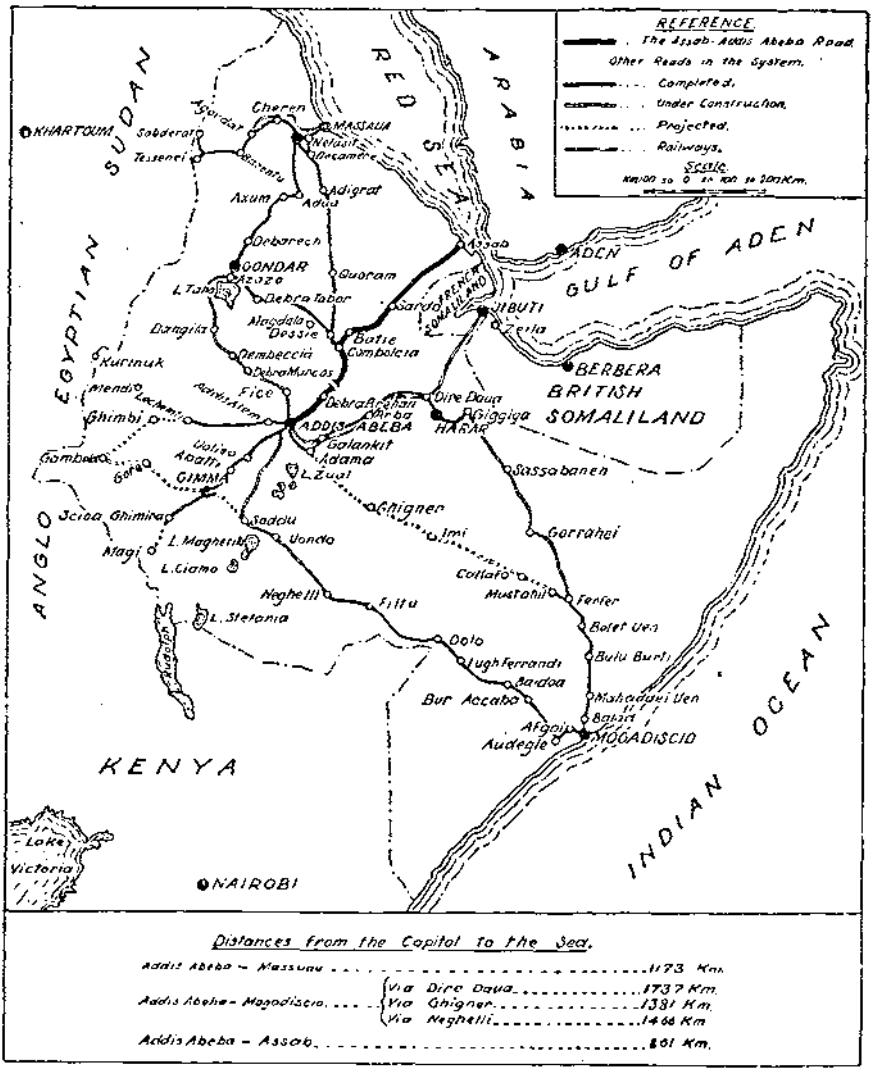
The story broke off at the time when our leading Brigade was nearing Mogadiscio, but at that point the campaign was still in its earlier stages, although the most critical phase was already behind us. From Mogadiscio our advance swung North, through Ferfer and Daghabur, until serious opposition was next encountered at the Marda Pass. The Italian position at the Marda Pass overlooked the rolling plain on which stands the little town of Giggiga, and barred the sixty miles of mountain road to Harar, one of the principal cities of Ethiopia. Italian opposition at the Marda Pass was soon overcome, and they were chased back, first to Harar, and then for another forty miles down the steep escarpment to Diredaua. At Diredaua we first made contact with the railway which connects Addis Ababa and the port of Djibuti, and provides Ethiopia with its only outlet to the sea. And at this point the "Q" lay-out for the maintenance of the force could be, and had to be, abruptly altered.

At the beginning of the campaign the force engaged, amounting to something over two Divisions, had been maintained from railheads at Thika and Nanyuki in Kenya. By the time we reached Kismayu the distance by road from these railheads had stretched to 500 miles, a distance impossible with the amount of M.T. at our disposal. Kismayu was then developed as an Advanced Base, although it lacked almost every facility for that purpose, and the force was maintained by sea from Mombasa to Kismayu and thence forward by road. The next port to fall into our hands was Mogadiscio, which was little better than Kismayu. It did at least boast of rail access, there was good *godown* accommodation on the quayside, and the roads and dock approaches were metalled; but against this there was a delay of weeks before we could use it at all, while the Navy swept a number of magnetic mines which had been laid in the fairway; and, more serious, for four months in the year the place was out of action. Mogadiscio is a lighterage port, and from about May till September the monsoon brings such a heavy swell that lighters cannot lie alongside a ship except on rare occasions and for short periods. And it was already March.

However, we had to make the best of a bad job, and began to develop Mogadiscio as an Advanced Base instead of Kismayu, supplementing it by the use of Merca, a tiny harbour fifty miles to the South. Maintenance forward from Mogadiscio was again by road, and again the distances stretched as the force advanced, until they became impossible. By the time our forward troops were attacking the Marda Pass they were seven hundred and fifty miles by road—most of it an atrociously bad road—from their Advanced Base at Mogadiscio.

*No special map is included with this article, as a small-scale atlas will give sufficient detail to enable the narrative to be followed. (But the map overleaf published in 1940, is reprinted, as it gives a little help.—ED. *R.E.Jl.*)

Ever since we left Mogadiscio it had been apparent that, if all went well and the advance continued, the time would come when our maintenance problem would be greatly simplified by opening an Advanced Base at Berbera and cutting ourselves adrift from Mogadiscio, Merca, and Kismayu. The main road inland



from Berbera ran through Hargeisa to Giggiga, where it met the road coming North from Mogadiscio, and the distance from Giggiga to Berbera was 200 miles as against 750 miles from Giggiga to Mogadiscio. The road from Berbera was believed to be in tolerably good condition, and even if Berbera was not much of a port, it could be no worse than Mogadiscio and Kismayu. Moreover, another hundred miles on from Giggiga would bring us to the Djibuti-Addis railway with its obvious possibilities for supporting an advance to Addis and beyond.

While these ideas were being examined, one factor which had to be remem-

bered was that Berbera and the whole of British Somaliland were in Italian occupation. As however so often happened during this campaign, the presence of an Italian army was an obstacle more easily overcome than the natural diffities of distance and terrain. This particular body of Italian troops was already anxious at finding its line of communication back to Addis threatened by our advance Northward towards Giggiga. On March 17th our forward units reached Giggiga, and on the previous day a British force, embarked at Aden, landed at Berbera, and occupied the town with little opposition. The Italian troops, caught between the two forces, vanished into the desert. On March 20th our Chief Engineer, Brigadier A. Minnis, and two armoured cars, drove through from Giggiga to Berbera, and heralded the opening of the Berbera-Addis L. of C.

* * * * *

So much by way of introduction. The object of this article is to describe the development and operation of the L. of C. from Berbera to Addis Ababa. Opened in March, 1941, it continued in use until the autumn of 1942, when the Emperor and his Ethiopian Army assumed responsibility for security in Addis and the last British troops were withdrawn. The period dealt with here, however, is only up to the beginning of July, 1941, when the new railway bridge over the Awasc River was completed. Thereafter the running of the L. of C. became a comparatively humdrum affair, but for the first three months, before the bridge was built, there was nothing humdrum about the Berbera-Addis L. of C.—far from it. Never a day passed without anxiety, never a week without a crisis. The thin rickety chain of maintenance was stretched and stretched, but somehow never quite snapped, and the Brigades operating from Addis, North, West and Southwest, received—somehow—their food and ammunition and petrol.

Addis Ababa stands 8,000 feet above sea-level, so that in travelling between there and Berbera one naturally covers a great diversity of country. Let us begin with Berbera.

The writer has seen a good many of the less agreeable parts of the earth, but Berbera in the hot months has them beat to a frazzle. It is believed that the British first occupied the place because there we could buy cattle to feed our troops at Aden. That is a poor excuse.

A long coastline brown yellow grey and white, devoid of vegetation of any kind, rising to broken ranges of hills equally arid. A projecting spit of sand curving round Westward and affording a stretch of sheltered water. A clump of stone-built houses overlooking the harbour, many of them in ruins, their gardens patches of grey rather than of green. A larger clump of mud huts composing the native town. That is Berbera.

Its full attractions are displayed between the months of April and September, when there blows a wind called the *Kharif*. This wind does not blow continuously, but tends to get up during the morning and to go on till sunset. It is a violent, gusty, wind, loaded with sand, and it brings a temperature of 110° and over. At least the wind does keep the air in motion, and when at sunset it dies away the apparent effect is a sharp *rise* in the temperature. It is difficult to sleep until towards dawn.

Add to these delights the effects of six months of Italian occupation: dirt, flies, mosquitoes, disease. Take into account the necessity for incessant effort to keep the port in operation, working day and night. Do not forget the absence of any sort of peace-time amenity—ice, good food, recreation. You will then understand why the useful life of the Europeans there in the summer of 1941 averaged only a few weeks.

Adapting one of Dr. Johnson's remarks: "The only good thing which an inhabitant of Berbera ever sees is the road that leads to Harar." Yet for the first hundred miles it is certainly not beautiful. Climbing steadily upward as it leaves the coast it plunges into the tangle of rocky hills and dry *wadis* which

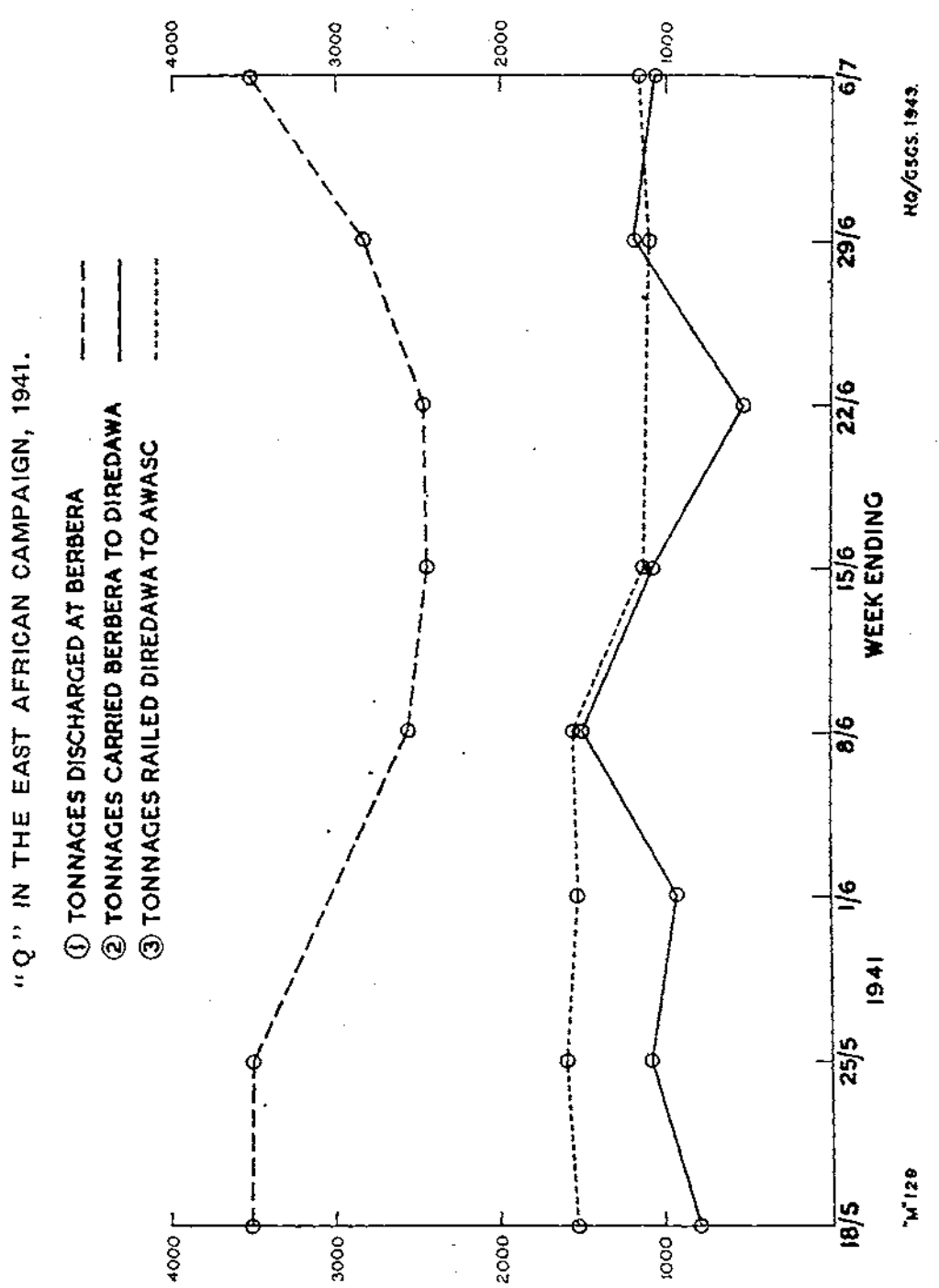

"Q" IN THE EAST AFRICAN CAMPAIGN, 1941.
① TONNAGES DISCHARGED AT BERBERA
② TONNAGES CARRIED BERBERA TO DIREDAWA
③ TONNAGES RAILED DIREDAWA TO AWASC
4000
3000
2000
1000
TONS
18/5
25/5
1/6
8/6
15/6
22/6
29/6
6/7
1941
WEEK ENDING
HQ/GSGS. 1943.
"M" 128

PLATE 1.

make up the plateau of British Somaliland. Even twenty miles away from the coast the difference in climate is marked; the days are still hot, but the nights are cool and even cold. After passing Hargeisa, a hundred miles from Berbera and 4,000 feet above sea-level, the country changes abruptly to grassland, gently rolling and almost flat. The grass is of poor quality and short-lived, but it does afford grazing for enormous numbers of camels, the animals on which the Somali depends for his food, drink, clothing, and tents. To a traveller coming from Hargeisa the foreground is a shimmering mirage which makes the camels' legs look three times their natural length and truncates into grey saucers the bases of the *kopjes*; the background is the mountains of Ethiopia, towering grey-blue against the blue sky.

On this plain, and at the foot of the mountain range, stands Giggiga. Once through Giggiga the road climbs to the throat of the Marda Pass, and the next sixty miles to Harar are through mountain country; but instead of the bare stones and boulders of British Somaliland this is a green well-watered land. Between the outcrops of rock lie either belts of forest, or clearings of cultivated ground, mostly under millet or maize; and in the valley-bottoms are vegetable gardens and fruit trees. So it continues through the Babile Pass, and then climbs again steeply to Harar, which stands at 6,000 feet.

The walled city of Harar is as ancient as it is ugly, but the countryside is beautiful and the climate agreeable. The Italians had planned to build a modern town on the slopes above the city. Most of their work was still in the embryonic stage, but the Governor's residence (Photo 1)—which was used as Advanced Force H.Q.—a hotel, and a few shops had been completed. It was much the most civilized place we had seen since leaving Mogadiscio.

From Harar the road runs on for twenty miles over a fertile and well-watered plateau to the top of the escarpment that looks down on Diredaua and the low-lying bush country through which runs the Djibuti-Addis railway. From the top of the escarpment to Diredaua the fall is 3,000 ft. The road is steep and narrow, but well-graded. One came to know it well, for Advanced Force Headquarters remained at Harar for some months and Diredaua was the nearest place where aircraft could land.

Diredaua is unpleasant: hot, squalid, and full of fever. It is a railway centre and nothing else, and came into existence when the railway arrived at that particular point and had to equip itself with workshops, depots, and sidings. The result is a rather nasty little industrial town set down in a rather nasty stretch of African bush.

For the 300 miles from Diredaua to Addis the road and railway run parallel to each other; through thorn-scrub and bush to the Awasc River; up through the corn-lands of Adama and Moggio; and over the last stretch of plain to where Addis lies sprawling on a mountain-side, its white—dirty white—walls showing through a forest of gum-trees.

* * * * *

The first "Q" Staff Officer to visit Berbera was Colonel (now Major-General) Sir B. H. Robertson, R.E., the A.Q.M.G. at Advanced Force H.Q.*, who went to explore its possibilities as soon as the place was in our hands.

*Throughout the campaign, there were two A.Q.M.Gs. on the strength of Force H.Q. Colonel Robertson was one of these two, and the writer of this article was the other. One of us was always at Force H.Q. at Nairobi; the other always at Advanced Force H.Q., wherever that might be. Periodically—about every two months—we changed places. The distance between Force H.Q. and Advanced Force H.Q. ranged between 500 and 1,500 miles; telegraphic communications were exceedingly bad, and air mails were irregular and uncertain. By exchanging places at intervals we ensured, first, that we both kept up-to-date with developments in the area of operations, and, second, that we both were aware of the difficulties of the one at the Base in meeting the stream of demands from the one at the front. As a system it may be unorthodox, and it requires complete trust and understanding between the individuals concerned, but it did work.

These possibilities were not encouraging. Berbera is a lighterage port, designed to deal in peace time with a minute volume of traffic. There is no deep-water berth; only a dhow or a vessel drawing a few feet of water can go alongside the small jetties, and any ocean-going steamer has to lie off in the anchorage and discharge by lighter. The number of lighters then available—three, to be precise—was so small that to discharge a ship carrying two or three thousand tons of cargo might well take a fortnight. There was not a single crane of any kind, nor electric power, nor electric light. The jetties themselves were in bad repair, the approaches to them were congested, and the roads pot-holed.

Aden had set the ball rolling by sending over and landing 30 days' supplies for 20,000 men. Colonel Robertson had to calculate what tonnage he would have to bring through the port once the Aden stocks were exhausted. It was not an easy calculation. The General Staff could and did provide an estimate of the number of Brigades likely to be operating in such areas that their maintenance should be based on Berbera, but the numbers of the front line troops in any theatre of operations is of course far from representing the gross total to be fed. To them must be added a host of ancillary services; medical, transport, pioneers, labour; the R.A.F., including its ground staff; garrison battalions; gendarmerie and police; and, last but not least, prisoners of war. Colonel Robertson arrived at a gross total figure on which we worked for the time, but in less than a month it had increased by 75 per cent.

Based even on this preliminary estimate, the tonnages to be handled were formidable enough when compared with the facilities available. The weekly quantities worked out at 500 tons of supplies, 1,000 tons of petrol, and 500 tons of other commodities; 2,000 tons a week in all. This was a bare minimum, and made no allowance for building up reserves of any kind, and it was imperative that this should be done as soon as possible.

Assuming that the necessary tonnage could be handled from ship to shore at Berbera, it had to be passed over three definite and separate stages of the L. of C. before it reached Addis. The first of these stages was the road from Berbera to Diredaua; the second was the railway from Diredaua to the broken bridge at Awasc; and the third was the railway from Awasc to Addis. Each of these stages was about 300 miles in length.

The tonnage to be carried over each stage was naturally less than over the stage preceding it. A rough graph was kept showing tonnages carried over the L. of C., and part of this graph, covering the period 18th May to 6th July, is reproduced here as Plate I. It will be seen that during these seven weeks the tonnage discharged at Berbera was averaging about 450 tons a day; the tonnage, carried by road from Berbera to Diredaua was about 200 tons a day; and the tonnage railed from Diredaua forward was about 150 tons a day. The differences represent, of course, the consumption of the units stationed along the various stages, and the very sharp drop between the tonnage discharged into Berbera and the tonnage leaving Berbera by road was due mainly to petrol consumption. The lorries doing the road haul from Berbera to Diredaua fuelled at Berbera for the round trip, and were drawing up to 25,000 gallons a day.

The first of these stages, the road stage, was in one respect the most straightforward of the three, in that the tonnage it could carry was in simple proportion to the number of lorries that could be put on it. The difficulty lay in deciding what that number should be, when there were in the field so many claimants for transport. Our forward units had entered Addis on April 6th, and now, operating hundreds of miles North, West, and South-west of it, had to be maintained by road from Addis forward. The greater part of one Division, operating in the Galla Sidamo, had still to be maintained by road from Kenya, a distance of 500 miles. Indeed, the demands for road transport were heavier than ever before, and this at a time when the wear and tear of the campaign, and long mileages over bad roads, were playing havoc with our M.T. Companies. The number of

Photo. 1.—The Governor's Residence, Harar.

Photo. 2.—Awasc railway bridge, demolished by the Italians.

Q' in the East African campaign, 1941 photo 1 & 2

Photo. 3.—Awasc railway bridge, demolished by the Italians.

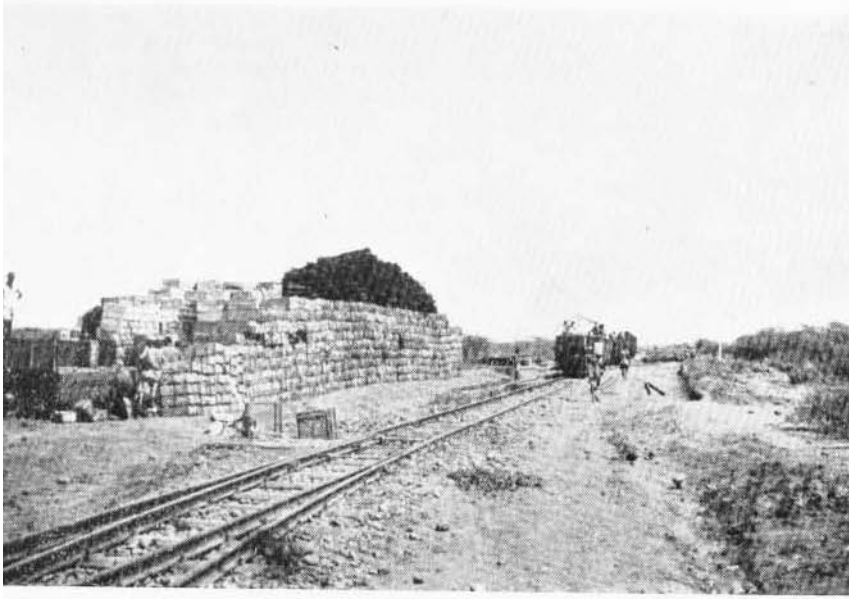


Photo. 4.—Captured arms and ammunition awaiting evacuation from Awasc.

Q' in the East African campaign, 1941 photo 3 & 4

Companies was much the same, but the proportion of vehicles non-effective through breakdown or accident was rising fast. At the beginning of February a Reserve M.T. Company had been worth 80 3-ton load-carriers; by the end of April it was lucky if it could turn out 50 "runners." It was no fault of the units —South African, Cape Coloured, or East African—who worked like slaves, but spares were in short supply, and workshop facilities, other than units' own workshop sections, were virtually nil.

The number of Companies running the road stage was immaterial, but the number of effective lorries on it was kept at about 800. They ran from Berbera to Diredaua and back on a six-day turn-round, and when it was at all possible they were allowed one day off for maintenance at their H.Q., making a seven-day turn-round. This gave us about 200 tons a day coming into Diredaua and on this we could just manage.

The second stage of the L. of C. was the railway from Diredaua to Awasc. At Awasc the Italians had demolished, very successfully, the high level railway bridge (see Photos 2 and 3), and they had done their best to ensure that even as far as Awasc the railway should be of as little value to us as possible, for they had removed to Addis as many of the locomotives and as much of the rolling stock as they could, and the few locomotives they left behind had all been put out of action. Our South African Transportation units, under Lt.-Col. Patterson, set to work with a will, and on April 9th the first train ran from Diredaua to Awasc. It carried 100 tons of supplies, and was hauled by the only locomotive in running order. But this could only be the beginning; a hundred tons every other day would not nearly meet our requirements. So by April 28th we had worked up to one train a day, and by the end of May to two trains a day. This was made possible partly by repairing locomotives in the Diredaua workshops, partly by bringing down from Addis sixteen short trucks and man-handling them—a delicate job—across the road bridge at Awasc.

The third and last stage of the L. of C. was the stretch of railway from Awasc to Addis, and this never gave us any appreciable trouble. The locomotives and rolling stock at Addis were ample to deal with any possible contingencies, and could always bring up from Awasc anything that we were able to deliver there.

All this may give a misleading impression that the work which our railway units had to do was comparatively light, but they had other tasks to carry out and other difficulties with which to contend. The building of the new Awasc bridge was a big job in itself, and at the same time much had to be done to restore and improve the permanent way throughout its length, right down to the frontier of French Somaliland. The operating staff of the railway were Italian officers and men, still in uniform, and as we could not replace them we had to retain them. This meant unending trouble, first with the Italians themselves, frightened for their own safety and the safety of their families, and insistent that they must be paid enough to enable them to live; and secondly with our own Security authorities, who were longing to throw them all into prisoner of war camps. We were lucky in having as our Transportation units Companies of the Union Defence Force, whose technical efficiency was only equalled by their resourceful energy.

The critical period in the life of the Berbera-Addis L. of C. was from its inception in the fourth week of March until the completion of the new Awasc bridge in the second week of July. Thereafter we could run trains through from Addis to Diredaua, and the position was greatly eased, but during those first three months it was a very near thing. The tonnages, indeed, which we were able to get through to Addis were much short of minimum requirements; and there must have been a breakdown had we not found an invaluable windfall there in the form of nearly a million gallons of Italian motor spirit. We looked upon this as a reserve, but borrowed from it to make good the shortfall which we could not carry up from Berbera. We borrowed 100,000 gallons at a time, and three

months later, when the Awasc bridge was completed, the dump at Addis was down to 100,000 gallons in all. But soon after the bridge was completed the demand for petrol slackened, and petrol crises became things of the past.

The worst moment during those first three months was when it was found necessary to embark a complete Brigade Group at Berbera for transfer to another theatre of war, and, as a preliminary, to disembark, from the same shipping, another Brigade Group which arrived to relieve them. The handling of the men and stores was manageable, but the handling of the vehicles—some 500 in each Brigade—was the trouble. They had to be transferred from jetty to lighter, and from lighter to ship, and *vice versa*, with no mechanical help other than the ships' derricks. Luckily we discovered that a certain number of vehicles of the same type were common to both Brigades; and we exchanged them from one Brigade to the other without having to move them physically. The *Kharif* was in full blast, and the port had to be worked through whichever hours of the twenty-four the wind and waves subsided enough to make working practicable. While this was going on the transit of other stores was inevitably delayed. The very able and forcible South African officer, Major Coy, who was then in charge of Movement Control at Berbera, said in a private letter, written on paper blotched with sweat: "Once this move is over I can promise you a daily tonnage of 600 tons for 24 hours working. It is 110° in the shade. I am covered with prickly heat. There is no beer. I am glad I am here."

Development continued of port, road, and railway. In the last week of April a detachment of the 41st (South African) Harbour Construction Company arrived at Berbera from Mogadiscio. Gangs of local labour were set to work on the Giggiga road, which was breaking up under the heavy traffic. (Incidentally, on April 27th Berbera received in a few hours its ordinary total rainfall for five years, and every road was washed out for two days.) On the railway more locomotives and more trucks were being brought into commission. The tonnages we managed to carry are shown on the graph, but it was not till later on that we really reaped the benefit of the work of those three months.

One or two points are worth notice about the various commodities we were carrying. As to the petrol, all of it, M.T. spirit and aviation, was at that time case-packed, not drummed, and the leakage figures were deplorable. The cases destined for Addis, each containing two 4-gallon cans, had to be handled from ship to lighter, from lighter to jetty, from jetty to dump, from dump to lorry, from lorry to railway truck, and then handled twice more at the Awasc crossing before they reached Addis (see Photo 4). At every possible transhipment point they were examined, and the "leakers" pulled out and used on the spot, but even so the wastage rate was at times over 30 per cent. Once we had succeeded in substituting drums for cases the rate fell to about 3 per cent.

As to supplies, we sent forward by sea from Mombasa to Berbera "balanced" rations; that is, quantities of the various items on the field scale of rations were sent in such proportions that they made up a certain number of rations complete in all respects. But we soon found, and continued to find, that stocks of certain items were always excessive, while stocks of certain other items were always short. It seems that in any campaign this is bound to be so. No matter how arid or desolate the country—and it is difficult to imagine anything more arid and desolate than Somaliland—there is almost sure to be some form of fresh meat, either cattle or game, and some form of grain. A good Supply Officer will jump at a chance to give his units a change from bully and biscuit, so his issues of bully and biscuit decrease, but there is no corresponding decrease in such items as butter, cheese, milk, and sugar. In every Supply Dump the preserved meat and biscuit piled up and piled up, and in the end we had to ship thousands of tons of them back to Kenya. Perhaps it was obvious enough that this was bound to happen, but none of us managed to foresee it.

Another lesson of the same kind is the need for most careful examination of

supply returns. A statement that a Supply Dump is holding so many "rations" may mean anything. A Supply Officer who had run out of, say, pepper, would be justified—technically, at least—in saying that he was holding no "rations," yet, though he was holding no *rations* he might be holding a great deal of food. The only answer is to look through the stock-sheets oneself, and see whether the items which matter are there or not.

* * * * *

The Berbera-Addis L. of C. was stretched taut for three months, but never broke. In conclusion consider for a moment another L. of C. in East Africa which did, for a short time, completely break down. This was the L. of C. running North from Nanyuki by the road through Marsabit, Mega, and Neghelli, some 600 miles. At the time it broke there was the best part of a Division at the end of it.

It looked all right on paper, and it had till then been working satisfactorily. There was enough transport on it to keep lifting forward all that the Division required, and there were even modest reserves held at various intermediate points. But when the rains came there were washouts on the road, and at one place in particular, the crossing of the Dawa Parma, bridges and rafts were in turn swept away. The daily run of the lorry convoys grew shorter and shorter. Then the leading Brigade ran out of petrol.

The second-line transport moved forward to refill the Brigade, itself ran out of petrol, and had to use the petrol it was carrying. The third-line transport did the same. The shortage flashed backward down the L. of C. until in three days there was not a can of petrol left in front of rail-head, all movement had stopped, and the Division was immobilized.

Luckily it did not matter much, as the Division was not actively engaged. Nor did anyone run out of food, though some of the commanders thought it prudent to put their troops on half-rations as a precautionary measure. Supplies take up little room, small reserves are easily carried, and units managed to tide over the weeks that it took us to push more petrol forward from Nanyuki and get it into circulation again. It seems a fair deduction that under more or less similar conditions, and in a well-watered country, the first result of a L. of C. being stretched beyond its limit would be a breakdown in the petrol supply.

* * * * *

These are rather disjointed notes, but then the Berbera-Addis L. of C. was rather a disjointed business. The episode which they cover was, furthermore, a small-scale operation, unlike some of those which have since taken place in other theatres of war. They will, however, have served some useful purpose, if, when the time comes for the Official Historian of the campaign in East Africa to compile his volumes, they remind him that few campaigns can ever have been more completely dependent on "Q" than was this one.

THE N.C.O. AND HIS TASK.

By MAJOR I. F. WARWICK, R.E.

FOREWORD.

THE following article contains the notes for a series of lectures to N.C.Os. strung together as best they could be, but still at times disjointed. The writer hopes that even so they may be of value to those who like himself have the task of inculcating the essential outlook and training required to produce the requisite standard of N.C.O. for the Corps. The importance of achieving this high standard cannot be over-emphasized. The relatively low ration of officers in our establishments means that the task of their subordinates are correspondingly severe, that senior N.C.Os. have often to carry out the work of officers. Only when they have and live up to a very high standard of discipline, training and leadership can they hope to carry out their duty in the manner which the Army rightly expects.

I. THE BACKGROUND.

Whether one has a liking for this " soldiering business " or not is unimportant. Whatever we were in civil life, soldiering is now our job. We should have an outlook sufficiently broad and an intelligence acute enough to see this point of view, to accept it and to work to it. The alternative is failure and all that failure in war implies.

To do our job properly we must become professionals, and that means learning our individual tasks completely and thoroughly. To do that needs all the grim determination and application possible, together with the utmost possible speed. We are working against time.

Many of us are far from active theatres of operations, and in this country the importance of leave and of being near one's family is often out of all proportion to the importance and urgency of our jobs in the unit. Wars are not won that way. Our task is to win this war and that will only be done overseas. All our efforts and thoughts must be directed at all times to fitting ourselves and those under our command for the accomplishment of this task.

For the present this job must be regarded as our chosen career on which our whole existence depends, as it surely does. Let us then take pride in our job, pride in our personal execution of the most trivial detail, appreciating its worth in the great scheme of things. Let us have well-founded confidence in our military and technical knowledge, always striving to improve it through enquiry and by acquiring new information and knowledge.

It is evident that we must have courage and fortitude, but they are not enough in themselves. Loyalty is essential—loyalty to our superiors, to our subordinates, to our comrades, to our Company, loyalty which is complete and unswerving at all times and in all circumstances. It is my sincere desire that every man should be imbued with this high ideal of loyalty. Add to that skill in the use of our weapons, at our trades in the application to our tasks of all the resources at our disposal, then we have a good beginning.

Remember it is not enough to do only our bare duty. We must always produce that little bit of extra thoroughness, efficiency, and conscientiousness that entitles the officer or N.C.O. to his authority and responsibility. We must set the example to our men at all times, and in war much more of the time is dull than is exciting. It takes more strength of character to keep up the standard in the dull period than in an emergency.

We learn by the example of our superiors (and often of our juniors), but don't forget that no one man can be perfect. We must choose our examples carefully, picking from each the characteristics which we most admire and moulding our own individual performance on the best we see in others. That is the way to set

and to reach our ideal, again remembering not to be discouraged when perfection in every aspect of our job is beyond our reach. Where one man fails at one job another will succeed, but if we all use our different talents willingly and energetically we shall produce a first-class team.

Finally, remember that anything that is worth doing in peace or war is worth doing well. What is more, in war it MUST be done well. Our lives and those of our comrades may depend on it.

II. The Make-up of an N.C.O.

The Sapper N.C.O. has a difficult task, which demands considerable ability in the application of engineer knowledge and in the organization of work. He must therefore have four things.

(i) *Military knowledge.* We are soldiers and all our work must be directed towards military achievement. We often have to fight and the N.C.O. is the leader.

(ii) *Field Engineering skill.* That is to say, knowledge of the common tasks and of how they are carried out, remembering that this knowledge is the basis on which we achieve successful improvisation in unforeseen circumstances.

(iii) *Knowledge of tradesmen's work.* He should himself be at least a Cl. 2 tradesman, preferably Cl. 1, in his own trade so that he has a personal standard by which he can judge. He must in addition know enough of all trades to be able to supervise work in any of them.

(iv) *Education.* Our work is so technical and entails so much theoretical work that a nitwit or even a half-wit is no use as an N.C.O.

Given these four things there are certain others which he must learn at once. They come from A.T.M. 35 of August, 1940 :—

(1) It is the duty of the N.C.O. to set a very high standard and example of loyalty, behaviour, and turnout. He must make himself *felt at once*, and ensure that his men realize that he will stand no nonsense. He must be firm but fair, efficient but not officious.

(2) He must look after the interests of his men. While letting nothing go, he must be prepared to help the lame ducks.

(3) When receiving orders, he must make absolutely certain he understands exactly what he has to do. He must check the order over in his mind, and if he is in doubt about anything, ask questions to get it clear. If he fails to check up, one day he will go away and then find that he does not understand the order ; when it is too late to check up. This may lead to disaster, not only for himself but for others. In short he must make certain of what is required of him before saying " Very good, Sir."

(4) When giving an order, he must give it in such a fashion that there is no manner of doubt in the mind of the recipient that the order is intended for him, and that what is required is " so and so."

He must not, for example, say " some of you do so and so," but " No. 1 Section or Smith, Lewis, MacDonald," or " you, you and you, (pointing at each man,) do so and so."

If the lance-corporal details the men in this way, it is unlikely that he will be disobeyed. If the order is not obeyed, the charge must follow, and in giving evidence the N.C.O. can say truthfully " I detailed him by name" or " I looked him straight between the eyes and pointed at him as I gave the order."

There will be no escape by the excuse " I didn't know he meant me."

(5) No officer or N.C.O. who seeks popularity is worth anything. He will sooner or later place his popularity in front of his duty.

On the other hand, the man who does his duty, avoiding nothing, without fear, favour or affection, and with fairness, will earn respect that may in time become devotion.

(6) He must remember that in war the lives of his men will often depend on his knowledge of his job, his efficiency and his ability to command. *It is his bounden duty on taking his stripe to do his UTMOST to make himself fit for the job.*

(7) Lastly, he must remember that he belongs to a fine unit and wears its badge. It is up to him personally to do nothing to let that unit down.

There are two paragraphs that might be added :—

(8) N.C.Os, must insist that their men carry out their orders to the minutest detail. N.C.Os. must, however, themselves be able to carry out orders with the utmost precision, since units will always reflect their officers' behaviour, both commissioned and non-commissioned. No man must ever excuse his actions when passing on a distasteful order by stating the fact that he has no connection with it ; it must be his order. He must stand on his own feet.

(9) An N.C.O. must discard all selfish interests. Service in the Army is a service of honour, and a service for the nation. This is that spirit of idealism which makes men ready for every sacrifice.

Remember the N.C.O. is the leader. Therefore leadership is one of his most essential qualities. His personality must command the respect due to his rank, he must set an example which will inspire his men to follow him, his determination must be ruthless, and he must be able to assert himself in accordance with his convictions.

III. Discipline and Loyalty.

These two things hang together ; in them are the components of the cement which binds individuals into a unit. Our strength lies in collective action and all individuals taking part must conform and direct their actions to the common purpose.

To the average mind discipline often implies something objectionable which has to be put up with. In actual fact discipline is essential to any organization. Good discipline springs from confidence in leadership and is born of willingness, not of fear.

When we have to obey orders which are unpleasant for us as individuals and which we feel are unnecessary, we must remember that we are not in possession of all the facts, and we are therefore not in a position to judge. When there are such colossal issues at stake in the world we cannot expect individual treatment all the time. We must see things in their proper perspective. This requires an intelligent mind and stern self-discipline.

To impose discipline, it is necessary that we ourselves shall have all those qualities which we expect in those over whom we have authority. We must set a personal example of obedience, loyalty, conscientiousness and fairness, uprightness and decent living. In accepting the privilege of rank an N.C.O. undertakes increased responsibility in the management of men (itself a great privilege), in the care of stores and equipment, and in the varied duties which fall to his lot. Personal feelings must be suppressed at all times, whether in dealing with superiors or subordinates.

It is sometimes due to inexperience that orders are not carried out at all or are not carried out efficiently and properly. But sometimes the non-performance of a task is due to our assumption or even a hope that the job will be done by someone else. No N.C.O. must ever shirk responsibility in this way. He must see that no one under him does so either. The task of an N.C.O. is to see that orders are carried out successfully, quickly, efficiently and consistently. This calls

for a dual measure of discipline—self-discipline and the enforcement of discipline on others. The efficiency of an N.C.O. cannot be judged by the number of defaulters he brings before the O.C. Whether the number is large or small is no reflection on the N.C.Os' capability. Unnecessary charges should not be made, but there must be no soft negative attitude to continual inefficiency and negligence. One warning from an N.C.O. should be sufficient for any man. As an N.C.O. you must insist on every man giving his best—and with the average man the best can be very good indeed. Remember that the standard must be set by you, not by the man himself. His turnout, his training and his work are all a true reflection of yourself and your methods.

To obtain this high standard good co-operation between N.C.Os. is absolutely essential. Every N.C.O. must have a real sense of loyalty to all other N.C.Os. It is unpardonable for any N.C.O. to discuss with his subordinates the shortcomings of his equals or seniors, however he may feel.

It is sometimes noticeable that when a senior N.C.O. has had to charge or even to reprimand a junior N.C.O. the junior man's loyalty to the Company becomes so thin and wretched that it affects his general attitude and impairs his efficiency. This niggling resentment is both petty and unnecessary.

With increased rank and responsibility small reprimands are obviously inevitable—but NEVER TWICE about the same thing.

Every one of us has a very real claim on your loyalty to the unit—to the O.C., to the Company and beyond that to the whole Army. A good man never speaks of his unit's shortcomings, real or imagined. Above all he does not discuss his unit with outsiders.

This loyalty is mutual. Every officer has it to you.

So, to sum up, you will only win the respect of the men under you by your own good example and by your behaviour both to your superiors and subordinates. There must be no " Barrack Room Lawyers " among you. Nor must you allow yourselves to be called by anything other than your rank and name outside the mess.

Always then, insist on the best that a man can give you, show no favouritism, be fair (which does not mean being soft), be unselfish, and above all—be loyal to your rank.

IV. Initiative and Leadership.

The points which have been raised in the previous lecture in discipline should be sufficient guidance for you in the building of your character as an N.C.O., but an N.C.O. is essentially a man of responsibility, a leader of men. It is this quality of leadership and responsibility which will be dealt with now.

When you have been selected for promotion (which is done very carefully) it means that you have been considered a man who is willing to undertake responsibility, one who realizes the seriousness of the job in hand, one who will carry out his own individual work thoroughly and conscientiously, one who is capable of leading and inspiring other men—in short, a man capable of doing many things of which you never thought when you were in " Civvy Street."

Do not look upon responsibility as an additional trouble, something which will keep you in at night, or interfere with your private affairs and make many demands upon you while giving you little in return. It is the duty of every man, army or no army, as a member of society to take upon himself the fullest responsibility of which he is capable. In becoming an N.C.O. a man accepts responsibility. He must be ready not only to share hardships, but at all times to place his men's comfort before his own.

Being a good N.C.O. means being a bit of a psychologist—knowing your men, being fair and reasonable, yet determined that it shall be your standard of thoroughness which will be reached. Leadership comes from the development of simple straightforward manly qualities which are latent in all of us. It depends

first and last in the leader having the confidence of his men. He must have intelligence, energy, tact and a lot of commonsense. He must be thoughtful and thorough and must remain cheerful in the face of difficulty. He must be physically fit and alert.

If a man has these qualities and if to them he can add initiative, which is the willingness to act on his own responsibility, he is well on the way to becoming a good N.C.O. In exercising his initiative he may occasionally be wrong in the action he takes, but he will certainly be wrong if he takes no action.

In your everyday routine work you will find plenty of opportunities for using these qualities. Take stock of yourself from time to time. Find out why you have succeeded on some occasions but failed on others. Apply the lessons you have learned to your future conduct. Above all, never go about feeling that you have been misunderstood. Try all these things out and military and engineering training will come more easily to you.

All training at the present time is based on the development of the leadership and initiative of the junior commander. Having been given the general outline of the object to be attained, he is given absolute freedom to make his own decisions. I repeat once more that together with this initiative and leadership, founded securely on a true sense of responsibility and duty, there must be loyalty. N.C.Os. must work as a team, and must stand fast together whatever their personal feelings may be.

V. Organization and Reconnaissance.

Good military engineering depends on organization for 90% of its success. The theoretical knowledge required for military work is not very great and is very often rule of thumb. What really does matter is the practical application of engineering principles to carry out the job against time. This means first-class organization in which each N.C.O. will have his share. The elements are labour, tools, equipment, material and transport.

Your job then, as the N.C.O. in charge, whether it be demolition or the erection of a standard structure or some entirely unexpected task, is to organize the job from the very beginning—long before men or stores are on the site. This will entail what is normally called a proper reconnaissance.

The first essential recce. is to find out *what* is wanted, and to plan *how* to do it. This covers layout of site, time tables, working party tables and so forth.

The *right* men must be got to the job in the *right* order, *e.g.* the bricklayers to lay the foundation before the slater to put on the roof. They must have their transport and equipment. They must have the material with which to work, *c.f.* " bricks with straw " as an historical example of failure in elementary organization. To get the whole lot to the right place at the right time means transport, labour to load it at the starting place and offload it when it arrives.

The following points must be borne in mind :—

(*a*) Obtain all available details and plans from your section officer.
(*b*) Get full details regarding all stores, plants and equipment on the site, in order, etc.
(*c*) Know the exact amount of labour available and for what length of time it will be available, excluding unforeseen contingencies.
(*d*) Take into account any special considerations of priority and order of work.

Every effort must be made to obtain all the above information before men, stores, etc., are on the site. This cannot be too strongly emphasized.

While the foregoing points are being settled, all likely administrative details should be completed :—

(*a*) Billets and rations.
(*b*) M.T. parking.

(*c*) Section stores.
(*d*) Landing and repair facilities.
(*e*) Leave, M.O. and hospital arrangements, pay, etc.

It is obvious that in active operations some of this may not apply, but those that remain will be doubly important, so accept responsibility for them now and they will be second nature in an emergency. Remember too that you will have many other things to think about.

When you are on the site then will come the test of your organizing and managing ability—that ability which is part of the reason for your being an N.C.O. at all. This entails the balancing of the skilled and unskilled labour available. Some tradesmen may be required to act as mates in another trade—nothing matters except the completion of the job within the fixed time.

The balancing of the labour available implies a sound knowledge of the job, so that the N.C.O. must be able to dovetail each trade or task with another, and as each task is completed, to place each man in his next allocated job according to the schedule, in the correct sequence of jobs and priority of each item.

Dealing with tradesmen is not an easy job for an N.C.O. in charge. No N.C.O. can be expected to be expert in all trades. But you must respect a first-class tradesman and not treat him as a labourer. Do not be afraid to ask the advice of a qualified tradesman provided you know your man.

Generally speaking, if a tradesman is good at his job leave him alone, don't nag him. He will probably appreciate being left alone, and will turn out a good job. Whenever possible give him a reason for anything distasteful which he may have to do. If it is not permissible to give an explanation, if you are a good N.C.O. you will have gained his confidence and you will find that the man acts upon your order immediately and without argument.

You will often come up against the fact that tradesmen are not used at their own trades, which may affect their trade rating. But this is minimized by trade training, refresher courses, etc. Think too of all the trained men in other walks of life who cannot draw trade pay and remember that the establishment of a unit is based on a very exact average of the requirements which experience has shown to be likely.

The authorities on whom this responsibility rests have an incredibly difficult task. Units may be identical but their requirements in equipment will vary according to the part of the world where they happen to be serving. Tradesmen are affected by these variations, which is an obvious reason for a sapper being good at more than one trade. A man in the Corps is first and foremost a soldier and should be able to turn his hand to anything which is necessary to complete the job in hand.

While you as N.C.Os. are not expected to be expert in all trades you *are* expected to be able to appreciate the work involved in any job—how long it should take and what it should look like when completed.

You must :—

(*a*) Plan the work from the beginning and work out the completion times of each job in each trade.
(*b*) Estimate your quantities with the assistance, if necessary, of your first-class men.
(*c*) Insist on the whole job running to schedule with the utmost smoothness.
(*d*) See that the quality of the work is the very best that each man can produce.

But no job ever progresses without hitches of some sort and it is your duty as an N.C.O. to reduce these to the barest minimum by using your own energy and initiative. The greater the extent to which you are willing and able to do this the easier it will be for your Section Officer to do his proper job, instead of being forced to undertake other people's jobs.

There is one golden rule whatever job you may be in charge of, and they are certainly varied. Never forget to make precise, definite arrangements beforehand for the feeding of your men if they are to be away from barracks, or delayed. Be there when the meal is served. If you wish to have their respect this is one of the surest ways of acquiring it. I commend it to you as being one of the most important functions of an N.C.O.

It might almost be said that the extent to which the most junior L/Cpl. is capable of using and willing to use his energy and initiative and to accept his full share of responsibility is the true measure of the efficiency of the O.C. Coy. and through him of the unit as a whole.

"SCORCHING THE EARTH."

By LU GYI.

THE phrase of the "Scorched Earth" is believed to have been coined to describe the Russian retreat before the Germans in 1941. Although, possibly, in the present state of this war the policy may not again be required by us, it has been necessary to try to bring it into effect in certain portions of our Empire and the following few random thoughts on the difficulties experienced may, if placed on record, be of value to others, if and when they are placed in similar positions. Official regulations, it is believed, contain no reference to such a policy, so Commanders have no guide on the procedure to be followed. It is therefore usually given to the Sappers to organize and implement, but it can only be carried through with the closest co-operation between all branches of the Armed Forces, civil officers of all departments of the Government of the Territory and many non-Government personnel in many types and grades of employment.

A "scorched earth policy" may be defined in a few words as action taken before or during a retirement to deal with the resources of a territory, both natural and artificial, so that the war effort and national economy of the invading nation will not materially be assisted by the occupation of that territory. There is nothing new about this policy and, as two examples, Wellington's retreat to the Torres Vedras lines during the Peninsular War and the German withdrawal to the Hindenburg line in 1917, may be quoted. With the great increase in the manufacturing capacity of the world since the former of these and the limited extent of the latter, few useful lessons can, however, be learnt from either of them.

The various personnel and articles that may have to be dealt with in implementing a "scorched earth policy" may conveniently be divided into:—

(*a*) the civilian personnel in the territory and their livestock and belongings;

(*b*) the natural resources of the area involved whether on or under the surface, the means of converting these to articles of trade and the articles so converted;

(*c*) imported articles, whether in their raw or finished conditions and any means of converting them from the former to the latter;

(*d*) all facilities for communication by air, land or water, including vehicles used for this purpose;

(*e*) all public utility concerns, workshops, etc., including water supply, electrical and sewage installations.

In considering the various articles that may have to be dealt with in such conditions, the officer placed in charge of such a policy has to have or obtain considerable knowledge of the procedure adopted by various trades. In the rubber trade, for example, although the latex obtained on tapping a tree can be exported as such, the usual procedure is for this to be coagulated, and probably " smoked," on each individual estate. Paddy also is usually " husked " in the country of production, whereas wheat is usually ground in the country of consumption. Or again, in the case of metals, in the Asiatic territories of the Empire, lead is smelted and run into " pigs " locally, tin ore used to be sent to one or other of two large refineries in the East, while manganese ore, except for very small quantities consumed locally, is exported as ore. Without some knowledge of such procedure, the officer detailed to carry through a policy of " scorching the earth " has great difficulty in knowing what to expect and how to set about his initial plans for dealing with indigenous products.

The three limiting factors in carrying out such a project, as with all other projects, are time, labour and materials, but it is desirable to divide the last-named head into two, namely, transport and other materials.

Except in an area under entirely military control, the time factor will probably be found the greatest difficulty. A Government, which has been established to foster the well-being of the country which it has administered, is reluctant to put into force a scorched earth policy and, as this policy is in direct antipathy to the instructions given to a Governor on appointment, it is usually essential to refer the necessity for it to the highest authority. The natural hope that a retirement may be only temporary and the necessity for consulting a large number of departments of Government, as to the effects of such a policy on the remainder of an Empire, usually result in a considerable period elapsing before such a policy will be approved.

Again, although most maps of a country normally show the railways and other main methods of communication, factories, mills, public utility concerns, etc., are not usually so shown. Although, therefore, personal reconnaissance of the communications is generally necessary, officers detailed for such duty can be directed " from the map " to certain specified spots of importance. The latter class of installations have, however, to be " hunted for " and, being of no " sealed pattern," each requires individual planning. Such areas as mines, oil-fields, etc., also require individual treatment, which may take a considerable period to plan and organize.

Labour will again be found a difficulty under usual conditions. Organized and trained units will not be available except for tasks of vital importance. Maintenance of productive capacity until the last possible minute is often required and labour employed on such work is liable to be disturbed by the knowledge that discussions are being held on the methods of destroying their plants. Threats of attack from the air are almost certain to lead to the disappearance to their villages and jungles of a large proportion of the locally-engaged labour. In the East these are largely in the non-technical and semi-skilled grades, the skilled and managerial grades being nationals of some other country. The latter require training and instruction in the best manner of denying their plants, while to prevent the faint-hearts keeping their eyes turned to the rear to ensure a good " get away," an evacuation plan must be worked out in detail. Such items as the previous evacuation of families and dependants, the provision of arm-bands or tickets to the demolition parties, the checking or weighing of kits retained by them, the actual presence of transport, known by them to be reliable, with materials required to run it and the collection of rations for the journey, are all aids to morale, if known to the personnel concerned.

Before dealing with the other heads of limiting factors, it may be desirable to mention here the problem of evacuees. In times of peace there is in the East a considerable amount of emigration from one country to another, and, although

compulsory evacuation of a territory may not be ordered, immigrants will whenever possible, endeavour to return to their own country and large numbers of evacuees will have to be catered for along all exits from the territory in which alarm has spread. These will be found with all sorts of transport, from lorries and motor cars to pack bullocks and asses, although the majority will probably be on foot. Unless carefully watched and traffic control organized, the unusual traffic may cause undue wear to roads and tracks that were not designed to stand this, thus adversely affecting the transport of the Army following behind. The swarm of evacuees will at least require staging camps, even if these consist only of sanitary conveniences, water supplies and cooking facilities.

Transport will also be difficult to come by. All the transport of the armed forces and any more which the transport authorities of these services can obtain will be required by them. It must not be forgotten that, in a retirement such as is under consideration, in addition to the movement of the fighting forces themselves, depots at, at least, advanced bases will have to be moved, with the result that an attempt to solve the problem of a " scorched earth " by the movement of materials can be unhesitatingly judged incorrect unless unlimited time is available. Large stocks of materials of all descriptions will be found in the hands of mines, workshops, etc., in many cases covering all possible requirements for full operation for some years. Stocks, which in the aggregate total immense quantities, will be found in cities, towns and villages in the hands of large and small dealers while the store-yards of Government (e.g. P.W.D., Forest Departments, etc.) and of semi-official (e.g. Municipal Committees) organizations will appreciably add to the total. Even the bronze statues and plaques erected to the memory of previous Vice-Consuls and others are of value to the enemy's war effort.

The method usually suggested for the execution of a " scorched earth " policy is that of demolition by explosives, but, although it is usually possible to effect a considerable amount of destruction by this method, there is often no well-stocked explosive depot on which to draw. It is therefore necessary to ascertain the quantities and types of explosive available in ordnance depots, in mines, and with civil firms etc., and to reserve these for items of vital importance, which cannot be denied to the enemy in any other way (e.g. vital bridges). Fire caused either by explosives or by ignition is another method of destruction, but the burning of crops is a very " chancy " business. It is a difficult matter to burn pressed bales of cotton or hay (unless the bales are burst open, which takes time and labour), large baulks of hard timber and other such articles. Unless the fire is very intense and prolonged, the effect of fire is only to char the surfaces. With the greatly-increased use in the last twenty-five years of paper as money, large quantities have also often to be destroyed and, as these notes are usually pressed and bound in bundles, time and labour is necessary for their destruction.

Even when machinery is destroyed by breaking with a sledgehammer or the removal of essential parts, the enemy is left with considerable quantities of very useful metal, even although it may be only scrap.

The danger of placing one's pen to paper has often been stressed and the importance of denying to the enemy the day-to-day records of any business may not be fully appreciated. Apart from such items as the geological records of a mine, the distribution plan of an electrical supply or the lay-out of a water supply, the value of which to an enemy is easily apparent, such documents as muster-rolls and pay-sheets may be of almost equal value, as showing the names, and possibly the addresses, of men who, from their rates of pay, can give more information than the ordinary coolie. It is again difficult to ensure the destruction of such records by fire, especially when bound in volumes, even if saturated with oil or petrol.

It is hoped that it has been explained that the difficulties of carrying out a complete " scorched earth " policy, especially under Eastern conditions, are

immense and, as is usual in many similar problems, action must be confined to essentials. But to select these, the officer in charge of the project has to have a good knowledge of the economic difficulties being experienced at that time and which are likely to be experienced by the enemy—a form of training that does not often come within the orbit of the normal R.E. officer. Further the action taken must be co-ordinated, not only within that theatre of war, but, with action taken or in contemplation in other theatres in that part of the globe. It is no secret that oil is one of the vital articles of this war. It is again no secret that the larger producers of oil in the Far East are Borneo, the Dutch East Indies and Burma, and when considering the denial of oil-fields and refineries, it was necessary to co-ordinate the attacks on these objects in these three countries so that the same portions of the plants were denied to the enemy.

To any reader who may be perusing this article in a dry climate, the writer regrets to report that, in one denial scheme, 55,000 dozen bottles of beer had to be diluted. Diluted, in fact, by running the liquor into one of the main rivers, the volume of which was such as to prevent even a smell of beer arising. The reader may, however, rest assured that there was no means available at the time of transporting this. Had there been, the amount wasted would have been reduced to 54,999 dozen or even less.

AN IMPROVISED BRIDGE OF 2 IN. TUBULAR SCAFFOLDING.

By SECOND-LIEUTENANT OIDRICH VALENTA (CIV. ENG.),

Czechoslovak Field Engineers.

THE Engineer Field Company, to which the writer belongs, were asked by the Authorities to make good an 80 ft. gap in a pier, caused by a previous demolition, see Fig. 5, (*Photo*) with some form of foot bridge to enable people to have access to the far end.

The erection of any form of pier in the gap was considered impracticable owing to the strong tides, and the uncertain state of the foundations remaining after the demolition. It was therefore decided to construct a single span bridge over the 80 foot gap, having two single girders, each 90 ft. long to allow of a 5 ft. bearing at either end.

The material available was :—

Tubular scaffolding 2 in. tubes in lengths of 8, 12 and 20 ft.
Hook Couplers. See Fig. 1. (*Photo.*)
2 in. S.W.R. (used). Any amount in random lengths.

In the *Military Engineering Pamphlet No.* 4, on the practical use of this scaffolding, nothing could be found similar to this problem. It was considered advisable therefore to make up and test an experimental form of girder bridge, whilst awaiting the official decision to start work.

It was decided that this experimental bridge should take the form of two single tubular scaffolding girders braced together top and bottom and with side sway bracing (rakers). Each girder to consist of 10 bays 9 ft. long and approximately 8 ft. high, the depth of the girders being roughly 1/11th of the span.

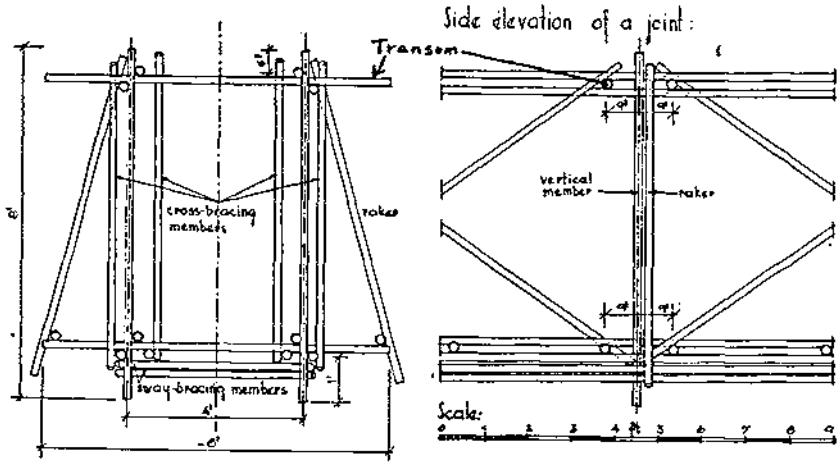
Horizontal cross-sway bracing was fixed under the roadway but not between the top flanges.

The following points of interest arose during the construction and erection of the experimental structure.

(1) The Hook-couplers cannot be used to connect tubes unless they are at right angles to each other. To fix the cross-bracing members (see Plate I) transom tubes were essential at the top and bottom of each joint—these transoms also carried the rakers.

PLATE I.

Improvised Scaffolding bridge—Test construction. Details of construction.—(hook-couplers are not shown.)



(2) *Construction of the top and bottom chords or "flanges"* (*vide* Plate II):

(*a*) In the top flanges, the whole length of tubing being in compression, complete contact between the end of tubes at the joints is essential, also some form of trussing to prevent buckling over their length. Each top flange was composed of two horizontal tubular members, made up of tubes butt-jointed every 20 feet breaking joint every 10 feet between the members. At each joint a vertical member (strut) was placed, secured by a hook fastener, making two vertical members per 10 foot bay. Across the top at every joint were fixed two transoms, *vide* sub para. (1), acting also as stiffeners for the top flanges and linking both girders together.

(*b*) In the bottom flanges or chords the tubes are in tension. Each chord was constructed of three tubular members. All joints in two of these members were positioned opposite the vertical struts, a similar arrangement to that in the top chord. In the third member the joints were in the centre of each bay. At the joints the tension was transmitted from the tube *a*, to the transoms T1 and T2 by the hook-couplers, and from the transoms to the tubes *b*; see Plate II, Bottom Chord tubes plan.

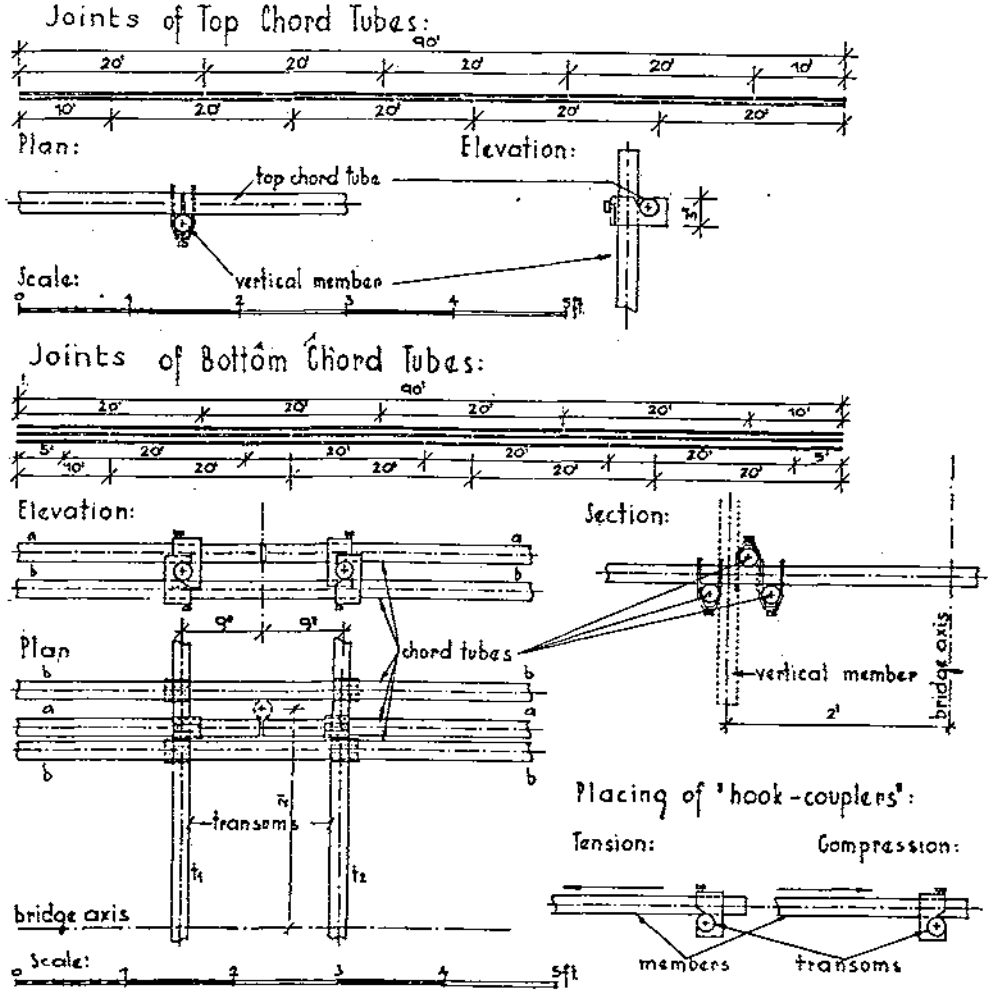
The transoms of the bottom flange also support the road bearers and the rakers.

(3) *Method of placing the hook-couplers.*

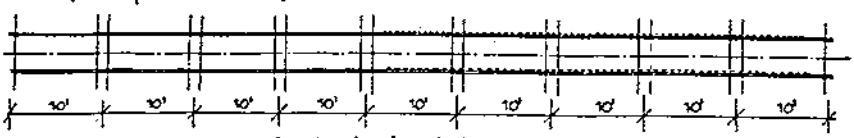
The hook couplers must be screwed to the tubes forming the flanges, the hook being placed round the transoms. At tension joints the hooks must face outwards

PLATE II.

Improvised Scaffolding Bridge.

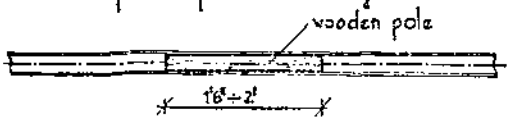


Collapse of 'test bridge': Top chords.



The top chords deviated as indicated by pointed lines.

Final form of extension joints:



and compression joints inwards. It is important that the hooks should be in good contact with the transoms before finally tightening the coupler screws; otherwise the structure would become permanently strained, which would be difficult to rectify.

After construction the experimental bridge was supported at each end clear of the ground for testing.

The total dead weight of the bridge was found to be 8,775 lbs. made up as follows :—

Total length of 2 in. tubing used, 2,592 ft., at 3 lbs. per foot	=	7,800 lbs.
600 hook-couplers at 1 lb. 10 ozs. each	=	975 lbs.
		8,775 lbs.

or 98 lbs. approximately per ft. run.

On test the bridge failed under a live load of 30 men, say 4,500 lbs., due to crippling of the top chord. From this data it was calculated that the maximum strain in the middle bays top flange was approximately 25,500 lbs., i.e., 12.7 lbs. per 8 ft. 6in. unsupported length of single tube. *M.E. Pamphlet No.* 4 gives the crippling load of such a tube as 14,000 lbs.

In the approximate calculation it was assumed that the sway bracing would neutralize the extra strains due to the effect of a live load, this combined with the fact that the actual unsupported length of the tubes in the top member was difficult to determine and in effect rather more than the 8 ft. 6 in. between transoms would account for the small difference in the above figures.

The test showed that the coupling of the bottom chord tubes was satisfactory but the unsupported lengths of the tubes in the top chord should be reduced and the structure stiffened.

The following alterations and additions were included in the final construction :—

(1) All vertical members and all cross-bracing members were doubled.
(2) Sway bracing of single tubes was added between the top chords.
(3) The raker tubes were made longer, and the bottom transoms increased in length from 8 ft. to 12 ft. thus increasing the angle of the rakers to the vertical.
(4) The depth of the girders was increased by using 10 ft. tubes in lieu of 8 ft. for the vertical members.
(5) All joints in the top and bottom chords were provided with wooden poles some 2 ft. *long* driven inside both tubes.

This made for ease in lining up the tubes during construction, and ensured that the compression joints butted fairly (Plate II, final form of joints).

(6) Top transoms and rakers were added to the centre of each bay.
For details of the final construction see Plate III.

These alterations involved an increase of practically 50% in the ft. run of 2 in. tubing required and in the hook couplers. The dead weight of the bridge structure was increased to 16,000 lbs., i.e., only 180 lbs. per ft. run—by an approximate calculation this dead weight gives rise to a strain of roughly 5,000 lbs. per tube in the middle bay, top chord.

The unsupported length of the chord tubes had now been reduced to 4 ft. 6 in. and the crippling load for this length taken from *Pamphlet* 4 is 28,600 lbs. Allowing a factor of safety of 3.5 the maximum permissible strain in the centre bay tubes would be 8,200 lbs., thus leaving some 3,200 lbs. available to meet the additional strain due to the weight of the necessary deckings and the live load caused by the users. A total availability of approximately 100 lbs. per ft. run of the bridge, sufficient for men in single file well closed up.

Fig 1.—" Hook-couplet."

Fig 2.—Reassembling of the structure.

Fig 3.—Top chord's joint.

Fig 4.—The bridge in launching (ropeway just being dismantled).

Fig 5.—View of the bridge over the gap.

Fig 6.—Bottom chord's joint.

PLATE III.—Improvised Scaffolding Bridge.

PLATE IV.—Lay-out of Launching Gear.

Are placed inside back cover to facilitate reference whilst reading the article.

An improvised bridge of 2 in tubular scaffolding
Fig 1 - 6.

Fig 7.—View of the bridge.

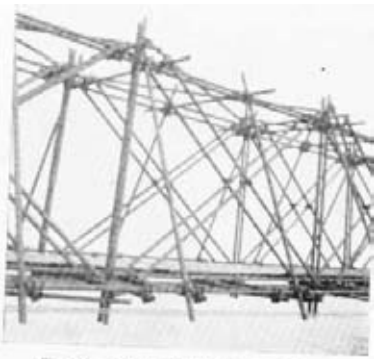


Fig 8.—View of the bridge's bay.

Fig 9.—Axial view of the bridge.

Fig 10.—View of the bridge.

Fig 11.—Wheeled bearing of the bridge.

An improvised bridge of 2 in tubular scaffolding
Fig 7 - 11

The time taken for the erection of the final structure by one sub-section of the company was 8 hours.

Launching the Bridge (see Plate IV).

The bridge was constructed on the deck of the pier which had been previously repaired. It was launched on 2 pairs of 2 in. S.W.R. which were strained over the gap by means of two treble 2½ in. blocks and then anchored under the decking over wooden bearing blocks (Plate III, Side Elevation). One S.W.R. only was taken over by boat; this cable was then utilized as an aerial ropeway to transport anything else needed on to the far side. A launching "nose" was improvised from two pairs of grooved wheels fitting the 4 S.W.R. launching ways and fixed to a transom tube:—a form of "leading bogie" truck. The tail of the bridge was similarly supported on two plain wheels. No intermediate carriage or support being provided, some method had to be devised to prevent the bottom chords resting on the near edge of the gap when the bridge was half-way across (which would naturally result from the sag in the S.W.R. launching ways thus placing the top chords in tension). Two alternative methods were considered.

(*a*) To raise the head of the bridge in launching by fixing special legs of requisite length between the bridge head and the four-wheeled truck. This would however make the bridge unstable when hauling over the S.W.R ways.

(*b*) To lift the tail of the bridge as launching proceeded. This method was adopted as it provided better control of the bridge during launching. The need for any type of high and somewhat unstable carriage for the wheels carrying the tail of the bridge could be avoided if the rear launching way were built up to the required form on the pier decking; See W and Wt Plate IV, "General idea of launching."

To reduce the height of the built-up railway the S.W.R's were raised some 8 in. at the edge (see Plate III, Side Elevation, and Fig. 11). The way for the rail wheels was built up of duck-boards on edge, with chesses on top to provide a bearing for the wheels.

Owing to the practical difficulty of building up this way with the material available, the lower ends of the vertical members did not completely clear the near edge of the gap as the bridge approached the half-way position during launching. This difficulty was met by using short lengths of tubing as rollers, with chesses on top to provide a bearing for the ends of the vertical members when passing over the edge of the gap. In consequence the top chords were subjected to a certain amount of tension and the joints opened slightly but closed up satisfactorily when the bridge was in position and bearing fairly on its ends.

The 8 in. wooden bearing-blocks under the S.W.R.'s at the edges of the gap proved very useful as the head of the bridge arrived at the far side; at this stage two wooden blocks 2 ft. deep were used under the hauling tackles to lift the head of the bridge as it came up to the far side of the gap.

The bridge was launched with its wooden road-bearers in position, it was then decked and the launching wheels taken off the head of the bridge, prior to lowering it on the prepared bank seat. The wheels were left on the tail end of the bridge (Fig. 11) to allow for movements due to expansion and contraction of the steel structure and the action of the waves on the pier piling.

The party for launching the bridge consisted of 40 men organized as shown on Plate IV, Plan. The time taken was 2 hours. The 4 S.W.R's used for launching were retained to give additional strength to the bridge. To ensure contact with these cables a transom was fixed underneath the bridge to the lower ends of the vertical members at every third bay, thus obtaining the effect of a trussed girder, see Fig. 7.

ORGANIZATION TODT.

By DR. ALFRED VAGTS.

(From the *Infantry Journal* of June, 1943.)

THERE was a time when the Reichswehr was the "sole arms-bearer" in the Third Reich (Basic Military Law of May 21st, 1935), this is no longer the case. But at no time was it the Reich's only "spade-bearer" for war. One mobilization of spade-bearers was undertaken through the "Organization Todt." In their work of re-arming Germany, the professionals of the Wehrmacht had numerous helpers. Among the organizations definitely welcome to the officers was that of Fritz Todt, even if not all the works undertaken by it were equally approved by them. It would appear, for example, that the first large scale enterprise on which Todt was employed, starting in 1933, the building of automobile express highways, was undertaken from the Nazi zeal, not to say frenzy, for imitating American and Italian roads of this kind, and as part of the general motorization of the German nation. At that time, however, the Reichswehr was of the opinion that the building of such roads was premature, since the enemies of Germany were vastly superior to her in motor potential and that consequently these roads, for the time being at least, constituted invasion routes rather than sally ports. Leaving such differences of opinion aside, the Wehrmacht found Todt decidedly useful and easy to work with. Perhaps the reason was that Todt was more of an expert than a politician, and only occasionally delivered a speech in Nazi vein.

Fritz Todt was born in 1891, studied engineering, graduated with a dissertation on "The Sources of Errors in the Construction of Highway Surfaces from Tar and Asphalt," and then served in the First World War with the artillery and the air force. He afterwards worked with a large Munich highway-construction firm, of which he became manager and part-owner in 1928. Unlike so many other "joiners," he was therefore a rather successful business man when he joined the Nazi party in 1923 and the S.A. in 1931, reaching eventually to the rank of *Standartenfuhrer* on the staff of the Supreme S.A. Leader. Being an "old fighter" in party battles made Todt the expert who could be trusted politically by the party leadership and on whom office after office could be piled until in the matter of office holding he even surpassed Goring himself.

The first of the public works undertaken by Todt was the Enterprise for the Building of Reich Express Highways (*Unternehmen Reichsautobahnen*) which, based on a law of June 27th, 1933, envisaged the construction of 6,500-7,000 kms. (or over 4,000 miles) of express highways within the ensuing six years (which, accidentally or not, would make the termination of the work coincide with the beginning of the Second World War). The work was announced as an unemployment relief project on the largest possible scale and Todt himself told the VIIth International Roads Congress held in September, 1934, at Munich, that these "roads of Adolf Hitler were a work of peace." As a public works enterprise it was administered and legally represented until early in 1941 by the Reich Railroads, an arrangement which was designed to avoid competition between the State-owned railroads and the new highway system and to ensure a routing which would be complementary rather than competitive. Todt himself was appointed Inspector-General of German Highways (*Generalinspekteur fur das deutsche Strassenwesen*) and as such was entrusted with the task of routing the new roads as well as settling their engineering features. The *Reichsautobahnen* enterprise was given a board of directors which included Major Huhnlein, leader of the Nazi Motor Corps and other German notables.

The understanding with the Reich Railroads made the routing of the new roads on the whole one dictated by transport requirements, of an economic rather than strategic character, though in total war and the preparations for it that distinction is small. While at first sight the routes offer a bewildering spectacle of loose ends, actually they fit on the whole into a general system of roads comprising two North-South lines, connecting Hamburg-Hanover-Frankfurt-am-Main-Karlsruhe and Stettin-Berlin-Leipzig-Munich, and two East-West lines connecting the Ruhr-Hanover-Berlin-Frankfurt-an der Oder and Karlsruhe-Stuttgart-Munich-Reichenhall. Two lines—Hamburg-Berlin-Breslau and Ruhr-Munich-Passau—running more diagonally are as yet only planned. They point to a more imperialistic tendency and are more in the character of sally lines for *Mitteleuropa*. Of the former routes, some 2,000 kms. had been built by the end of 1937, and it is estimated that an additional 1,000 kms. was built in each of the two following years.

The imperialistic urge behind this road building was on the whole given no hope for the execution of its dreams until after the day of victory, though there was a good deal of scheming that reached beyond the German frontiers. Distrustful of this, the Swiss declined to have great international highways, no matter who planned them, run directly through their own country. Other satellites of Germany like Hungary have continued (even during the war) with the planning of automobile highways intended after the war to give immediate access to the German routes at Vienna and Graz.

Much of the German " large space " scheming runs along the lines of intra-European highways, connecting the seats of the " master race " with the satellite countries. This might be called the road section of Geopolitics. What old Lord Salisbury called " lunatic lines," the lines of imperialistic expansion in days gone by along which railroads were to run, and along which nowadays automobile roads are to extend, will be the lines along which a German-dominated Europe will direct its traffic. While the war has stopped most actual construction, nevertheless the Reich Government has encouraged and permitted the Danish Government to carry on the work on the " Bird Flight Line " from Hamburg to Copenhagen, a line for railroads and automobile highways, envisaging large new bridges including one spanning the Fehmarn Sound, as well as ferries, a system which is to shorten the railroad travelling time from nine and a quarter hours to a little over four hours. The war has still left some " large space " speculations alive and German road planners have given their blessings to French plans for a system of canals and roads connecting the Atlantic and the Mediterranean, a system which they view as part of a trans-continental system of communications in the " new Europe " stretching between Bordeaux and the Black Sea.

Still another group of planners close to Todt and his work are the space planners working inside the Reich, men making blueprints for settlements, re-locating industries, arranging for spaces in which a *Grossraumwirtschaft*, a large space economy, would function. In June, 1935, Todt ceded that part of his organization which was originally intended and used for the preparation of the automobile highways to these planners, who did business under the resounding title of Reich Office for Space Order, *Reichstelle fur Raumordnung*, later renamed Association for the preparation of Reich Planning and Space Order, *Gesellschaft zur Vorbereitung der Reichplanung und Raumordnung*. Their task was defined as " Centralizing over-all planning and ordering the German space for the total territory of the Reich."

The express roads built under Todt's direction are very similar in construction to U.S. super highways, though the road bed may be made to carry somewhat heavier burdens, including heaviest calibre guns. They have an over-all width of 78½ feet, including two concrete one-way driveways of 24½ feet on which three cars can travel abreast, with the driveways separated by a strip of lawn

and bordered on the outsides by other strips of lawn. There are no grade crossings and the gradients on the whole do not exceed 5 degrees. The expenditure on the construction of these national roads plus maintenance amounted to somewhat over one billion marks a year on the average in the later 1930's, of which about 100 million a year went for maintenance. The administrative personnel as in so many Nazi enterprises was rather numerous, giving jobs to many an "old fighter." The office work of the *Autobahnen* construction in January, 1935, involved 4,260 people, when at the same time 80,294 workmen were employed on 1,191 km. of roads under construction—that is to say, one "clerk" for nineteen workers and four per km. of building work.

The principal engineering experiences gained on this construction work were in the field of mass employment of labour and the mass handling of materials. By the spring of 1934, 15,000 men were employed on twenty-two projects, totalling 1,076 kms., with 500 million marks being spent in each of the two years 1933 and 1934. In 1934 altogether 100,000 men were employed on the highway work directly and some additional 150,000 on work connected with this construction, such as the building of bridges, work in quarries, etc. Thus in 1935, 250,000 men were employed on or for the *Reichsautobahnen*.

These experiences and performances qualified Todt in the eyes of the Fuhrer for the direction of the larger and more urgent work of finishing the construction of the Westwall, the line of fortifications behind which German rearmament was to be completed without fear of interference on the part of the Western powers. Begun in 1936 by the Army itself under the direction of its own engineers, the work done within a year and a half satisfied neither the Fuhrer nor the leader of all German technicians, and by an order of May 28th, 1938, Hitler told Todt to take this work in hand and bring it to a quick conclusion. For the purposes of this work the "Organization Todt" was then set up.

From his headquarters at Wiesbaden, Todt organized the work as a gigantic problem in excavating, steel and cement procurement, concrete mixing and transporting, concrete pouring, labour transporting and housing problem, all put on a twenty-four hour basis. As the Nazi and German military press depicted this enterprise, a variety of organizations and enterprises were called upon to contribute—the German cement industry threw in one-third of its total production; private construction firms furnished the largest excavators available and fully a third of all concrete mixers in the Reich, as well as pneumatic drills, tractors and 15,000 trucks, or over one-third of the whole German truck fleet. The Reich railroads put at Todt's disposal 6,000 freight cars per diem, later raised to 8,000, and the Reich postal service, which runs the larger part of the German rural bus lines, sixty-eight per cent of its total fleet. The National Socialist Motor Transport Corps (NSKK) furnished numerous truck drivers, despatch riders, and traffic control officers.

It was a tremendous test mobilization of machines and men, and not without its disturbing effects even in the Third Reich. For one thing the health authorities noted an "increase of gonorrhea in the regions of the Westwall."

The O.T. began its work with 35,000 men of its own on July 20th, 1938, practically all building workers; this number rose to 45,000 a week later and thereafter in the following acceleration:—77,000 on August 3rd; 191,000 on September 7th; 213,000 on September 14th; 241,000 on September 21st; 278,000 on September 28th; and to its maximum of 342,000 on October 6th. While these numbers rose and the work got actually under way, Hitler, speaking at the annual party day rally on September 12th, called it "the most gigantic fortification work of all ages." To the labouring contingents were added 90,000 workers employed by the Staff of Fortification Engineers or *Festungspionierstab*, who did the surveying, cable-laying, camouflaging, etc., and 100,000 men of the Reich Labour Service, on whom Todt increasingly drew as a labour force.

Thanks to this mobilization and co-operation of forces and materials, the

work on the Westwall was completed by Todt in December, 1939. The French, already deeply impressed by Hitler's boasts about the strength of his Wall, left it undisturbed even after the outbreak of the war. The main work had been completed by May, 1939, when Todt discharged a sizeable number of workers and transferred others to similar work in the east of Germany.

With the coming of war Todt's activities took on, if possible, a more exclusively military character. He was made a reserve major-general of the Air Forces. And although he already held the offices of Chief of the Four Year Plan, and General Deputy for the Regulation of Building Construction, he was now made Inspector General for Special Tasks under the Four Year Plan (February, 1940), Inspector General for Water and Electric Power (*Generalinspektor fur Wasser und Energie*) and, most important, Minister for Armaments and Munitions (March 17th, 1940). " Dr. Todt, as one of the greatest German engineers, represented technology in the topmost direction of the State," said the *Pariser Zeitung* on May 20th, 1942.

Under the direction of Todt far-reaching reorganizations in the German war industries were undertaken, but not all of them were in their final shape when Todt was killed in an aeroplane accident early in 1942. He was replaced by Speer, an architect and the executor of some of the Fuhrer's own architectural fantasies in addition to some of his own, which are said to include the blue prints for a Europa House, a palace for the future meetings of all the delegates of a German-dominated Europe.

Todt and Speer tended to establish the supremacy of the engineer over the economist in the war industries. In fact the Nazi press announced that the day of the technician had finally arrived, that price considerations were mainly preserved to bring out the comparative usefulness of plants in war production, that the director of a war production plant was to be the engineer and not the owner or manager. Economy engineers were appointed to determine where steel could be saved in the construction of factory buildings and where fuel could be used more economically.

The O.T. followed the *Wehrmacht* " frontward " into the several conquered countries, always, as is emphasized, in close co-operation with the various technical units of the *Wehrmacht*. Todt is reported to have said in those days : " I now need engineers who do not sit in construction offices but who are in the midst of events. I need technicians who are at the same time leaders." The Front-Engineer, *Frontingenieur*, was about to have his day—with the coming of war, a large part of the workers of the O.T. became " front workers," doing tasks in the rear zones, often close to the front lines.

Considering the habit of the Nazi press to claim much for the various war-making organizations—in which the totality of claims seems often to go beyond the sum of the performances—it is on the whole rather difficult to determine from these various " write-ups " exactly what are the functions, tasks and performances of these several organizations at different times. Much for example has been claimed for the O.T. in the field of " adapting the industry in the conquered countries to the requirements of Germany's war industry " but these do not square with those put forward on behalf of the Economy and Armament Staff of the Wehrmacht.

Apparently the largest part of the O.T's war work has been along its old fields, highway building and the construction of fortifications. In this activity it was used much as the so-called *Armierungstruppen* of the First World War were used by the German army. Seen with army eyes, the O.T. constituted engineering troops farthest away from the battle-field, with the so-called *Bautruppen*, a body of definitely military character wedged in between the O.T. and the front line of regular engineers. The O.T. consequently remained largely without uniforms, though most of the other features of military organization were incorporated in its administration.

In Russia the emphasis of the work of the O.T. was again on road building, as Hitler expressed his disappointment in a Reichstag speech of September 30th, 1942, "Russia unfortunately has no roads or only fragments of roads. Thus we have to build roads as well. The first really gigantic roads are now being put into service by our Organization Todt. In some regions paths have to be designed through swamp land. These are regions where formerly no one believed any traffic could be established." In addition to road building, part of the long distance traffic, as for instance between Berlin and Smolensk, was undertaken by the transport division of the O.T.

In order to keep highways and railroad tracks clearer during the winter of 1942-43 than they were in the preceding winter, a special snow-removing service was set up by direction of Speer. A committee of experts designed snow removal machinery and instructed a special personnel.

The destruction of railway bridges in war has usually presented the greatest obstacle to an early resumption of traffic. In the First World War this burden was found so very onerous by the regular German engineering troops that private firms specializing in bridge construction were called in to assist when it came to the more permanent repairs and reconstruction work. Now the O.T. has been called in. It has been engaged for many months on the repair of bridges across the Maritza River where rail traffic into Turkey is still interrupted; it has also worked to get Bulgarian roads into better shape in order to facilitate traffic with Turkey. It has repaired the combined rail and road bridge over the Danube at Belgrade-Pancevo, of which two spans had been destroyed in April, 1941, and has since proceeded to reconstructing the Belgrade railway station. Together with an engineer unit and a Hungarian construction battalion, a body of 2,000 O.T. workers repaired an important bridge on the Dnieper.

In the west of conquered Europe the greatest single task for the O.T. has been the "Second Westwall," as it has been called, a line of concrete fortifications along the westernmost rim of German conquests from Kirkenes, near the North Cape, to the Spanish-French frontier. Into this work has gone most of the output of the cement factories in the occupied countries, which the occupation authorities have requisitioned. The purpose of this wall is to forestall invasion of the continent from the sea. Todt's successor Speer boasted in June, 1942, that in the sector along the Dutch coast from which the population has largely been removed: "every farm has become a blockhouse, and a network of roads has been constructed to carry supplies to any possible front." It was some such works—"hotels turned into forts," etc.—that the commandos encountered at Dieppe where they found members of the O.T. on the spot, some of whom they made prisoners temporarily.

While the Eastern front presented the Germans with a number of problems incident to wide distances and low temperatures, the African front offered others due to similar distances and high temperatures. In this theatre of war, the "Transport Standard," which had been at Speer's disposal before he became Todt's successor, was used as part of the supply system. Todt himself had evolved for the Africa Corps a whole repair shop system, placed behind the front and if necessary under enemy fire, which enabled the Germans to repair damaged fighting vehicles quicker than their enemies.

In the First World War requisitioned transport was used by the German Army with some success. Present German commanders are quite open-minded about the use of non-military transport such as offered by the O.T. and the N.S.K.K. on land and water. The O.T. maintains a fleet of its own. In the exportation of goods from Portugal, for example, these are carried in Portuguese bottoms only as far as Bilbao, the farthest point north to which the Portuguese are willing to let their own ships go. Here goods are transferred to ships belonging to the O.T. Where the transportation needs are acute, as in Norway in the

summer of 1942 when fortification lines were being built, the O.T. diverted the greater part of its shipping space and manpower to Norway.

The mobility of labour, never as great under ordinary conditions in Europe as in the United States, has always been accelerated by war. German military leaders realize that complete military mobilization implies a certain waste of energy and personnel. A military body of equal size calls for more superiors than a body of civilians working on military tasks of a simple nature. To use German terminology: a "group" in the military sense calls for at least one non-commissioned officer for every eight men; a "group" of O.T. workers, however, has only one overseer for 25 or 30 men. Thus for very sound reasons the complete militarization of such bodies of men seems undesirable. The O.T. allows for the labour mobility which "large space was economy" requires. That requirement characterizes the O.T., the units of which have worked and are working in the regions between Kirkenas and the Mediterranean, the Atlantic and the Black Sea, as well as in the German homeland, where on occasions they repair air raid damages.

Within the Old Reich, O.T. groups have been employed in transferring German industries to the east under the Four Year Plan Office. According to German reports, some 40,000 construction workers from the O.T. formerly employed on this work, have undertaken the reconstruction of Ukrainian key industries.

Before the outbreak of the war, regulations for hiring O.T. workers provided for a minimum of one year's service. The O.T. furnished shelter, food and transportation for workers whose residence was too far away from the various projects to commute. No less than 200 large labour camps were set up for those employed on the Westwall, in addition to those of the Reich Labour Service in that vicinity. Working conditions were hard enough, with a twelve-hour day, including only three short intermissions of altogether seventy minutes, and a seven-day week, with a furlough of ten days every six months. Release was hard to obtain. These conditions were not improved after the outbreak of the war. Those workers not taken into the armed forces had to be given a so-called *Treugeld*, a premium for long term services and re-enlistment.

Another psychological sop for these workers was the introduction of a uniform. As a publicity man for the O.T. declared: "Since with the increase of foreign labour in the organization German labourers might conclude that they were only little, if any, better than prisoners of war and foreign civilian workers, they were to be given a uniform of their own in order to set them off." Uniforms were worn within the O.T. by Germans only (aside from the overseer personnel). They consist of a rough khaki-coloured cloth tunic open at the throat, a red brassard with a swastika in a white circle on the left sleeve, and a narrow band on which the words "Org. Todt" are inscribed in white Gothic lettering about 3 inches above the left cuff. The belt is black with a plain buckle and the trousers are tucked into the jackboot. The foreign workers wear civilian clothes, with the addition of a grey brassard on which a unit or group is stitched.

The administration of the O.T. comprises the following services:—

(1) The central office is located at the *Avus-Nord-schleife* in Berlin—the Avus is an automobile highway and racing track in the west of that city.

(2) Chief works departments which supervise the various labour projects in the field, having direct liaison with Berlin.

(3) Front control and security services, responsible for the working, housing and hygienic conditions of the O.T. workers. The security services conduct investigations and supervise the transfer of men from labour camps to punitive camps and back.

(4) Principal camps, the living and eating quarters for the O.T. men. Each camp is placed under a camp leader or *Lagerfuhrer*. The men in the camp are assembled in working gangs or groups of from twenty-five to thirty under a

group leader or *Gruppenfuhrer*. Each group is inspected by an engineer of the Chief Construction Office, and every three days by a physician.

(5) Supply camps maintain stocks of food from which rations are drawn.

(6) The Todt Police, recruited from members of the O.T. protect important works by day and night and are responsible for the safety of trains and trucks of the O.T. *en route*. They are also responsible for the discipline of the O.T.

(7) Punitive camps, where O.T. men are sent for breach of discipline, slow work or idleness. Prisoners are usually segregated by nationality, and work in these camps is carried on under the supervision of armed sentries, with no rest periods during the day.

(8) Medical service.

(9) Propaganda Staff which employs O.T. war reporters (O.T.-*Kriegsberichterstatter*) and takes care of the publicity for the organization. It edits the paper of the O.T., under the title of *Der Frontarbeiter* (The Front Worker), which has appeared since December, 1940. It also edits books with titles like *Die Propagandastaffel der O.T. Berichtet* (The Propaganda Staff of the O.T. Reports) or *O.T.-Kriegsberichter, Dichter und Maler erleben den Einsatz der Frontarbeiter* (O.T.-War Reporters', Poets' and Painters' Experiences with the Front Workers.)

The recruiting of workers for the O.T. has undergone nearly a complete swing from voluntary engagement to impressment. While the construction of the automobile highways was carried out with German labour largely engaged on a voluntary basis, the original Westwall labour force was largely conscripted. Aside from the Reich Labour Service, the strictly Nazi-controlled employment offices (*Arbeitsamter*) furnished one large contingent. A call also went out to certain contracting firms and industrial plants for part of their personnel, ranging from engineers to workers and their equipment. Occasionally the whole personnel and equipment of a construction firm was taken over.

At a later date, building and construction firms, German and non-German, have been similarly absorbed by the O.T., which took in some 5,000 German firms of various kinds, mostly building concerns. Where such builders tried to obtain profits higher than the German authorities were willing to concede, the O.T. undertook a clean-up and on one occasion, in Norway in the summer of 1942, deprived twenty firms of the right to carry on their trade. In September, 1942, the O.T. had engaged 500 chauffeurs in Norway, all mechanics available, eighty per cent of the garages and automobile equipment. Recently the O.T. has repeated the methods used while the original Westwall was under construction. When soldiers are unavailable to do the work for them, construction firms are mobilized *in toto*, as on January 15th, 1943, after the Russian successes, 5,473 German firms were declared mobile and told to hold themselves ready to leave for Russia, with their equipment and personnel, to have tools and spare parts ready for packing, and to have workers medically examined and inoculated.

The wages paid by the O.T. were originally non-military and extremely variable, often depending on those drawn by a worker in the building trades. In October, 1942, these wages were made uniform, at least for the "front workers" of the O.T. Beginning January 1st, 1943, uniform wages were introduced for all construction work undertaken in Europe. In the case of the "front workers," pay is equivalent to a soldier's pay. The difference between former higher wages and the present uniform wage is paid as a family allowance to the worker's dependents.

The numerical strength of the O.T. in war time has never been made public, but estimates vary between 450,000 and 2,000,000. Early in 1940 the Germans announced that the O.T. at that time included nearly half a million, again in the summer of 1942 it was stated by them that over 200,000 trained men were employed for several months along the Channel coast. With its strength, the

composition of this force had also changed considerably since the outbreak of the war. The original force, needless to say, was practically all German. But since 1939 Germans have been taken out for more immediate fighting purposes and have been replaced by either "voluntary workers" from the occupied territories or the Allied countries or even prisoners of war. Early in 1940 it was announced that the O.T. had lost the majority of its German workers to either the armed forces or the war industries. By August, 1941, only one-fifth of its strength was presumed to be German, a large part of these being overseer personnel. There were complaints that the foreign worker, and in particular the "Eastern worker," proved more inefficient than the original German worker.

With increased shortcomings in the German war labour supply, ever more pressure has been put on the German-occupied countries to provide workers. Open labour conscription was avoided, but the various administrations of these territories as well as the several Quisling organizations were told to obtain hands for either war industries in Germany or for work done by the O.T. inside and outside Germany.

HINTS FROM HISTORY.

The Royal Engineers and the Air Force.

By BRIGADIER-GENERAL W. BAKER BROWN, C.B.

THE success of the Royal Air Force in the present war has roused a wave of interest in the early stages of its growth and statements have been made which, if based on fact, sometimes overlook the services of individuals who have contributed to its success.

There can be no doubt that the Balloon Service, which was originally developed by the Royal Engineers, was the predecessor if not actually the ancestor of the R.A.F. and certainly the system of fixed balloons which now form a very visible part of our defences are the direct descendants of the R.E. balloons.

In *The R.E. Journal* of March, 1942, an interesting article was published on "The Use of Balloons in War," by Colonel Sir Charles Arden-Close, who was one of the young R.E. officers who went through the Balloon School at Chatham in the early '80's. This article includes the work of the R.E. with balloons from 1862 to 1902 the end of the Boer War, and the ordinary reader reading Arden-Close's conclusion may assume that the use of balloons in the British Army practically came to an end in 1902 except for the purpose of providing anti-aircraft barrages. The facts are that the use of balloons for observation developed considerably and was supplemented by the system of Cody Kites which more than doubled the value of the service, while after the Flying Services were handed over by the R.E. to the Royal Flying Corps, observation balloons continued to be used in large numbers, as many officers who saw the continuous line of balloons which punctuated the trench system in France up to 1918 can testify.

The present article is intended to summarize the work of the R.E. from 1862

to the transfer to the Royal Flying Corps in 1912, but facts already given in Arden-Close's article will be dealt with only shortly.

The first official connection of the R.E. with ballooning dates from 1862, when two young officers of the R.E.—Lieut. G. E. Grover and Capt. F. E. B. Beaumont, were attached as Associate Members to the R.E. Committee to carry out experiments.

These two officers, with Sir F. Abel, the W.D. chemist, formed a sub-committee which arranged experimental ascents at Aldershot in July, 1863, and at Woolwich in October of the same year, though no opportunity occurred for the use of balloons on service.

In Vol. II of our *History* mention is made of some officers who succeeded the early pioneers, including Major P. Scratchley, Capt. C. M. Watson and Major H. P. Lee. A working method of producing hydrogen gas was evolved, but the gear was rather heavy for use in the field; patterns of balloons were also prepared and all parts of the equipment were tried, including a waggon carrying a winch, and also an automatic camera which took a series of six plates. When signalling was perfected by the R.E. in 1870, it was brought into service with the balloon and later when the telephone was first tried by the R.E. about 1878, it was also used, a telephone cable being incorporated in the mooring rope. The weak point of the gear up to 1882 was the silken envelope which was not quite impervious.

In 1882 Major J. R. B. Templer of the K.R.R. Militia, who was well known as an amateur balloonist, brought to the notice of the War Office a method of constructing the balloon envelope by the use of gold-beater's skin. This seemed so promising that a grant of £150 was made for experiments at Woolwich and these proving successful, the method was adopted and Templer was engaged to develop his invention. An old ball court in St. Mary's Barracks, Chatham, was adapted as the nucleus of a factory, the process of manufacture being kept secret. Templer also proposed and developed a system of compressing the hydrogen gas into steel cylinders, of which forty-four were fixed on a wagon which could accompany troops on the march. The Balloon detachment was at this time under the command of Capt. H. Elsdale and some of the younger officers were attached to the Balloon school during 1883 and 1884. These included J. R. L. Macdonald, R. J. Mackenzie, G. E. Phillips, C. F. Close (later Arden-Close) G. M. Heath and H. B. Jones, most of whom appear again in the history of the Balloon units.

The practical value of the balloon equipment was tested very soon. In the autumn of 1884 a section was sent out with the expedition to Bechuanaland under Sir Charles Warren. Major Elsdale commanded the section with Lieut. R. J. Mackenzie as his observer. Sir Charles Warren was successful in accomplishing his object of freeing Bechuanaland from an invasion by Boer intruders without fighting, but the balloon proved its practical value and much impressed the native chiefs.

In 1885, a Balloon Section accompanied Sir Gerald Graham's force in his advance from Suakim, it was commanded by Major Templer with R. J. Mackenzie as his observer and did good work at the battle of Tofrek.

In 1886, Major C. M. Watson relieved Major Elsdale in command of the Balloon detachment and under his command the finishing touches were put to the equipment, a training ground was taken at Lidsing, near Chatham, and systematic instruction was given to officers and sappers. By 1890 it was decided that a Balloon Section should be given a definite place in the organization of the Army Corps which was centred at Aldershot, the Balloon School was moved to that station and Major Templer was appointed Commandant of the School and Superintendent of a new Balloon Factory, which was formed at Farnborough.

On the outbreak of the Boer War in 1899, No. 1 Balloon Section under the command of Capt. H. B. Jones was detailed for the 1st Army Corps on its des-

patch to S. Africa under Sir Redvers Buller, and a newly formed 2nd Section under Major G. M. Heath was sent to Natal, where it joined Sir George White at Ladysmith and was employed during the siege. A 3rd Section under Lieut. R. D. B. Blakeney was sent out the following year. Of these the 1st Section accompanied Lord Roberts on his march to Bloemfontein and Pretoria, and did good service at Paardeberg and in the other battles on the route; the 2nd Section put two balloons into the air until the supply of gas failed; the 3rd Section accompanied the force which advanced from Kimberley. An extra section was improvised in Natal by Capt. G. E. Phillips, using balloons and gas tubes borrowed from Cape Town. This proved its value during Buller's advance on Ladysmith.

At home three extra sections were formed at Aldershot. At the opening of the war, Templer, who had been interested in developing the use of steam transport in the Army, was sent out to S. Africa in charge of a detachment which later became the 49th. Coy. R.E. He was relieved temporarily at Aldershot by Major (Bt. Lieut.-Colonel) J. R. L. Macdonald, who in 1900 took out a Balloon Section for the Boxer campaign in N. China, but it arrived too late to take part in the fighting.

On the conclusion of the South African War, considerable interest developed in many countries in the use of transport by air; this took two forms, first a dirigible balloon, that is a balloon of a suitable shape and size to be propelled through the air, and secondly a flying machine which at first took the form of a kite or kites connected to an engine. Many people in this country were interested in these developments, among them was Colonel R. M. Ruck, R.E., who had considerable influence behind the scenes in the development of the new science of aeronautics. In 1903 a beginning was made with the construction of a dirigible balloon at Aldershot, but the funds available were so small that it took three years to complete the work. In the same year a young officer, Lieut. J. W. Dunne of the Wiltshire Regiment, who had been wounded in the Boer War, invented a form of flying machine which would be automatically stable, and was employed at Farnborough to carry out experiments with his invention. Another inventor, Mr. S. F. Cody an American, was engaged to try out a system of man-lifting kites, which promised to be an important auxiliary to balloons; the utility of the latter was adversely affected by a high wind in which kites would be at their best.

In July, 1904, another step in advance was made by the appointment of Major (Bt. Lieut.-Colonel) J. E. Capper, R.E., as Commandant of the Balloon School and Factory at Aldershot and under his control all the above experiments were pushed to a conclusion. The dirigible balloon was completed, after Capper had paid a visit to Paris to find an engine light enough for the work required, no such engine being then obtainable in this country; when it was completed Capper with Mr. Cody as crew made a spectacular flight round St. Paul's, but being unable to return against a head wind came down in the grounds of the Crystal Palace. The Dunne aeroplane was completed and flown, though later superseded by other types. The Cody kites after a thorough trial were recommended for introduction into the service, after Capper had himself given them many personal tests.

At the end of 1904 when the estimates for 1905-06 were under preparation, a proposal was made on the authority of the Secretary of State—Mr. Arnold Forster—that money could be saved by the abolition of the balloon service. At this time the R.E. and all their work were being very adversely treated following the proposals of the Esher Committee, and there was a real risk that the proposal would be adopted. Colonel R. M. Ruck at the beginning of 1904 had been appointed Director of Fortifications and Works, the new head of the Engineers in the War Office. The writer of this article had joined Ruck's staff in 1904, and at the end of the year had been appointed Inspector of Electric Lights, and

among other duties, had been made responsible for all work connected with the supply of technical engineer equipment for R.E. units. Among this was the administration of the small sum, about £6,000, allotted annually for balloon services. The proposal to abolish ballooning in the Army was remitted for consideration to two members of the Army Council, Lt.-General Douglas, the Adjutant General, and Maj.-General Sir J. Wolfe Murray, the Master General of the Ordnance. The first I heard of this was a summons from Ruck to attend him at a conference in the old War Office with these two officers; the matter was considered secret and important and I was the only other individual present at the Conference. I was naturally very interested to hear what line of defence Ruck would adopt, but I was more than surprised to hear him assert, "that he was confident that in the early future, the question of military supremacy would be decided by fighting in the air." His views prevailed and the Balloon Vote was saved. That summer the experiments with the Cody kites were completed, and the G.O.C. Aldershot thought so highly of the result that he sent the chief staff officer of the command on a special mission to the War Office. This was Colonel A. M. Murray (now Sir Archibald), and with his support, the kites inventions were purchased and embodied in the equipment of the balloon units, while Mr. Cody was engaged for a term of years to supervise manufacture and training. Cody later designed and constructed a form of aeroplane, but was unfortunately killed in one of his trial flights. While we got some increase in our Vote the total never exceeded £9,000 a year up to the end of 1908 when I left the office.

In 1906, Capper was sent over to America to investigate the claims of the Brothers Wright that they had constructed a machine which could fly. He reported that their machine could certainly do what they claimed and brought with him a firm offer under which the British Government could purchase the exclusive right for the sum of £20,000, coupled with an engagement of the brothers for a term of years. This proposal was supported by Ruck and was submitted to the Government by the Army Council, but was rejected on financial grounds. The inventions of the Brothers Wright were subsequently purchased by the French Government.

Capper remained at Farnborough till 1911, when he was succeeded by Major Sir Alexander Bannerman, under whom the balloon organization of the R.E. was expanded into an Air Battalion. By this time foreign nations had begun to develop their air forces and the question was thus forced on the notice of the government and the public, so that in the next year, 1912, the Royal Flying Corps was formed with an establishment of 1,000 officers and men, and an estimate was voted for the new Corps of one million pounds. A new civilian director was appointed for Farnborough. This change was the end of the responsibility of the R.E. for the flying service, but some officers of the R.E. were transferred to the new Corps when it was formed.

Major-General R. M. Ruck left the War Office in April, 1908, but he continued to interest himself not only in the use of flying machines, but in many technical details, and on his retirement in 1912, he was elected Chairman of the Royal Aeronautical Society, a post which he held till 1919. He rejoined for duty during the War of 1914-18 and after service with the Central Force and in the Eastern Command was appointed in 1916 Vice-President of the Air Inventions Committee under the Air Ministry and was also made a member of the first Civil Aerial Transport Committee. In 1920 he received the K.B.E. for his work for aeronautics.

Although the R.E. had ceased to be responsible for the flying service in 1911, they remained responsible for the very important work of the selection and construction of aerodromes up to the formation of the R.A.F. in 1918. This work was in charge of Colonel W. Macadam of the R.E., who had joined the staff of the Director of Flying Services in 1912, in charge of the technical side of his office. On the outbreak of the first World War, Macadam was transferred to the

office of the Director of Fortifications and Works in charge of the construction of flying stations and aerodromes, and acted as a liaison officer between the two services. All the stations constructed in Great Britain and Ireland during the war were selected and designed under his control, the preliminary arrangements for clearing the area and the removal of telegraph wires and such details were made in the War Office, and the scheme then passed to the command concerned for execution. On the formation of the R.A.F., Macadam was transferred to the head office in charge of their Works Services.

THE LAGHOUAT ESCAPE TUNNEL.

By WING COMMANDER R. G. BRICKELL, A.M.INST.C.E.,

Airfield Construction Service, R.A.F.

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INTRODUCTION.

IN October, 1941, about ninety British military internees, who by the accidents of war had arrived in various parts of Vichy French North Africa, were concentrated in a barracks on the oasis of Laghouat, about 400 kilometres (248 miles) south of Algiers, and on the fringe of the Sahara desert. The internment camp was arranged on the German model. The living quarters were enclosed by triple 10-ft. close barbed wire fences, the spaces between which were filled in with concertina wire, whilst a *ligne courante* 2 metres (6 ft. 6 ins.) inside kept the internees from interfering with the main fences. Guarding was very strict, and was carried out by Arab *Spahis* and *Tirailleurs* patrolling outside the wire. Every inch of the surround was, in addition, covered by well-placed searchlight positions, machine-gun positions, and " Jim Crow " sentries installed on the tops of the buildings, whilst an added hazard was provided by the 14-ft. outer wall of the barracks. Bribing of Arab sentries had usually proved unsatisfactory elsewhere, and on first inspection it seemed that no loophole remained in the prison. A party of enthusiasts, however, removed a flagstone in the Officers' Block and chipped through the brick arches to discover a small cellar (Fig. 1.) The distance from this to the outer wall was judged as about 60 yds. (actually it proved to be 192 ft.), but the cellar looked just large enough to take the spoil of a tunnel. The then senior British officer, Lieutenant-Commander G. Hare, D.S.C., R.N., called a meeting of all ranks, and the whole of the internees volunteered to work on the scheme, though it was known that only a very limited number would be able to use the tunnel. Captain E. Montgomery, the originator of the cellar search, acted as organizer-in-chief, and the Author was appointed Honorary Consulting Engineer. Work commenced on the tunnel proper on the 14th November, 1941, and continued day and night for nearly seven months, interrupted only for other escape attempts, alarms, searches, and the twice

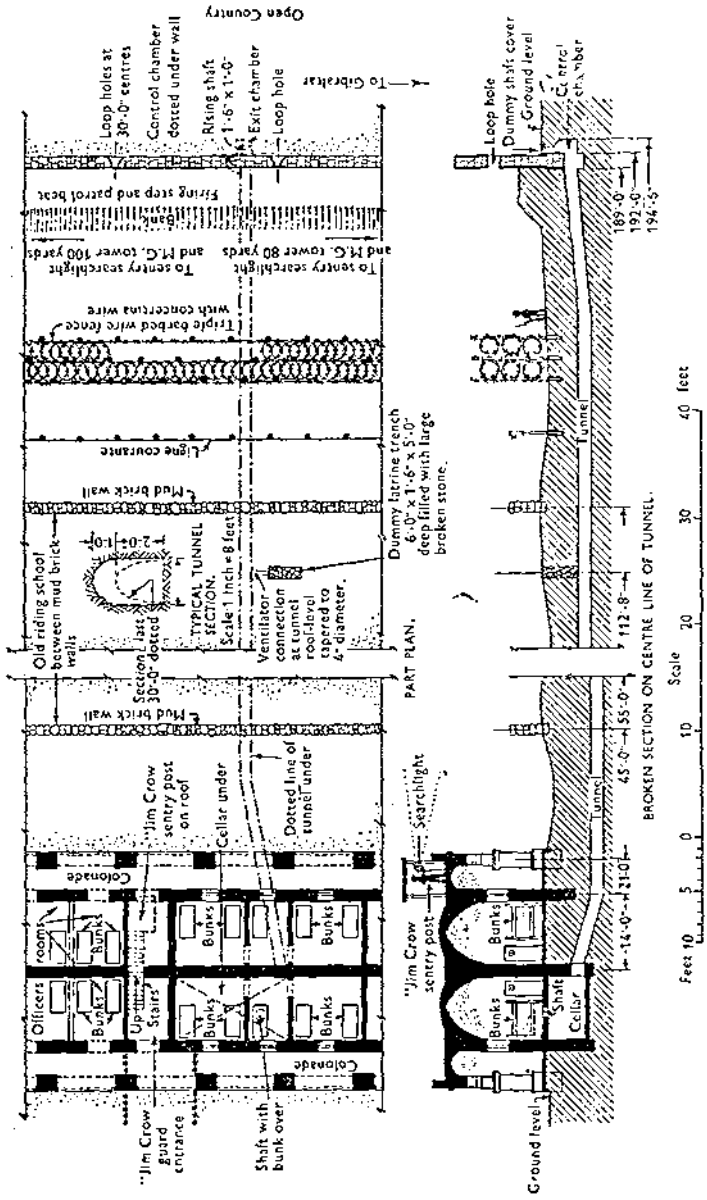


FIG. 1.—The Laghouat Escape Tunnel.

daily sealing up for *Appels* (roll-call). The average progress was at the rate of nearly one and a half inch per hour of work at the face.

Organization.

From the beginning, for security reasons, working was known as "Playing Poker." It was a game for five players by day; one at the face, one at either end of the "mucking-out" bucket-hauling line, one in the room above, and one as outer guard. By night, four officers slept in the two rooms above the hole, one at a time working a lonely shift at the face and one resting uneasily on the bed which camouflaged the floor-hole leading down to the cellar. Alarms were frequent by day. The most nearly fatal was during a *Genie* (barrack) inspection when the French Commandant narrowly missed putting his foot into the hole, protected as it was only by blankets hastily draped from the bed, while a terrified Flight-Lieutenant gazed fascinated from below at a large French boot projecting over the edge of the hole.

Plant.

Frequent searches had removed anything which could conceivably aid escape—empty tins, pocket-knives, all carelessly hidden money and maps, torches, compasses, etc. Two large strong bread-knives had, however, been overlooked. These proved superior to anything else devised as digging tools, and just survived the job with 3 inches of blade left on each. A *crachoir*, or round flat galvanized basin, with two handles to which were attached odd lengths of twine, served for "mucking out" the tunnel excavation to the cellar dump. Lighting was a constant "headache." The tunnel was wired up with odd lengths of wire "spared from elsewhere and jointed with sticking plaster and shirt-tail. This gave excellent service, but was available usually for about 5 hours per day only. For the remainder of the time candles had to be improvised, and these were made in small tins with "shirt-tail" wicks wound on a wire former. For fuel, distilled eau de cologne, hair oil, olive oil, and similar fats were excellent when available, but most of the fuel-supply consisted of a curious black-market product, labelled Margarine. It was a sort of white axle-grease which smelt bad, tasted awful, and burnt most reluctantly and capriciously; but it served its turn.

Design.

The strata varied considerably: they consisted principally of various grades of coarse and fine gravel held with more or less clay, running here and there into pure mud or very weak sand-clay mixtures. No timber whatever was available and the best that could be done was carefully to arch the roof and keep the width small. The tunnel started with a nominal section 60 centimetres (23.6 ins.) wide from the floor up to 60 centimetres height, enlarged to a total height of 90 centimetres (35.4 ins.) with a semicircular arch. This proved to be the most economical section, although some lengths were left towards the end of a height of only 60 centimetres. It proved possible to work with reasonable efficiency as far in as 100 ft. without forced ventilation, but beyond this point candles refused to burn, and working approached the danger-point for men. Many alternatives for improving the air-supply were considered, of which that adopted seemed the simplest, safest, and most effective. At distance 112 ft. 8 ins. a latrine trench 6 ft. long, 3 ft. deep, and 18 ins. wide was dug at right angles to the tunnel-line and 1 metre (39 ins.) from its centre-line. This was filled with large broken stone and its value as an aerobic filter-bed was casually explained to the authorities, who by then had grown accustomed to curious British fussiness in matters of hygiene and sanitation. As there was a danger that they would excavate it to look for hidden treasure of maps, money, etc., the connexion to it was not made for some weeks, and even then was effected by a 4-in. "level"

from tunnel roof to the end of the trench bottom which could be rapidly back-filled and camouflaged. When connected, however, the system provided an excellent through draught, and enabled the work to be completed without further serious ventilation difficulty.

SETTING OUT.

It was, of course, highly desirable to be able to control the tunnel position within close limits in order (1) to be able to connect to the ventilation trench direct with one small level; (2) to be able to break surface at an exact hour, outside, but close alongside the outer barrack wall, as the ground immediately under this wall could not easily be viewed by the sentry and was almost blind from his fire.

The following makeshift instruments enabled this to be done within the given limits.

For level.—A water-level, or more strictly, a red-wine-level, was made from two glass tubes connected by 2 ft. of oxygen-mask rubber tubing, and fixed to a carrier board. For levelling the ground longitudinal section, a man walked casually to the points required and stretched his arms upward. The point of intersection of the level line on his body or arms was then measured off inside the building.

For setting out the position of the ventilation trench.—For setting out the position of the ventilation trench and the measurement of the exact distance to the outer wall, a system of triangulation by plane table was used. The plane table consisted of a small drawing-board, two needles, a rule, and some lengths of fine cotton. For surface measurements it was erected on some furniture at the two extreme ends of the officers' block, a baseline was lined up with some lengths of cotton, and sight-lines were taken to a loophole in the barrack wall and the head of a man standing on a trial position of the ventilation trench. During a convenient Sunday siesta, the baseline position between the two plane-table positions was carefully measured. In a similar way azimuth control of the tunnel lines in relation to this baseline was maintained with the aid of the plane table.

For shaft plumbing and extension of the tunnel lines.—Two plumb-bobs were made by unwinding barbed wire and re-winding some strands on to sharpened sardine keys in the form of a normal plumb-bob.

For measurement of distance.—Various rods were graduated from a Laghouat standard 80-centimetre (31.5-in.) rule.

By careful repetition of measurements the errors which such primitive instruments would inevitably produce were reduced within satisfactory limits, and the connexion of surface and underground surveys at the ventilator, and later at the outer wall, showed only the following discrepancies :—

	Ventilator D distance 112 ft. 8 ins.	Connexion to surface outside wall.
Level	2 ins.	3 ins.
Line	4 ins.	Not checked
Distance	3 ins.	9 ins.

OPENING CEREMONY.

It was finally decided to use the tunnel on the 6th June, 1942. Prior to this date a control-chamber had been built under the 1-metre wide foundations of the barrack wall, at a depth of 6 ft. below the outside surface. Beyond the wall the tunnel was continued to form an outlet chamber 2 ft. 6 ins. square at the same level, and this was tapered upwards to form a shaft 1 ft. 6 ins. along the wall and 12 ins. wide at right angles to it. The top of this shaft was arched over at an estimated minimum of 9 ins. below the surface.

The final break-through was commenced at 6 p.m. and the first party climbed through to liberty at 9.30 p.m. Twenty-nine officers and men, complete with heavy marching kit, went through by 2.30 the next morning, after which the shaft was carefully sealed off with blanket-covered boards fitted into a rebate in the shaft top, the whole being made good with 4 ins. of surface material. The escape was discovered at *Appel* next morning, and the last escapee, an ex-Foreign Legion serjeant, was caught three days later.

The French authorities, who usually regarded and punished any attempt to escape as a very serious crime indeed, adopted an unusually good-humoured attitude to the whole affair, which they quaintly described as " le good sport." The actual tunnel exit was, by a most unhappy accident, subsequently discovered and sealed up, though its route was never actually located. After the happy events of the 8th November, 1942, however, this secret was sold to the Colonel-Commandant of the Region, for a supply of tea-water for the repatriation train, and it seems doubtful, therefore, if the tunnel will serve our Axis successors in the onetime dreary " home " of Laghouat.

The note is accompanied by one sheet of drawings, from which the Figure in the text has been prepared.

WAR BOOKS.

" TOTAL WAR " in all its aspects provides an infinite variety of matter for description, explanation and discussion, so that the plentiful crop of war books, always extending in spite of the paper restrictions, need cause no surprise. Many feel called upon to write, and very many more have the urge to read. There is no space here to survey the whole field : one can only gather selections from parts of it. And an effort—perhaps unsuccessful—will be made to avoid mention of the books which have already been reviewed in these pages.

The serious reader may well direct his attention to *British Strategy, Military and Economic*, by Admiral Sir Herbert Richmond, who provides a sound historical survey from which he draws valuable lessons. *The Nature of Modern Warfare* is a reprint of the Lees Knowles lectures delivered by Captain Cyril Falls, military correspondent of *The Times* ; Hoffman Nickerson, the American writer, in *The Armed Horde*, a thoughtful and well-reasoned book, sees the inevitable decline of mass armies but, obviously, that time is not yet ; a translation, entitled *The Army of the Future*, of General de Gaulle's work written six years before, appeared in 1940. W. E. Hart's *Landmarks of Modern Strategy* is a better book than its title would imply : it contains a good exposition of German military doctrine. In *The Royal Armoured Corps*, Captain J. R. W. Murland, a Regular soldier and an up-to-date student of warfare, is not obsessed by the value of armour, but shows that the modern army should consist of all arms in proportions suitable for the particular task ; and that victory in the field, as always, is to be won by the proper co-operation of all arms. *Engines of War : The Mechanized Army in Action*, a Black publication, is sound and up-to-date as far as it goes (July, 1941) ; its illustrations are from official photographs, and Field-Marshal Sir John Dill provides an introduction.

Naturally, much has been written about the Arch-Enemy. In *Germany the Aggressor* Professor F. J. C. Hearnshaw explains how the German temperament has never changed throughout the ages; George Sava's *School for War* is an account of the manner in which the German people have been psychologically conditioned for "total war"; in a translation, *Health under Hitler*, of Dr. Gumpert's book one may read how the health of the nation has steadily deteriorated under the Nazi regime; Thomas Reveille's *The Spirit of Europe* reveals the Nazi technique for the financial and economic spoliation of conquered countries; Wilhelm Necker, a German ex-officer, in *Germany Can't Win*, points to her lack of essential raw materials and her transportation weaknesses. American newspaper correspondents, who remained in Germany whilst the U.S.A. was neutral, describe various aspects of the war-time life of the nation: Joseph C. Harsch in *Pattern of Conquest*, Howard K. Smith in *Last Train from Berlin*, William Russell in *Berlin Embassy*, and Frederick Oechsner with his colleagues in *This is the Enemy*.

A number of writers have offered their "recipes for victory." Major Alexander Seversky in *Victory through Air Power* was the first since the Italian General Douhet, who wrote before 1914, to suggest that the war can be won by air action alone. His book, which has attracted far more attention in the U.S.A. than it has here, advocates overwhelming attacks upon Germany by hordes of bombers based upon America, "half a world away" as one critic has expressed it. William B. Ziff (*The Coming Battle of Germany*) favours the same method, but would base his invading air squadrons on Great Britain. "Auspex" devotes his *Victory from the Air* to the argument that Germany can be so weakened by overwhelming air and naval attack that comparatively small mechanized armies would be needed to administer the *coup de grâce*. We shall see. The prolific F. O. Miksche, in *Is Bombing Decisive?* shows himself anti-Seversky. It is interesting to observe that Captain A. O. Pollard in *Bombers over the Reich*, is optimistic as regards our prospects of smashing by air attack Germany's industries and communications, whilst J. M. Spaight (*The Sky's the Limit* and *Blockade by Air*) considers the bomber the chief weapon of victory and studies its employment against Axis shipping. Captain Norman MacMillan, in *Air Strategy*, regards air power as the dominant factor.

Where to strike occupies the attention of others. Ralph Ingersoll (*Covering All Fronts*) is a press correspondent and a shrewd observer and commentator who has been to Russia, China, the Middle East and Malta; he recommends an attack through Italy, but seems to under-rate Japan. Lieut.-Colonel W. F. Kernan, U.S. Army, whose reading of history leaves something to be desired, urges in *Defence Will Not Win the War* that the U.S.A. should make its main strength felt in Europe, preferably by way of Italy; he regards the intervention of Japan as a distraction engineered by Hitler.

Of contemporary narratives of the war as a whole, first place may be given to Hutchinson's quarterly publication, which is the work of many able writers. *The First Quarter* and *The Second Quarter* were edited by Sir Ronald Storrs; on his departure to an appointment in the Near East he was replaced by Mr. Philip Graves, and the succeeding volumes have maintained the original standard. The narrative is well balanced and, as there is so much information which cannot yet be made public, criticism is, quite properly, restrained. The three volumes of "Strategicus," called *The War for World Power, From Dunkirk to Benghazi*, and *The War Moves East*, are notable for well reasoned, rather strong opinions which tend to be controversial. *The First Year* and *The Second Year* by the Canadian professor, Edgar McInnes, owe much to press reports, but have not quite their pronounced journalistic manner. Major-General H. Rowan-Robinson's *Wavell in the Middle East* treats of all the campaigns directed by General Wavell from Cairo; his *Auchinleck to Alexander* embraces every theatre of war—Russia, the Pacific, Malaya, Burma, China—and brings the story down to El Alamein and the Allied landing in French North Africa. As might be expected, these

volumes contain a critical survey with special reference to the tactics of armoured forces, and urge the formation of a Ministry of Defence.

There is no satisfactory account of the Polish campaign from the Polish side. Bernard Newman's *The Story of Poland* provides a general historical background. *I saw the Siege of Warsaw* is a description of the scenes in the capital by an eye-witness, Alexander Polonius. *Nazi Conquest of Danzig*, by Hans L. Leonhardt, compiled from documents and personal experience, is good. *The German Invasion of Poland*, published by Hutchinson, records the atrocities committed by the Nazi soldiery. *The German Fifth Column in Poland*, also from Hutchinson, is a collection of documents showing how the Germans made use of the non-Polish minorities. The sufferings of Poland under Nazi occupation are placed on record in the excellently documented *Black Book*, in two parts, issued by the Polish Ministry of Information, and also in Simon Segal's *Nazi Rule in Poland*, the indictment being supported to a very large extent by information from German sources. The subsequent military effort of Polish forces may be followed in Stephen Klecskowski's *Poland's First* 100,000; it tells of the two divisions which fought in France, the troops in the Middle East, and the airmen who are fighting with the R.A.F.

For the Norwegian invasion and occupation one can only turn to tales of personal experience. Carl J. Hambro, President of the Norwegian Parliament, relates in *I Saw It Happen in Norway*, how German preliminary penetration made actual invasion easy, and the Foreign Minister, Dr. Koht (*Norway Neutral and Invaded*) explains Norwegian policy before and after the occupation. The mayor of Narvik, Theodor Broch, who remained at his post throughout the fighting, has written a very good account of it in *The Mountains Wait*. Karol Zbyszewski's *The Fight for Narvik* tells of the author's experiences with the Polish mountain brigade, and Captain P. O. Lapie, in a translation called *With the Foreign Legion at Narvik*, writes a story of French assistance. Jacob Worm-Muller describes scenes during the earlier days of the German occupation in *Norway Revolts Against the Nazis*.

Denmark: Hitler's "Model Protectorate" by Stein Gudme, is rather apologetic concerning Denmark's slight resistance to the aggressor, but explains the Danish methods of "non-collaboration." Paul Palmer's *Denmark in Nazi Chains* shows how the morale of the people is rising so that Germany's comparatively favourable treatment of the country is not producing the desired effect.

Dr. E. N. Van Kleffens in *The Rape of the Netherlands* states the case for Dutch policy up to the time of the German invasion. *The Netherlands at War*, by H. S. Ashton is a popular account of the resistance of the Dutch armies and the continued opposition of the people under the German occupation, which is also the theme of L. de Jong's *Holland Fights the Nazis*.

An official account of the invasion of Belgium and the events which preceded the German attack is published by the Belgian Ministry of Foreign Affairs. In his two volume *The Situation in Belgium: September 1939—January 1941* and *The Prisoner at Laeken*, Emile Cammaerts provides a vindication of King Leopold. *Belgium Unvanquished* by Roger Motz describes the "underground" struggle which continues under Nazi rule.

For the Battle of Flanders we have Lord Gort's published despatches which can also be obtained in a popular edition. John Masefield, the Poet Laureate, had official assistance in writing his admirable story of the evacuation at Dunkirk entitled *The Nine Days' Wonder*. Many of our own participants have related their adventures, notably "Gun-Buster" in *Return via Dunkirk* and *Battle Dress* and Captain Sir Basil Bartlett with his *My First War*. *Infantry Officer: A Personal Record* is an excellent narrative. The author of *The Diary of a Staff Officer* was employed on air intelligence liaison, and sharply criticizes the handling of our air forces. Keble Chatterton in *The Epic of Dunkirk*, has described the Navy's part.

The French writers, particularly those who took part in the fighting during

the Battle of Flanders and the Battle of France, frankly reveal the lack of armament, equipment and training in the French Army, and also the defects of the High Command. On this account Hans Habe's *A Thousand Shall Fall;* Rene Balboud's *Cette Drole de Guerre;* D. Barlone's *A French Officer's Diary* (in translation); Bidou's *La Bataille de France;* General Eon's *The Battle of Flanders: Sedan;* and Paul Allard's *La Verité sur l'affaire Corap* are all of interest. The French review *Candide*, 25th December 1940, has a very informative article describing the break-through on the Meuse; *Verité sur les Combattants* (Labusquière-Lardanchet, Lyons) is a well documented account of phases of the struggle on the French front, and shows how valiantly some formations fought under conditions which were hopeless.

Charles Riebel, a member of the Senate Committee on the Army, who was at G.Q.G., gives a circumstantial account of the French collapse as he saw it. His book is called *Pourquoi et comment fut decidée la demande d'Armistice.* The causes of the capitulation have naturally engaged the attention of a host of writers. Pierre Maillaud's *France* is an admirable appraisement. *Truth on the Tragedy of France*, by Elie J. Bois, editor of *Le Petit Parisien*, very informative on the political side, and *Why France Fell*, by Andre Maurois, are both translations from the French. For France under the Vichy regime one may read Lieut.-Colonel Pierre Tissier's *The Men of Vichy*, a good analytical study, but not well translated, and *The Riom Trial*, by the same author. This book is compiled from full shorthand notes of the proceedings and it shows how the Vichy Government failed to pin the responsibility for France's defeat upon a selected group of politicians, and how the Germans were disappointed of the prospect of seeing France publicly self-condemned for her participation in the War.

The Russo-German Pact and the Russian invasion of Poland, followed as they were by the campaign against the Finns, "a war within a war" encouraged few to view the U.S.S.R. with sympathy and understanding in the first year of the struggle. Finland's case was well—too well—presented throughout the world; the books of press correspondents, who were allowed to see little or none of the actual fighting, proved misleading in the extreme. In *Battle for the World*, however, Max Werner's comments show little or no bias. *The Soviet-Finnish Campaign*, by W. P. and Zelda K. Coates, does much to correct popular false impressions.

Of the successive campaigns on the Eastern Front, following the German invasion of Russia, much may be gathered piece-meal from *Soviet War News*, issued daily by the Soviet Embassy in London. *Russia at War*, by the well-known publicist Ilya Ehrenburg describes much of the first year's operations; Alexander Werth's *Moscow 1941*, in diary form, pictures the city under threat of investment and explains the justifiable hatred of the Russians for the common enemy. *Soviet Documents on Nazi Atrocities*, amply illustrated, is a terrible indictment of the German soldiery as well as of its leaders. *Russian Glory*, by Philip Jordan, pays tribute to the fighting qualities and efficiency of the Russian Army; *Russia Fights On*, by Maurice Hindus, is a knowledgeable and sympathetic appreciation of Soviet progress in past years, including preparation for war.

Much more, undoubtedly, will be written about the achievement and the tragedy of Greece, but in *The Greek Miracle* by "Athenian," translated, we have a well documented outline of the Italian invasion and of the Albanian campaign. *Greece Against the Axis*, is by Lieut.-Colonel Stanley Casson, first a member of our Military Mission and then, when our troops landed, Intelligence Officer at G.H.Q. He knows the country and the people well and writes of events with sympathy and understanding. T. H. Wisdom, a Public Relations Officer of the R.A.F., who went on many bombing sorties and witnessed the British evacuation of Greece and something of the fight for Crete, tells his story in *Wings Over Olympus. Victors in Chains*, by "Amynter," published by the authority of the Greek Ministry of Information, describes the popular resistance to the Axis

occupation; Compton Mackenzie in *Wind of Freedom* speculates on the "might have beens" had British policy been different.

Of the books devoted entirely to the African scene, two by Alan Moorehead, *Mediterranean Front* and *A Year of Battle*, cover the fighting in Libya and Egypt up to the retreat on El Alamein. These rank with the best work of the war correspondents. G. L. Steer, who was in charge of publicity on behalf of the Emperor Haile Sellasie, writes an interesting account of fighting and of propaganda activities during the Abyssinian campaign in *Sealed and Delivered*; the South African part in this conquest is well described by Carol Birkly's *It's a Long Way to Addis*. More comprehensive is Eric Rosenthal's *The Fall of Italian East Africa*, a short but good general account unfortunately not provided with maps.

It would seem that we possess fewer authorities on Japan than we do on Germany, but the aggressor in the Far East speaks for herself. *How Japan Plans to Win* is the translation of a book by one Kinsaki Matsuo, described as a liaison officer between the Japanese Foreign Office and Admiralty, published in Japan in 1940. The argument is that Japan can win if she strikes first—she certainly did—and then conducts a vigorous offensive-defensive to preserve her conquests which, as enumerated, comprise just those territories which she has actually overrun. *Volcanic Isle*, by Wilfred Fleisher, is a study of the growth of Fascist principles in Japan; Hugh Byas in *The Japanese Enemy* describes her military strength as formidable, and insists that she is no puppet of Germany.

So far there is little to be learnt of our Far Eastern disasters save from the recounted experiences of individuals. Thus O. D. Gallagher's *Retreat in the East* has a particular value: the author, an experienced war correspondent, was in Malaya, Singapore and Burma and he writes freely of what he saw and heard.

It could hardly be other than a depressing tale. Several Americans write of the Pacific war, *Pearl Harbour* is by Blake Clark, a professor who, when the Japanese attacked, happened to be at Honolulu and worked as a member of a rescue party; afterwards he gathered many first-hand accounts of the raid. *The Flying Guns* is the narrative of Lieut. Clarence E. Dickinson, a U.S. naval airman: he fought at Pearl Harbour, at the Battle of Midway Island, and in other engagements. W. L. White in *They Were Expendable* tells the story of six motor torpedo-boats which arrived at Cavite shortly before the Japanese attacked the Philippines; these little craft were engaged against enemy warships and eventually brought General MacArthur away from Corregidor to an island whence he could leave by air. *I Saw the Fall of the Philippines* is by a Filipino officer, Colonel Carlos P. Romulo.

A peevish reviewer has said that books written by R.A.F. fighter-pilots are rather too numerous. He should have remembered that the Battle of Britain must, in great part, be described from the air. Certainly more has been written about the R.A.F. than about the Royal Navy or the Army, but much of it is good reading. *Fighter Command*, by A. B. Austin describes the Battle of Britain; *Squadrons Up!* by Noel Monks is the record of two Hurricane squadrons in the Battle of France; *Fighter Pilot*, a Batsford publication, and *A.A.S.F.* (Advanced Air Striking Force), by Charles Gardner, have won the approval of many of our airmen; Blake's *Readiness at Dawn* tells of the proceedings in the operations room on a fighter aerodrome. Our Allies are represented by *Tally Ho!* a good and modest account by A. G. Donahu, the first American to fly with R.A.F. Fighter Command; *Squadron* 303, by Arkady Fiedler, the story of a Polish fighter squadron; and *Together We Fly*, by "S.M.-M." describing the career of a famous Czech pilot, Sergeant Josef Frantisch. Hubert Griffith's *R.A.F. in Russia* is the record of No. 151 (Fighter) Wing which introduced Soviet airmen to the Hurricane; *They Flew in Sand*, by George W. Houghton and *Libyan Log*, by Eain G. Ogilvie, describes operations in North Africa.

Bomber Command is well represented by Squadron-Leader L. Cheshire's *Bomber Pilot*; Flight-Lieutenant R. C. Rivaz's *Tail-Gunner*; and *Bomber's*

Battle, which describes the difficulties of strategic bombing. The voice of the Coastal Command is heard in *No Peace but a Sword*, by Wing-Commander R. P. M. Gibbs, a product of Cranwell in the economy years who has seen much service with a torpedo squadron; and *Coastal Command at War* by Squadron-Leader T. Dudley Gordon, really the work of a syndicate, composed of three Public Relations officers. John Moore has compiled a very good little book called *The Fleet Air Arm*.

Records of naval operations year by year are to be found in *Brassey's Naval Annual*, edited by Rear-Admiral H. G. Thursfield. *From Gibraltar to Suez: The Battle of the Middle Sea* is perhaps the best of Lord Strabolgi's naval war books: he includes a survey of land and air operations in order to complete the picture. *Lioness of the Seas*, by George H. Johnston, is the story of H.M.A.S. *Sydney* during her service in the Mediterranean. Actual life in the fighting ships is also portrayed by A. D. Divine's *Destroyers' War*, the eight months' commission of H.M.S. *Firedrake* in home waters and the Mediterranean; Nicholas Monsarrat's *H.M. Corvette*; David Masters's *Up Periscope*, a submarine story; and "First Lieutenant's" *Terriers of the Fleet* which describe the hazardous work performed by our armed trawlers. Other aspects of the war at sea are presented by Sir Archibald Hurd in *Battle of the Seas: the Fighting Merchantmen*, and by Leo Walmsley's *Fishermen at War*, which places on record the persistent German attacks from the air upon our lightship crews and fishing vessels.

Accounts of the Army's achievements are mostly to be found in books—many have already been mentioned—describing our land campaigns. The training of the commandos is the subject of *Commando Attack*, by Gordon Holman, who was in the St. Nazaire raid and gives an account of his adventures; of *Rehearsal for Invasion*, by Wallace Reyburn, a Canadian reporter present at the Dieppe affair; and of *We Landed at Dawn*, by A. B. Austin. He did land at dawn, at Dieppe with Commando 4.

The official accounts of operations published for the Admiralty, Air Ministry and War Office are well written summaries with admirable illustrations. Among them are *Ark Royal; Combined Operations* 1940-42 which describes the raids on the coasts of Europe and in the Mediterranean; *East of Malta, West of Suez*, making clear our naval policy in the Mediterranean; *His Majesty's Minesweepers; The Battle of Britain; Bomber Command; Bomber Command Continues; Coastal Command. The Defence of Calais* and *The Highland Division*, by Eric Linklater; *The Abyssinian Campaign; The Campaign in Greece and Crete*; and *The Battle of Egypt*, which is the story of the Eighth's Army victory at El Alamein. All these are cheap, as only Government publications can be: it is a pity that they are not of uniform size and style.

Books continue to come out of Germany, but many of them are merely intended to maintain, or enhance the prestige of the *Wehrmacht*. Of such are *Deutsche Siegeszug in Polen*, by General Ernst Kabisch, the well-known military writer; *Mit Bomben und M.G's über Polen* by Josef Grabler; *Die Männer von Narvik*, by Hellmuth Unger; *Unser Kampf in Norwegen*, and *Vormarsch mit Panzer*, an account of the Dutch campaign by Schober. Others merely contain the German official communiqués and newspaper comments on a campaign, but nearly all are remarkable for their excellent illustrations. *Unser Kampf in Holland, Belgien und Flandern* and *Unser Kampf in Frankreich* were compiled by various writers, the best accounts of the course of these operations being provided by General Kabisch. Ernst Freiherr von Jungenfeld in *So Kampften Panzer* provides an interesting account, despite the bombast, of his experiences as a tank commander in the Battle of France; he admits to heavy losses inflicted by British artillery and machine-gun fire. Very characteristic of German propaganda methods is the officially published *Die Geheimakten des Französischen Generalstabes*, being translations of French General Staff secret documents which reveal the aggressive plans of the Allies. We are asked to believe that the

documents were found in a goods wagon at a small French railway station. The best accounts of campaigns from the German side, almost the only accounts worth consideration, appeared in the *Militär-Wochenblatt*, now no longer published. These included articles upon the invasion of Poland, the occupation of Denmark, the capture of Crete, "Breaking the Stalin Line," and the Greek operations in Albania. From Italy comes *Un Anno di Guerra*, published in Rome in 1942, a vainglorious piece of propaganda which becomes more and more pathetic to read as time goes on.

J.E.E.

A UNIVERSITY FOR THE SERVICES.

By MAJOR (now LIEUT.-COLONEL, *ret.*) W. E. BRITTEN, O.B.E., R.E.

(Republished by kind permission from *The R.U.S.I. Journal* of November, 1930.)

NOTE :—The present complex "amphibious operations" have no doubt emphasized the value of commanders and staff officers who can speak the language of all three Services, and understand their problems. The training of such officers for our Regular Forces after the war is a problem which the suggestion contained in this article, now 13 years old, might help to solve.

> *"With regard to the question of a Ministry of Defence, there is not a sufficient body of common thought between the three Services to justify such a step here and now."*
>
> Sir Samuel Hoare in the House of Commons, December, 1929.

IN his thoughtful article in the August, 1930, number of the *R.U.S.I. Journal*, Wing Commander Leslie comes to the same conclusion as Sir Samuel Hoare, but he suggests a method by which this lack of common thought could be remedied in the course of about a decade by placing a number of picked graduates of the Imperial Defence College on a "Combined Staff." From this Staff a supreme Head of all three Services could, ultimately, be chosen.

The idea is at first sight an attractive one, but, on consideration, it is a little difficult to visualize officers of probably forty years of age divesting themselves of the prejudices and predilections of their own Service, and emerging as something that is neither "flesh, fowl nor good red herring." It may be difficult to teach an old dog new tricks; it is far more difficult to rid the genus *homo sapiens* of early ingrained bias, derived from his youthful days at Woolwich, Sandhurst, Dartmouth or Cranwell.

The trouble lies deep down in the fact that we have three Services whose officers do not speak the same language, and who have not spoken the same language since they were boys together at preparatory schools.

Two years ago the writer attended a conference of naval officers of the Mediterranean and Atlantic Fleets at Gibraltar. The two fleets had just fought their annual battle in the Mediterranean, and the conference was held to discuss the lessons brought out by the exercises. The staff work of the conference was

excellent; there were large-scale diagrams showing the position of the fleets at various times throughout the operations, and these were explained by the officers best qualified by their commands or positions at the time to bring out the lessons to be taught. But from the first the writer found himself in deep waters, and as the conference proceeded the waters closed over his head and left him gasping for light and air. Later on, after the conference was over, he found a naval friend to explain to him some of the expressions and phrases used, and realized that once these were reduced to common terms, there had been nothing in the elementary tactics of the operations that he could not quite easily understand from the analogies of land warfare.

Doubtless a naval officer, attending for the first time a divisional conference after army manœuvres, would find himself equally at a loss, especially in these days of mechanization, despite the fact that inter-tank fighting must tend to resemble naval warfare.

It is not only in matters of strategy and tactics that these difficulties arise. In matters of administrative detail, the Services have different words to express the same ideas, different message and signal forms, different forms of official letter and memorandum. Thus, "other ranks will parade at 3 p.m." in peace-time army phraseology is "ratings will muster at 15.00" in naval language, and the writer has to confess to complete ignorance of the Air Force equivalent. Again, how many soldiers could explain what a Commodore is, or naval officers the difference between a Brigadier and a Colonel? How many junior R.A.F. officers would know what to expect of a D.A.A. and Q.M.G.? Countless examples of a similar kind could be quoted, but these are sufficient to show some of the difficulties that arise through want of a common language, or through lack of opportunity of acquiring knowledge of a "foreign" tongue.

How then can we implant a common language and common traditions at an age when the mind is most impressionable?

The answer suggested is a common "nursery," to which members of all three Services would go after leaving their Public Schools, instead of to Woolwich, Sandhurst, Dartmouth, and Cranwell, as at present. It is not proposed to work out here details of such a "Service University," for many of these would be matters for experiment and compromise, but the broad outlines of the scheme might be:

(1) A common entrance examination on University lines.
(2) Entrance from the Public Schools at normal leaving age.
(3) A four-year course.
(4) During the first two years, trainees to be "Cadets, General Service," *i.e.*, not detailed to any of the three Services.
(5) At the end of two years, Cadets to be appointed by examination and selection to one of the Services "on approval."
(6) For the last two years, trainees to be paid as combatant officers, but to remain under training at the University. This half of the course would include short periods of attachment to all three Services during manœuvres, exercises, etc.

Specialist courses for all three Services, such as engineering, gunnery, etc., would follow, under arrangements made by the Service concerned. These would not be taught at the University, which would supply a good general education on University lines. Thus the chief subjects taught would be:—

English, history (naval and military), mathematics, modern languages, the elements of tactics and strategy, based on the recognized principles of war, drill, physical training, and the elements of mechanical engineering. The instructors for the first two years of the course would probably be chiefly civilians but, during the last two years, Service instructors would deal with the application of the general principles above mentioned to the three Services concerned.

There are obvious advantages in such a scheme. The University would be the foundation of a liaison between the officers of the three Services that cannot possibly exist at present, particularly between the Navy and the other two Services. An Army officer might, under present conditions, call upon every ship of the Mediterranean and Atlantic Fleets without seeing a single familiar face; in fact, if he had not previously during his service served at a naval port, and had no relations in the Navy, the chances would be against his knowing any single one of them. Under this scheme, however, he would know the officers in every ship who were within a couple of years of his own seniority, for they would have been at the University with him.

The scheme would also provide for a certain amount of elasticity in respect of the Service to which individual officers were appointed. Not all boys at the age of eighteen have made up their minds that they prefer any one of the three Services, and at the University, Cadets would be free to change their minds up to the end of their second year; there is no reason why in special cases changes should not be permitted even later in the course, where round pegs were obviously being fitted into square holes.

The chief obstacle to the scheme is probably the financial side. Apart from the capital cost of building the University, it may be argued that the taxpayer cannot afford to keep officers away from their units for an extra two years, as this would involve an increase of establishments all round. But would it? Many of the duties now performed by young officers of all three Services could probably be performed equally well if not better by the highly educated warrant, petty and non-commissioned officers of the present day, and it is understood that recent experiments on these lines in the matter of Boards, Courts of Inquiry, etc., have been very hopeful.

On the other hand, a combined University would certainly cost less to run than the existing four training establishments. The first half of the course could perhaps be made to pay for itself. The good education and Service discipline would attract many parents who did not necessarily intend their sons for the fighting Services, just as West Point does at the moment. Thus, the fees charged for Cadets could be made to cover the cost of this portion of the course, and a refund of fees could be made to Cadets who finally entered the Services. Those Cadets who left at the end of the two years to take up a civil profession would be encouraged to join the Territorial Army, or its Navy and R.A.F. equivalents, and would probably form a useful source of recruiting for the commissioned ranks of those forces.

The other main objections that will be raised to the scheme are, firstly, the argument that the naval officer must be caught young, *i.e.*, before he goes to a Public School. Many senior naval officers undoubtedly hold this view, but most junior naval officers to whom the writer has spoken are strongly in favour of the Public School entry, although they themselves have been to Dartmouth. The second objection will probably be that between the time of leaving the University and joining the "Combined Staff" suggested by Wing-Commander Leslie, an interval of twenty years will elapse, during which officers will forget the language and traditions of their communal upbringing, and will have reverted to pure types of their own Services. This is to a certain extent true, but only to a certain extent. There is to-day, for instance, far more common feeling, or "sympathy" in its older sense, between Gunner and Sapper officers than between these and other branches of the Service. It would be very difficult to deny that this is due to their early years together at the "Shop."

It would, of course, be necessary to keep up this liaison during the twenty years in question by periodic attachments to the other Services, in *executive* capacities where possible. There is no great difficulty in this, given the will on both sides. It has been tried out in the attachment of young Sapper officers to infantry on manœuvres (where they have commanded platoons with consider-

able success), and it has probably been tried in other branches of the Services also.

As regards a "common language," or at any rate a familiarity with all three "languages," it is suggested that this can be obtained in part by the methods outlined above, but chiefly by further amalgamation in peace time of the administrative services such as Supply, Works, Ordnance, Pay, Medical and Chaplains Departments. There can be little doubt that the naval and military medical officers who have served in any of the combined hospitals have gained very valuable experience of the administrative working of the other Service, and it is believed that the financial adjustments necessary have not offered any very great difficulties. It is also for consideration whether a combined Signal Service will not soon be a necessity, in view of the ever increasing importance of wireless.

The "Combined Staff" must of necessity include departmental staff officers representing the above mentioned administrative services, and the training of these officers can only be effected in administrative departments combined under one head. Thus, at Malta, and similar stations where all three Services are in being, there might be a combined Supply Office, a combined Works Department, a combined Medical Service, and a combined Pay Office, etc. Each might have to be internally divided into three branches, one for each Service, but the chiefs could in turn be naval, military and air force officers, candidates for, or graduates of, the "Combined Staff."

It would, of course, take some years to get these schemes working, and it would probably be ten or fifteen years before the first results were visible, and, as Wing Commander Leslie says, another ten years before the "Combined Staff" could produce an officer fit to be the Chief Staff Officer of all three Services, but it is suggested that only by some such means will full co-ordination and a proper balance between the three Services be obtained.

THE RÔLE OF SAPPERS IN BATTLE.

A Swiss Digest.

A CAPTAIN of Engineers, Kollbrunner, published in the May and October, 1941, numbers of the *Technische Mittleilungen fur Sappeure, Pontoniere und Mineure*, two interesting articles on the role of sappers in battle. These have been summarized in the *Revue Militaire Suisse* for March, 1942, by Colonel H. Lecomte.

* * * * *

The role of the sappers in battle can be regarded in two distinct ways: as skilled workmen in the fighting zone, or as actual fighters.

Until recently, it has hardly been possible, in the Swiss Army, to notice the latter conception, partly because of the brevity of the recruits' courses, and partly because of the insufficient numbers of sappers. They have been obliged to limit themselves to the consideration of the engineers as armed workmen, with the duty of carrying out work on the battlefield for which the combatant arms are neither trained nor equipped. In principle, the protection of their work is assured by the infantry; they must, however, protect themselves in

case of need. Captain Kollbrunner observes that the situation has changed by reason of the creation of numerous demolition detachments and labour units, which may take on themselves a good part of the tasks hitherto regarded solely as the sapper's. Moreover, the training of recruits in the Swiss Army for four months, instead of two, enables instruction to be carried further, and the periods of actual service allow it to be completed. We may therefore look to the employment of sappers as picked combatants, marching at the head of assault columns or defending breaches. In the Napoleonic wars hundreds of engineer officers and thousands of sappers fell in the foremost fighting ranks. This tradition, at one time somewhat lost sight of for the benefit of technical work, has been revived in most modern armies. It can be, and therefore ought to be adopted by the Swiss.

* * * * *

Captain Kollbrunner's study only skims the employment of the sapper as a workman, it is almost entirely devoted to his role as a combatant.

His first article deals with the sapper in the offensive battle. Although the task of the Swiss Army is essentially defensive, it necessarily includes minor offensive actions, which should be carried out with the utmost vigour. In such actions, the sapper a specialist in the handling of explosives will often play the foremost part. Captain Kollbrunner classes these offensive actions in two categories: pursuit patrols and assault detachments.

The task of the pursuit patrol (or the independent patrol) will often involve demolitions behind the enemy's line. It must in this case include sappers trained in the use of explosives. When their technical work is finished, these sappers must not be an encumbrance to the detachment. They must, therefore, be equipped and trained for close combat in all its forms.

The demolitions to be carried out will as a rule be done with high explosives, prepared beforehand, and provided with short fuzes, ensuring the explosion a few seconds after lighting. If it is a question of blowing up a bridge or a railway, the sappers must know how to fix the charges safely and rapidly, while the infantry provide the covering party. On the march forward and on the withdrawal, the sapper will act like the infantryman.

In the assault detachments, on the other hand, the composition of which can be varied in each case according to the task, the sappers can be employed to the full. If it is a case of a surprise attack on an isolated post or the assault of a position, the detachment will benefit by the help of the heavier infantry firearms, or even of artillery. Even so, it will almost certainly come up against some obstacle or strong-point insufficiently destroyed, which only the sappers can overcome with charges of explosives prepared in advance, or with other technical means, such as flame projectors or smoke apparatus.

As an example, Captain Kollbrunner deals in some detail with a raid having for its object the destruction of a strong-point, by an assault section, without heavy artillery. The section is composed of two groups of riflemen, and two parties of sappers. If the leader is not an engineer officer, a sapper N.C.O. is attached to him. Fire support is furnished by a mountain battery and machine-guns, infantry guns and trench mortars. The strong-point is protected by a barbed wire entanglement behind which is a trench. The section, divided into two, moves forward by infiltration to the right and to the left of the strong-point. The two sapper parties, under cover of the fire of the riflemen, creep up to the wire and place their charges. For this they use lengths of gaspipe about 6 metres in length, packed with explosive. Plastic explosives like gamsite, cheddite, altorfite, etc., are best for this. The regulation explosive, trotyl, is insufficiently plastic for this purpose. The tube has a point or a small wheel, to slide it under the wire. If the wire belt is more than 6 metres thick, two tubes are joined by means of a sleeve. The charge is exploded by means of a special lighter at the rear end. To obtain the best effect, the tube should be placed along a row of

pickets. The explosion should cause a gap 4 to 5 metres wide. The gap is seldom entirely cleared; the sappers carry cutters to clear it if necessary.

As soon as the gap has been cleared, the sappers rush through, and with the aid of the riflemen clear the trench with grenades. Protected by the fire of the infantry, they attack the entry to the post with concentrated charges, and the garrison with grenades. A heavy charge is then placed in the embrasure and well tamped. The leader of the sappers gives the signal for withdrawal, and then lights the fuze and retires through one of the gaps in the wire, covered by the fire of the infantry, while the post blows up.

* * * * *

Whatever may be the part of the sappers with these patrols and assault detachments, their principal role is in the defensive combat.

Every defensive position to-day consists of a zone strewn with irregularly placed strong-points, each supporting others. In the case of a small post, the garrison will usually have to hold it to the last; it will not as a rule include any sappers. A large work, a locality for example, will require sappers in order to look after the communications, repair breaches, etc. Between these strong-points, on the other hand, the defence will be active; it will be carried on by counter-attack parties, in composition similar to raiding detachments. There will then be fighting at close quarters; the sappers, with their special weapon, explosives, will play an essential part.

Explosives used in small doses, like hand grenades or rifle grenades, have too small an effect in many cases, for example, against tanks. To stop and destroy these, stronger charges are required, thrown or placed by specialists in the handling of explosives, i.e., the sappers. Charges thrown by hand ought not to have fuzes burning for several seconds, but a percussion fuze. To ensure this, the charge must have several percussion points so that it will explode whatever part of it hits the object.

One service type consists of a steel box, containing 1.35 kilogrammes of trotyl and a central bursting fuze, and furnished with 9 percussion horns; the whole fixed to a wooden handle. The sappers can, if necessary, improvise similar contrivances.

Another type, very effective but more delicate, has only one percussion striker in front, and flight-ailerons at the back.

In special cases, long charges can be used, i.e., for raiding parties.

Captain Kollbrunner makes a distinction between the active and the passive tasks of defensive fighting. The passive tasks belong, as a rule, to the garrisons of strong-point or of demolition parties. They are, for example, the construction of obstacles against infantry and tanks, the placing of mines, wherever these works can be foreseen and prepared beforehand. Whenever these have to be improvised in the battle zone and during the battle, the tasks will fall to the sappers of the counter-attack parties. There is a very wide scope for the ingenuity of the sappers in the placing and method of setting off the mines, either by contact or by distant control. By the way, the sappers of the attack must display a similar ingenuity to discover and draw the mines. There is here an important branch of training to develop.

The active tasks include the fight against tanks, motorized infantry, assault detachments, parachutists and air troops. Here the well-trained sappers, supplied with ample explosives, have the finest role to perform.

In the struggle against tanks, it is a case of first stopping the tank, or of slowing it down, then of destroying it. Sometimes the stopping can be done by an obstacle. If there is none, the sappers will try to cause the breaking of a track or a gear by throwing a charge, or placing it in the way of the tank. Then they will attack the tank with charges like those described above, or else try to set fire to it or smoke it out. Captain Kollbrunner deals shortly with different

examples of attack against tanks, with numerous drawings by a skilled artist, Lieutenant Stückeli. These show some sappers attacking tanks held up by various types of obstacles, others pushing a charge under the track or in the gun muzzle, others are setting fire to a tank with bottles of petrol, others again are exploding a charge as the tank passes over. There are 27 drawings, excluding technical sketches, showing the role of the sappers not only in the defence against tanks, but in all phases of the battle, offensive and defensive.

The cross-country vehicles and motorized infantry are attacked in the same way as tanks. These vehicles being, as a rule, vulnerable to infantry weapons, it will not often be necessary to use explosive projectiles. It is chiefly a case, for the sappers, of placing charges in the way of the vehicles.

The fight against assault detachments will assume the character of a duel, the adversaries being armed and equipped much alike. The advantage will not be with the more numerous, but with the boldest and most skilful. Lieutenant Stückeli shows us some sappers, posted behind barbed wire, throwing their charges against the enemy sappers in the act of placing theirs, then against a raiding party in a gap, and finally fighting with knife and shovel against men who have forced the gap.

In the struggle against parachutists and air-borne troops, the role of the sappers will be to destroy the material landed, while the infantrymen attack the personnel. The drawings show us sappers placing their charges under a box of ammunition and a mortar, while around them are others fighting with bayonets and grenades.

It is good for the commanders of infantry regiments, battalions, and companies to know that the sappers who may be attached to them are something more than diggers, bricklayers, or carpenters. They must not, however, fall into the opposite error of supposing that the engineer units are primarily fighting units. I may say that they are to-day and will continue to be, and ought to be, essentially units of skilled workmen in the battle zone.

AERODROME ABSTRACTS.

(50. Ditching with Dynamite: Anon.: *Explos. Engr.*, 1942, 20 (9), 255-61.)

The drainage of wet swampy areas to be used for aerodromes, cantonment sites, or for roads, can be speedily accomplished by blasting open ditches or drainage canals with explosives. The advantages of blasting such drains with dynamite are that construction is rapid, little labour is required, mechanical equipment is eliminated, no spoil banks are created, and there is no debris to be removed. Also a drain of almost any size can be opened by varying the technique, drains may be dug in ground that is too boggy to be shovelled, stumps and roots are removed simultaneously with the blasting, and equipment for subsequent grading can go to work with minimum delay. The blasted ditch or canal is produced by the practically simultaneous explosion of a series of charges of dynamite placed in a single line of holes or in several lines of holes at given intervals and depth. In the propagation method of firing, which is recommended for wet soils, a line of holes is put down and charged with dynamite, but only one charge is directly fired. The shock from the explosion of this charge communicates itself through the soil to the other charges (charge spacing is 12 to 24 in.) with sufficient strength to detonate them. This method is preferred wherever practicable. The electric method, in which each charge (of less sensitive dynamite) is fired by an electric blasting cap, is ordinarily used for dry soils only. Blasting normally produces a V-shaped drain, but it is possible to blast a drain of desired bottom width by placing the charges at certain depths. The blasting method may be employed for making drains in any type of soil except very thin muck, dry sand or gravel. Instructions are given for laying out the drain, calculating the amount of explosive required, and detonating the charges. Tables show approximate charge weights and lay-outs for different drain sections, ranging from 6 ft. to 30 ft. wide at the top, 3 ft. to 14 ft. wide at the bottom, and 3 ft. to 10 ft. in depth. The cost per cu. yd. ranges from 9 to 25 cents (U.S.A.). Blasting can also be used for cleaning out old drains.

(From *The Journal of the Institution of Civil Engineers*, June, 1943.)

AN ARMY MARCHES ON ITS ENGINEERING.

Republished from *The Engineering Journal* (The Engineering Institute of Canada) for April, 1943.

IF Napoleon were taken to a modern battlefield he would revise his famous dictum that an army marches on its stomach. To-day it marches on the skill and ingenuity of its engineers.

In peace time, Britain was world-famous for the durability and meticulous accuracy of her engineering products. She was therefore fortunate when war broke out in having a pool of highly-trained technical men ready to hand. They became instructors of eager and intelligent young men who now form one of the vital elements in a mobile and resourceful army.

It is a tradition in the Royal Engineers that nothing can stop them. They will build a bridge in a matter of minutes; not a flimsy structure capable only of carrying troops but sturdy enough to take the heaviest equipment used in modern warfare—tanks, big guns, tractors. They will cut a road through ground that is broken by trenches or shell holes in the time it takes to smoke a cigarette. They will make raft ferries under fire capable of taking line transport, such as anti-tank guns and tanks, across a river. They will lay a minefield under the enemy's nose or—most perilous job of all—crawl on their stomachs through the enemy's minefields and discover and dig up his mines.

Recently a new engineering corps has been added to the British Army, or rather it is new only in name, for its personnel were drawn from existing units; it is the corps of Royal Electrical and Mechanical Engineers. These men are the front line armourers of the army, a hospital service for inanimate objects. The unofficial motto of the R.E.M.E. is, "Anything that the Army can break we can mend."

The operations of this repair corps cover all the weapons and equipment that an army carries. They will mend a derelict tank or put a new leg on a mess-room chair. They will install guns on merchant ships or solder a leaking saucepan. They will overhaul a typewriter or dig a tank out of a shell hole.

The Engineers of the British Army have proved their ingenuity in battlefields in three continents. Their skill in improvisation helped materially to rob Hitler of a decisive victory at Dunkerque. Their genius for overcoming obstacles enabled the British Army in 1941 to travel 1,840 kilometres through East African mountain, desert and jungle in the record time of 50 days, with the resultant loss to Mussolini of a vast empire and an army of half a million men. It is the Engineers of the British Army who have encased the shores of Britain in fortifications which Hitler has not dared to assault. In the desert of North Africa, engineers have dug wells and supplied a large British Army with filtered and sterilized water. In Persia, British Army Engineers have built and maintained new roads and railways which are now carrying an ever increasing quantity of war material to the Russian Army.

It must not be thought that the Engineers can wield nothing more lethal than a spanner. They are all trained fighters. They can use a rifle as effectively as the ordinary infantryman. They have had courses in unarmed combat. They will, when necessary, leave the lathe to take part in a bayonet charge, or cross a river by a bridge of their own making and wipe out the hostile machine-gun nests that tried in vain to stop the construction.

So important are the technicians in a modern army that it is estimated that one man in every twelve in Britain's land forces is a sapper. Wars are won nowadays by the brains behind machines. In that particular form of brain capacity, Britain has excelled for centuries.

MAURITIUS GARRISON—1833-34.

By Colonel J. Spottiswoode, M.C.

It so happened that a little while ago I had occasion to visit that Pearl of the Indian Ocean, the sugary Isle of Mauritius, and brought back with me out of the C.R.E.'s office a rather interesting book containing the Garrison and C.R.E.'s Orders from 3rd September, 1833, to 12th March, 1834. The pages are very brittle and not in good repair; the writing is not always copperplate and has worked its way through the pages in many places so that reading is not always easy though always possible. The covers are parchment.

The times dealt with were not exciting as far as international affairs went nor need it be supposed that the life of the garrison as revealed by the book seemed anything but normal to those who wrote it. Nevertheless, although some incidents strike a familiar note, it reads as oddly to us as no doubt ours would to anyone picking them up a century hence.

The chief thing that strikes one on reading it through is the large number of General and Garrison courts martial. No fewer than 54 are convened during the 6 months for a garrison apparently consisting of four infantry regiments together with some Gunners, Sappers, Commissaries and Ordnance.

Only the most serious sentences and those on officers are promulgated in orders. For instance, on the 5th November, 1833 :—

> " At a Gen'l Court Martial held at Pt. Louis on the 28th and continued by adjournment until 29th October, 1833, was arraigned Pte Jno . . . . of the . . . .th Regt. upon the following Charge viz: For Mutiny when the Prisoner was Sentry over the Barracks at Villa Baque in the Island of Mauritius on or about the 12th October, 1833, in having without provocation feloniously attempted to stab with a Bayonet fixed upon a firelock, Lance Sergeant James A . . . of the same Corps or otherwise to do him some grievous bodily harm " (how careful the framing of the charge) " upon which Charge the Court came to the following Decision. The Court having maturely and deliberately considered and weighed the evidence in support of the Prosecution against Prisoner Private Jno . . . . of His Majesty's . . . . Regt. of Foot together with what he has stated in his Defence is of the opinion that he is (*Guilty of the Crime with which he stands charged*) being in breach of the articles of War and doth sentence the said Prisoner Private Jno . . . . of His Majesty's . . . . th Regt. to be *transported as a Felon for Life*.
>
> " Which sentence has been confirmed by His Excellency the Commander in Chief.
>
> " 2. The Commander in Chief is confident that the Crime of which Private Jno . . . . has been found guilty must strike with horror every man possessing the true feelings of a British soldier, the Prisoner without having received any offence whatever from Sergt. A. . . . attempted in the most deliberate manner to take away his life nor was the Crime in the smallest degree diminished because his wicked aim did not succeed.
>
> " Through the lenity with which the Prisoner was tried he has not been adjudged to suffer Death, a Sentence which for the enormity of the offence he most justly deserved, and it is to be hoped that during the remainder of his Life he will feel sincere contrition for the act he committed.
>
> " The numerous instances of mutinous and outrageous conduct which have recently taken place at this Station have occasioned the Commander in Chief the deepest Grief he earnestly appeals to them to reflect most seriously on the dreadful Consequences of not controuling their angry passions the instant they arise and above all he desires them to recollect

that arms are put in their hands for the honourable purpose of being made use of in their Country's Cause and not to be the instruments for the destruction of their fellow soldiers.

"3. His Excellency the Commander in Chief therefore directs that the Prisoner Jno . . . . late Private soldier in His Majesty's . . . .th Regt. shall be handed over to the Civil Power for the purpose of being *transported as a Felon to New South Wales* agreably to his Sentence."

Unfortunately H.E.'s confidence was not justified, for on 10th December two soldiers are sentenced to be "shot to death" "at such time and place as H.E. the Commander in Chief may think proper" for similar "mutinous and outrageous" offences. Private Robert . . . . No. 761 of His Majesty's . . . . Regt. on or about 24th November, whilst quartered at Port Louis did "twice deliberately take aim with and twice pulled the trigger of a Musket loaded with Ball cartridge when by him levelled at Color-Sergeant F . . . . of the same Corps with intent to murder, maim or disable him or do him some grievous bodily harm, the perpetration and accomplishment of the above mentioned attrocious act being prevented and frustrated solely by the said Musket missing fire."

At the other end of the Island at Mahebourg, Pte. Charles . . . . No. 795 of the . . . .th Regt. of Foot was charged with, on or about 20th November, "wilfully and maliciously discharging the contents of a Firelock loaded with Ball Cartridge or some other deadly missile attacking Sergeant-Major M . . . . with intent to Murder or Maim him or do him some grievous bodily harm and afterwards aggravating the said attrocious offence by very insubordinate and outrageous conduct when ordered in consequence of the Commission thereby to the Guard Room."

The N.C.O.'s and W.O.'s of the Island seem to have borne charmed lives.

It can be presumed that these sentences were carried out since, after the special appointment of two Provost Marshals on 19th December, the detailed and rather grisly orders for the execution parades appear on the 20th.

Though fortunately no Sapper Officer is likely to have to write such orders nowadays, the example may be interesting. The brackets represent missing portions of the page.

"(1) With reference to the General order of the 16th instant the Sentence of Death passed on the prisoners Ptes . . . . and . . . . will be carried into execution in the ( ) of the respective Garrisons of (Port Louis and ?) Mahebourg on Saturday ( ) sunrise ( ) Detail viz an Execution Party consisting of one Sergeant and twelve Rank and file of the Regt. to which the Prisoner belongs :—

"An escort consisting of 1 Subaltern, 2 Sergeants and 30 Rank and file to be taken from the Garrison Guards (leaving Sentries standing) and to be completed if not of sufficient strength to that number, these Parties to assemble at the Main Guard and form in procession as follows :

"1. The officiating Provost Marshal.
"2. The Band of the Regt. to which the Prisoner belongs with muffled drums.
"3. The Execution Party with arms reversed.
"4. The Prisoners' Coffin borne on the shoulders of 4 men of the Company to which he belongs.
"5. The Prisoner accompanied by the Reverend Mr. Jones with a Private from the Escort on each side and a Non Com'd Officer in the rear.
"6. The Escort in 3 Divisions—the Procession to be under the orders of the Captain of the Day.

"On arriving at the place appointed for the execution where the troops will be formed on three sides of a square facing inwards the Procession

will enter by the left flank and move in ordinary time the Music (being?) the Dead March in Saul through the Ranks opened at 6 Paces—the front Rank facing to the Rear when the Prisoner and the Execution Party shall have been placed by the Provost in their stations the Escort will retire and form on the Right of the Royal Artillery ; the Coffin Carriers will also retire to their Regiment and the Square will be brought to its original formation.

" The Crime and Sentence of the Court Martial on the Prisoner will then be read together with the Warrant for his Execution and after a reasonable time being allowed for Prayer the Prisoner is to be placed on his knees with his eyes bound and facing the Troops when the Provost Marshall will proceed according to his instructions. The Execution being finished the Troops will break into open columns of Sections Right in front and march past the Body in slow time as soon as the whole have passed the Body will be incased in its Coffin and enterred.

" Signed H. E. Hunter,
D.A. Gen'l."

Then follows, oddly enough, " Garrison Order continued," which gives merely details of troops getting to the site. " No man to be absent Sick and Duty excepted." Para. 4 reads :—" The Flags at the Forts to be hoisted half mast at Daybreak a Gun to be fired at Fort William at the moment of Execution and the Flags to be lowered." This is signed by W. L. Stafford, Garrison Adjutant.

This is followed by another homily by H.E. in a similar strain to the last. We will leave it to be imagined, especially since the page is in a very bad state of preservation.

No other punishments on soldiers are detailed, but occasionally troops are ordered to parade to witness sentences being carried into execution, from which we may reasonably imagine floggings.

Sentences on Officers are not so grim, though Mr. C . . . , Clerk in His Majesty's Ordnance Establishment and Mr. R . . . of the same service, were dismissed from His Majesty's Service. The crime of Mr. C. was that of having " presumed to convey from Mr. R . . . to Lieut. P . . . of His Majesty's . . .th Regt. a Messuage demanding and seeking for explanation of a circumstance that had previously taken place in a manner having in its object the promoting of a Duel between the Parties and afterwards upbraiding the said officer for refusing to listen to or having anything to do with the said Messuage and grossly insulting him by making use of the following observation and expressions or words to the same effect or meaning (You have commenced the busihess unlike a Gentleman and you have ended like a Coward) the whole of such Conduct being destructive of the interests and well being of the Service and in breach of the Articles of War."

H.E. was more severe on duelling than the Court, since the latter first only sentenced him to be publicly and severely reprimanded, but being ordered to re-assemble and reconsider deemed it its duty to alter its Sentence to dismissal.

The charge against Mr. R . . . discloses the " circumstance that had previously taken place " thus :—

" For having on or about the 22nd Day of August, 1833, at Port Louis on the Island of Mauritius in consequence of Lieut. B . . . and Lt. P . . . of His Majesty's . . . .th Regt. protesting against the obstruction made by him the said Mr. R . . . in conjunction with other persons to the Passage along the Public Footpath in St. Georges Street in the above Town and which obstruction was designedly and intentionally made challenged one or both of the said officers by saying if you want any satisfaction you know who I am or words to the same effect and meaning." The charge then includes the sending of the Challenge by Mr. C . . .

The last disciplinary proceedings of which we have the record must have caused a deal of gossip and laughter on the Island. I fear that it reveals a certain

cleavage between the Military and Civil which not even the authority of H.E. the C. in C. could close. It is the case of "Dep. Assist. Commissary General S. upon the following charges, viz. :—

"1stly, for having on or about the morning of the 6th January, 1834, proceeded to the House at Grand River, N. West, then and presently occupied by John R . . ., Esq., President of the Court of first instance in His Majesty's Colony of Mauritius, and there falsely charging Mr. R. . . with having inveigled away from his (Mr. S.'s) service an apprentice (named John) belonging to the Customs Department.

"2ndly, for having without any real or apparent cause and without seeking for any explanation or having any regard to the peculiar obligations imposed by virtue of Mr. R.'s judicial functions and in a most unmanly manner and without provocation characterized Mr. R.'s conduct as ungentlemanly, etc., etc.

"3rdly, for having, on being told to leave the ground by Mr. R., given utterance to language and used gestures of a most degrading and indecent nature by placing his hand on the lower part of his back, turning round and using the words (Not for this respectable Journal.) and other expression of a similar tendency.

"4thly, and further and in aggravation of his foregoing conduct with having attempted to vindicate and justify that conduct by false and calumnious allegations contained in a letter to Lieut. R . . . Assistant Military Secretary to His Excellency the Governor and Commander in Chief for the Commander in Chief's information.

"5thly, with having written in that letter in a style and manner calculated if possible to provoke a breach of the peace, particularly in making use of the expression 'the office I hold does not certainly leave Mr. R . . . no alternative for Redress.'

"The whole of such conduct tending materially to injure the interest of and the good understanding which ought to exist and be maintained between the different branches of His Majesty's Government in this Colony and most unbecoming to the Character of an Officer and a Gentleman."

The Court maintained the Military side of the dispute and acquitted Mr. S. on all five charges, remarking about the 2nd : "Altho' so much of the allegations contained therein is proved as consists in the Prisoner having characterized Mr. R.'s conduct as (ungentlemanlike) yet influenced and misled as he had been by an apparent Cause the Court doth not think proper to attach any criminality to his having so done or having acted on the occasion in a manner unbecoming the character of an Officer and a Gentleman."

H.E. thought otherwise and ordered the Court to reassemble "for the purpose of reviewing their former proceedings in consequence of it appearing to the Commander in Chief that the Charges preferred against Dep. Assist. Commissary General S . . . ('are substantiated by positive evidence to a much greater extent than the Court has found')."

The Court having reconsidered "with the greatest attention" gave H.E. the minimum satisfaction. On the first and second charges it adhered to its previous opinion. "On the 3rd charge the Court finds the Prisoner guilty with the exception of that part which states he used 'other expressions of a similar tendency' and he stands acquitted accordingly." (Love-15.)

On the 4th Charge that "altho' it be true that Mr. S . . . the Prisoner did write the letter therein alluded to dated 8th January, 1834, and said to contain false and calumnious allegations against the character of Mr. Justice R . . . yet as it conceives that letter was written with a view to explanation and resulting from apparent Grounds the Court does not think proper to attach any criminality to his having so done." (15-All.)

On the 5th Charge "the Court adheres to its former opinion and now adds

that it considers the said Charge as frivolous and vexatious in the extreme." (30-15.)

And having found the Prisoner Deputy Assistant Commissary General S. "Guilty to the extent set forth doth adjudge *that he be admonished to be more circumspect in his conduct in future.*" (Let.)

> "The Court cannot close its revised proceedings without expressing its decided opinion that had the Common Courteseys of life been extended to Mr. S . . . on the occasions connected with the unpleasant charges which it has been its painful Duty to investigate the necessity of their Exhibition against him would never have existed and the Court has in consequence thereof passed the above lenient sentence which Sentence is confirmed and Asst. Commissary S . . . is hereby admonished and will return to his Duty." (40-15.)
>
> "The Commander in Chief at the same time feels it incumbent on him to record his dissent from the view which the Court has taken as to the lightness of the offence imputed to Mr. S . . . especially in the 3rd Charge and of which the Court has in its revised opinion found him Guilty with the exception, etc., etc." (40-30.)
>
> "The Commander in Chief must likewise add that he cannot coincide on the opinion that the circumstance alluded to in the concluding observations of the Court however convinced the Court might feel of the truth thereof ought to have operated with regard to the Sentence." (Deuce.)

The President of this stiff-necked Court was Lt.-Col. Thomas Fyers, R.E., C.R.E. Mauritius, and he was assisted by two Field Officers, six Captains, and six Subalterns.

The rest of the doings, of which these pages give us a glimpse, are less remarkable, but not uninteresting. To keep for the moment to Garrison Orders. On many occasions we find the Troops in garrison, Royal Sappers excepted, ordered to parade in line on the Road at half an hour after gunfire.

The organization of a Regiment is revealed as Grenadiers, four Companys and a Light Company.

Boards are formed to "report on the actual contents of the Military Chests at the close of the quarter," "to report on the quality of some Cape Salt Beef and Europe Salt Pork for the use of the Troops," or, for the same use, on some Colonial Rum, no doubt a more popular duty.

Quartermasters were Quarterblokes in those days for:—"It having been pointed out to His Excellency the Commander in Chief that in very numerous instances double Rations have been drawn from the Commissioned Magazines arising from admissions into and discharges from Hospital," etc., etc., the procedure, over a couple of pages, is tightened up and a new *pro forma* and certificate introduced.

"It is particularly requested" (they were polite then) "that minute attention be paid by the Officers composing the Boards to the exact quantities both by weight and tail. . . ." What is "tail"?

"The captured Africans enlisted into the Pioneer and Signal Company. . . ." Who were the captured Africans? Where did the Pioneer and Signal Company come in?

"The number of voluntary enlistments in the Corps of Military Laborers having fallen very far short of what the Commander in Chief had reason to expect. . . ." the establishment is reduced. One European Staff Sgt. gets 2s. 6d. per diem with Rations, Clothing and Quarters, also Rations for his wife if married and legitimate children. The Blacks consist of 2 Sgts. at 1s. per day, 6 Corporals at 6d. and 114 Privates at 3d., all rationed and clothed but no mention of quarters."

A working party of 2 & 60 is to be employed under Lt. Patten, R.E. "in collecting the Tools and the Timber of the several Public Buildings destroyed by the last Hurricane."

" A working party of one subaltern, three Sergeants and fifty rank and file of the . . . .th Regt. will proceed at gunfire tomorrow morning . . . to be employed under the orders of the Surveyor General. The Party will receive the usual rates of Working Pay." Later it comes out that they worked on repairs to a bridge, and the Genl. is happy to have received a favourable report of their exertions.

" Doubts have arisen as to whether the opinions given by the Board of Survey of which Capt. B. was President are sufficient to warrant the rejection of certain American and New South Wales Salt Beef. . . ." a stronger board composed of two Lt.-Cols. one Major, three doctors, three Lieutenants and an Assistant Commissary General are given the job and also to go into the whole question of the supply of Colonial Salt Meat.

The Returns for the Blue Book for the year 1833 are to be submitted. Targets for Ball practice are limited to one per Company. " Island Allowance to the Women " is granted. Gun fires at 5 a.m. from October to April and 6 a.m. from April to October. A quite normal raspberry occurs about Officers and Soldiers being seen improperly dressed in the streets of Pt.Louis and on the Place D'Armes. A working party employed on repairing damage done by the Hurricane to a Battery is not to be employed between 7.30 a.m. and 5 p.m. Divine Service takes place at 6 a.m. and Courts Martial assemble in the Officers' Mess House.

The C.R.E.'s Orders naturally have not so much to talk about but present a few points of interest. The Officers were Lt.-Col. Thomas Fyers, C.R.E., Capts. Grierson and Vicars, Lts. Patten and Twiss, and we hear of Mr. Baker as Clerk of Works.

Which Sappers and Miners are present is not clear, though the 2nd Company is mentioned. Care is taken of them as they too have to keep out of the noonday sun. " N.C.Os and Privates who work in the Sun will leave off at 9 o'clock in the morning when they will breakfast and remain under shelter till 3 in the afternoon and work from that hour till sunset. The N.C.Os employed at La Petite Montagne and the Tower at Crand River will occasionally visit and direct the other workmen there but will not permit any of the Sappers to expose themselves to the sun during the above period." Discretion was given however to working when the sun was obscured.

The C.R.E. also had charge of the Ordnance Barracks Company, for we get records of " African Invalids of the O.B. Coy." being raised from the 4th to the 3rd Class, being appointed Commanders, etc. One of the latter was John, but we are not told if he was victim of the following entry five weeks later :— " William F . . . and Charles G . . . will be chequed their pay to-day for striking and abusing John a Black belonging to the O.B. Company and all persons are strictly forbidden from striking any Black employed in the Department whether hired or otherwise on any pretence whatever."

Leall, African Invalid, is confined till further orders, and chequed a week's pay for misconduct while in charge of erecting a building, while Adam, Government Black, soon joins him in clink having been detected in taking *Bordeaux* from the *Caudan*. Use is also apparently made of Indian convicts.

Sappers were Privates in those days and their appearance in Orders is usually to have their working pay reduced for being drunk in various situations, particularly as cooks. However, Ptes. Henry Bolton, Thomas Glover and John Langford have their's raised from 9d. to 1s. per diem " in consequence of their late good conduct."

The last entries strike a human note. They are twelve in an identical pattern :— " Mr. Baker, Clerk of Works, will proceed to . . . . for the purpose of inspecting and measuring building materials supplied by Contractor (or Contractor's work performed there)." The dates range from 26th August, 1831 to 3rd May, 1834. I can see Mr. Baker suddenly discovering that he was missing T.A. to which he was entitled and thumbing through his diary.

Major General Edward H Hemming CMG

MEMOIRS.

MAJOR-GENERAL E. H. HEMMING, C.M.G.

EDWARD HUGHES HEMMING was the son of G. W. Hemming, Esq., Q.C. He was born on 13th May, 1860, and after education at Clifton College and the R.M. Academy was commissioned in the R.E. in 1880, passing out of Woolwich the head of his batch and gaining the Pollock Medal. At the S.M.E. he showed a decided bent for constructional engineering and was awarded the Fowke Medal. In 1882 he volunteered for Indian service and was posted to the Bengal Sappers and Miners at Roorkee, with whom he served in the Zhob Valley expedition of 1884. On returning from this he joined the staff of the Inspector General of Military Works at Simla. He was promoted Captain in 1889 and the same year married at Simla, the daughter of Colonel Arthur Macnaghten of the 2nd Bombay Lancers. Returning to England on leave, he was employed for a time in the office of the Inspector General of Fortifications in London. In 1892 he returned to Indian service as Executive Engineer at Aden, and the following year took charge of the Bombay defence division. In 1896 while still on the Indian Permanent list he returned to England, and after a short period as D.O. Liverpool, was appointed in 1898 to the office of the I.G.F. in London, where he took charge of the Barrack design branch, and was promoted to the rank of Major the same year. The Barrack design branch was responsible for the custody of the record plans of barracks, and for the preparation of schemes for new barracks and hospitals all over the world, except in India, and worked in close contact with the Sanitary Committee of the War Office, which, under the Presidency of the Quarter-Master General, had been started in 1862; on the initiative of Sir Douglas Galton. Hemming was a master of detail and gave a great deal of work to his job, leaving behind him a revised synopsis of barrack and hospital accommodation which set a standard for many years to come. In 1902 under revised Indian Regulations he reverted to English Service and in 1903 was made Assistant Inspector-General of Fortifications for Barrack work. In 1905 he was ordered to Malta as C.R.E. of the Sliema district in anticipation of his promotion to Lieut.-Colonel in 1906. This district included three new barracks for Infantry, which were just being finished and he had also to rebuild the group of R.G.A. barracks at Tigne.

He returned home in the autumn of 1910 and was employed in the London district until placed on half pay in 1911, receiving the usual brevet of Colonel, antedated to 1909. In 1912 he rejoined the War Office as the head of the Barrack branch under the Direction of Fortifications and Works, graded as A.D.F.W., where he resumed his liaison with the Army Medical Advisory Committee which had succeeded the old Sanitary Committee. During his absence from the War Office, a new Civilian Director of Barrack Construction had been appointed, who was at first placed under the Civil Under-Secretary of State, but this organization proved a failure, and the Director of Barrack Construction was transferred to the control of the Master-General of the Ordnance, who arranged to distribute the building work each year between the military and civil branches.

There was at this time a big scheme of new hospital construction in progress in which Hemming had a big share, this included the new hospital at Cosham for the Portsmouth area, the central Millbank hospital, a new hospital at Gibraltar, and two hospitals in Ireland.

In 1913 Hemming was nominated for the dormant appointment of Deputy Director of Works with the Expeditionary Force, and on the outbreak of the Great War in August, 1914, he mobilized with the staff of the Director of Works

in Kensington, and on 10th August proceeded to Havre, which was the base of operations for the B.E.F. One R.E. company, the 29th, had been specially mobilized for work on the L. of C.; its equipment included a portable machine workshop and a staff of engineer clerks and mechanists for an engineer office at the base, and another at the headquarters of the L. of C. which was at Amiens. There were also 30 R.E. officers who mobilized for work under the Director of Works, but no subordinate staff was provided for these officers. The arrangements for the L. of C. had been kept a close secret and the French had undertaken to prepare rest camps for the B.E.F. and to make all arrangements for the movement of troops and stores to the front. In addition to Havre the ports of Rouen and Boulogne were to be used for the disembarkation of troops, and at each place the French had provided the nucleus of a camping site and horse lines with water, but had left no troops for their completion or maintenance. In addition to the 29th Company, the 20th and 42nd Companies were each equipped as a small field company for work behind the front, the 20th Company accompanied the Director of Works to Havre. On arrival there the Director of Works sent some of his attached officers to Rouen and Boulogne, and at once began the preparation of hospitals, bakeries, remount depots, veterinary hospitals, and offices, for which no preparation had been made by the French. On the 17th August, the Director of Works left for Amiens to take charge of the Works in the Army area, taking with him a section of the 29th Company and the whole of the 20th Company, and leaving Hemming in charge of all the work at the ports.

On the 27th it was decided to evacuate all the base ports and to move the base to St. Nazaire with camps at Nantes. Hemming and his staff with the remainder of the 29th Company moved by sea to those stations, where much miscellaneous work was started, the 29th Company set up its workshop and started making camping accessories. After about a month at these stations, the channel ports were reoccupied and Hemming, with the 29th Company, returned to Havre, while engineer services were required at Rouen, Dieppe, and Boulogne.

A base for the Indian contingent was also opened at Marseilles. By this time most of the R.E. officers allotted to the L. of C. had been drafted to the Armies to replace casualties, an Engineer-in-Chief had been appointed at Headquarters who took over the 20th and 42nd Companies, and later the Headquarters of the 29th Company, and on the 15th October, the Director of Works moved to Abbeville. The officers and men on the L. of C. were replaced by civilian engineers from England, graded as temporary Inspectors of Works, and by six Works Companies from Territorial units.

All these changes involved very heavy detailed work on Hemming, who had to get work done somehow. It was not surprising that his health failed under the strain and after visiting the southern stations at Marseilles and Orleans, he was sent for a month to an officer's convalescent home in the south of France. When he returned to duty he joined the Director of Works at Abbeville. In February, 1915, a second Deputy Director was appointed who took charge of the northern part of the L. of C. from Etaples to Calais and Dunkirk, but Hemming remained in charge of the southern stations and also acted for the Director of Works when the latter was away.

His story from now on was the story of the Directorate, a continual struggle to cope with a rapidly increasing quantity of work. Large quantities of road material and timber had to be provided, partly from overseas, and partly from French quarries and forests. In addition to the standing camps and hospitals which reached figures of 350,000 all ranks with 35,000 hospital beds, there was a continual demand for remount and store depots, mechanical workshops, and a large programme of dock and port extensions and cranes.

In June, 1916, Hemming's health again failed and he was invalided home. He was awarded the C.M.G. for his services in France.

In November, 1916, he was appointed Chief Engineer Eastern Command with

Brigadier General William B Lesslie CB CMG

the rank of Brigadier-General, where he had the responsibility of housing 650,000 troops with 62,000 hospital beds, also a number of aerodromes and the maintenance of the coast defences from the Wash to Chichester Harbour.

Early in 1918, Major-General Twining was appointed Director of Fortifications and Works, and having himself no previous experience of the War Office, brought Hemming into the office as Deputy Director retaining his rank as Brigadier-General. Here he remained until 12th April, 1919, when he was placed on the retired list as he was well over the retiring age for his rank. In May when a list of honours was published for work in the War Office during the war, Hemming was promoted Major-General, but there was no vacant employment in this rank, and though he applied that his retirement should be cancelled, it was decided that it should stand, but his promotion to the General's list was ante-dated to 1st April, and he was placed on the reserve of officers.

At the time of his retirement, there was in hand a programme of building associated with the name of Dr. Addison, and Hemming was appointed the Deputy Commissioner for Housing in Lancashire and Cheshire under the Ministry of Health. The details of houses promulgated by the ministry followed very closely the synopsis of married quarters used by the War Office, so Hemming was well qualified for this appointment. But unfortunately the cost of construction rose very rapidly all over the country and the scheme was terminated in 1921.

Hemming then settled in Newbury, where he interested himself in church and social activities, and in 1930 he was elected a member of Newbury Town Council, when he placed his experience of housing at the disposal of the Council. He remained on the council till 1937. He was also an active member of the British Legion and other interests, and the local paper describes him as "a keen actor and reader, a connoisseur in antiques, a handy man in the workshop, a croquet player, fisherman and a very keen gardener." He died at Newbury on the 20th April, 1943, in his 83rd year. His wife had predeceased him by only five months. They left two children, a daughter who is unmarried and a son, Brigadier W. E. G. Hemming, formerly of the Royal Horse Artillery and now commanding the Royal Artillery of an Armoured Division of the Home Forces.

W.B.B.

BRIGADIER-GENERAL W. B. LESSLIE, C.B., C.M.G.

William Breck Lesslie was born in Canada in 1868, and was educated at the Royal Military College at Kingston, where he won the Sword of Honour and a silver medal. At the age of nineteen he received a commission in the Royal Engineers. After serving at Chatham and in Ceylon, he returned to Kingston as an instructor in 1895, remained there for four years, and then went to India. For eighteen months he served with the Royal Bombay Sappers and Miners, at Kirkee. At the end of 1902 Lesslie, who had now been a Captain for three years, joined the Somaliland Field Force and, in the ensuing campaign he held, in turn, the posts of C.R.E., Camp Commandant of the Flying Column and Press Censor, C.R.E. on the lines of communication, and D.A.A. and Q.M.G. He received the Somaliland medal with clasp, and for his good work was mentioned in Despatches and advanced to Brevet Major.

When the Great War broke out Lesslie was serving on the Indian Army Headquarters Staff at Simla, as D.A.A.G. for the Royal Engineers. Several months later, when General Birdwood, appointed by Kitchener to take command of the Australian and New Zealand forces in Egypt, was called upon to select his staff, he at once chose Lesslie, realizing only too well how he and the troops could rely implicitly on the ability, devotion, and courage of the man on all occasions. At first Lesslie had no definite appointment, but was very soon made A.A. and Q.M.G. of the Anzac Corps.

At Anzac, where he was made Military Landing Officer, Lesslie did yeoman service. Never content to stand by and superintend work, he always had his coat off, laying in to the job with the best of his men. He grappled marvellously with the water difficulties in those early days, and few realized that it was due to his courage and resolution, in the face of fierce fire from the Turkish battery at Scrubby Knoll, that water reached the men in the front line.

With Captain (afterwards Brigadier-General) Tom Griffiths, Lesslie husbanded the nightly reinforcements and got them safely to their allotted places. It is safe to say that no two men at Anzac laboured so incessantly and with such purpose under constant shell-fire as Lesslie and Griffiths. On the nights before the opening of the August offensive this work reached its apex, for, in addition to Australians and New Zealand reinforcements, British battalions had to be landed and tucked away out of sight of the Turks before daylight. One battalion was moving through the Hell Spit cutting when a shell burst very close to it. Its men, coming under fire for the first time, slowed down and seemed to become heavy-footed. Most men would have damned their souls and told them to get a wriggle on, but Lesslie, in his breezy style, said to one of their officers : " This part isn't recommended as a health resort, never mind about keeping step."

In August, 1915, Lesslie became Chief Engineer at Anzac, and never was a job more faithfully earned. In October he was promoted Brigadier-General. The sappers of the 1st Australian Division made for him, from the copper driving band off a Turkish shell, a pair of badges (crossed sword and baton) of his new rank. He was intensely pleased with the little gift, valuing it highly.

On the formation of the II Anzac Corps in Egypt, early in 1916, Lesslie became its Chief Engineer, and in June he crossed to France. But his real *forte* lay in handling men in difficult circumstances, and he was intensely happy and honoured when, in January, 1917, he was given command of the 1st Australian Infantry Brigade. As a brigade commander Lesslie was in the very first rank ; he never did a job other than well, and the troops knew that he was untiring in their interests.

By the middle of 1918, in view of the Australian Government's wish that A.I.F. commands and staffs should be " Australianized," most of the British Officers who had been attached to the force overseas were re-absorbed into their own service. Lesslie left the 1st Brigade on June 6th on receiving command of the 190th Brigade, 63rd (Royal Naval) Division.

General Lesslie, who retained the command of the 190th Brigade until it was demobilized in 1919, directed its efforts in the operations at Bucquoy, Le Barque, Queant, the Canal du Nord, Bourlon Wood, the Canal d'Escaut, and on the right flank of the Canadians in the final advance to Mons. During this period the brigade served successively in three Corps—IV, XVII, and XXII—of Byng's Third Army. The XXII Corps, which had been the old II Anzac Corps, was commanded by General Godley, who, for the advance to Mons, sent Lesslie a detachment of Australians from the Corps mounted regiment. So happy was Lesslie at this unexpected meeting with old friends, and so invaluable was their help, that he personally delivered to them the accumulated savings of his own rum ration—a gift that was highly appreciated by the Digger troopers.

Towards the end of 1919 Lesslie returned to India, and during 1920 commanded, first, the lines of communication in East Persia and, later, the military mission

Brigadier Frederick H Kisch CBE DSO

and force at Meshed. After this he became Brigadier-General, R.E., in India, and until the end of 1921, commanded the Royal Bombay Sappers and Miners. He then returned to England, the War Office sending him up to Edinburgh to take charge of the 155th (East Scottish) Infantry Brigade, Territorial Army.

When in 1925, at the age of 57, he retired from the army, General Lesslie settled down at Basingstoke in Hampshire, but later moved to Mortimer, a hamlet in Berkshire, six miles south of Reading.

A short thick-set man, always physically fit and mentally alert, William Breck Lesslie had bright twinkling eyes and a keen sense of humour. No matter how gloomy things looked during the war—and occasionally they looked very bad—he was always ready with a joke to buck up anyone who appeared to be down in the mouth. It is true that he was quick-tempered, and would flare up at anything mean or shabby, but his righteous anger subsided as quickly, and he was again the cheery, gallant soul who dearly loved the Diggers. No man who spent five minutes on Anzac Beach in times of stress but has retained a vivid picture of him in shirt sleeves, brimful of energy, clearing a block here, succouring a wounded man there, his voice often husky, but nevertheless compelling, whether shouting orders in Hindustani or with that infectious Canadian accent which he never lost.

The above is extracted from an article on Brigadier-General Lesslie, published in Australia in December, 1937. Paper restrictions prevent the re-publication of all of it, but the many anecdotes show how thoroughly Lesslie endeared himself to his comrades of the A.E.F.

He died on 23rd November, 1942, at Reading.

Brigadier-General G. H. Boileau, C.B., C.M.G., D.S.O., Colonel of the Royal Bombay Sappers and Miners, writes: "He was always cheery and bright and is a great loss to his many friends."

F.E.G.S.

BRIGADIER F. H. KISCH, C.B., C.B.E., D.S.O.

FREDERICK HERMANN KISCH, whose death is announced as having occurred on active service in April, 1943, was born on 23rd August, 1888, the younger son of H.M. Kisch, C.S.I., and was educated at Clifton college. He was commissioned Second-Lieutenant, R.E., on 9th August, 1907 and on leaving the S.M.E. was posted to India. He was promoted Captain in October, 1914 and served as 2nd-in-command 21st Company, Bombay Sappers & Miners, and Field Officer, 3rd Lahore Division, in France and Mesopotamia. In 1916 he was promoted temporary Major and in that year awarded the D.S.O. and in 1917 the Croix de Guerre in recognition of his valuable services in France and Mesopotamia.

In "The Indian Corps in France" Colonel Merewether and the late Lord Birkenhead state that at the battle of Givenchy he was "always to be found where the fight was thickest," and describe him as "cool as ever," sketching the plan of a barricade. In April, 1915, at the second Battle of Ypres, in spite of wounds, he approached within a few yards of the German trenches and made a plan of the enemy's position in front of the Jullundur Brigade. Service in France (1914-15) was succeeded by service in Mesopotamia (1916-17), where he was again wounded.

While convalescing he took up work in the Military Intelligence Directorate at the War Office, where he quickly made his mark, being closely concerned with Russian and Eastern Intelligence. Kisch, now Lieutenant-Colonel, served on the War Office Delegation throughout the Versailles Peace Conference, and at its close remained on the Military Staff attached to the Council of Ambassadors.

During that time he had the opportunity of studying post-war engineering development in France, Germany, Poland and Czechoslovakia. In the King's Birthday Honours in 1919 he was created a C.B.E. as a reward for his work.

At his own request he retired from the service in November, 1922, and was placed on the Reserve of Officers and granted the rank of Lieutenant-Colonel. Taking up residence in Palestine, he was appointed Chairman of the Executive of the Jewish Agency, being associated with the inception of the Palestine Electric Corporation and of Palestine Potash, Ltd., both of which were developed into engineering concerns of high magnitude. From 1932 to 1938 he was in private practice as a Consultant Engineer in Palestine and Director of the Palestine Road Constructing Company.

At the outbreak of the present war he was recalled for service and as a Lieutenant-Colonel took up the appointment of C.R.E. Alexandria. He later became C.R.E. Establishments, Cairo, and in August, 1940, was promoted Acting Colonel on appointment as Deputy Chief Engineer, British Troops in Egypt. In February, 1941, he was promoted Acting Brigadier and appointed Chief Engineer, Cyrenaica. Later he became Chief Engineer, Western Desert Force, and in September of that year Chief Engineer, Eighth Army, directly under the Engineer-in Chief, Middle East Forces, and Director of Works, Middle East Forces. In 1942 he received the C.B. in recognition of his gallant and distinguished service in the Middle East during the period November, 1941, to April, 1942.

Brigadier Kisch was killed in action in April, 1943. He had gone forward to organize work of repair to the main road bridge over the Wadi Akarit near Gabes and was killed by the explosion of a mine.

Many tributes have been paid to the valuable work he performed in the Middle East and from them it can be said that it is a tragedy that he, who had been the pioneer of work dealing with the mine menace, should himself be killed by a mine. He was considered the best Chief Engineer any Commander could want to have and his name will for ever be remembered in connection with the longest advance in history; his engineering enterprise had much to do with the conquering of North Africa.

Brigadier Kisch received various foreign decorations, including those of the Croix de Guerre and the Legion of Honour. He was twice married, leaving two sons by his second wife, Ruth, daughter of Sir Leonard Franklin.

A.G.C. in a letter to *The Times* writes:—"As one who was associated with Brigadier F. H. Kisch and saw him at work during the formation and subsequent early days of the Eighth Army, of which he was the first Chief Engineer, may I be permitted to add a few lines to your notice announcing his death in action? Tireless in his work, unlimited in resource and initiative, he brought his great technical talents to bear on the many very great engineering problems which faced the Eighth Army at that time. Of these perhaps the most remarkable was his success in leading Nile water over hundreds of miles of barren desert to a point near the Libyan frontier, in time to allow the offensive to start on the appointed date. He was one of the pioneers in solving the difficulties of clearing minefields, a matter which at that time was causing great concern. Undeterred by the many shortages in resources from which the Army was suffering, by boundless enthusiasm, energy and imagination he overcame the great handicaps from these causes. A very gallant Engineer Officer has passed, but his work and example will live in the Army for many a long day."

The loss of Brigadier Kisch is severely felt, but the influence will continue of one who gave of his very best in the service of his country.

All Reviews of Books on military subjects are included in the provisions of K.R. 547(c) *1940*.

BOOKS.

(Most of the books reviewed may be seen in the R.E. Corps Library at Brompton Barracks, Chatham.)

GERMAN FOR THE SCIENTIST.

By PETER F. WIENER. With an Introduction by E. N. DA C. ANDRADE, Quain Professor of Physics, 208 pp.

(G. Bell & Sons, Ltd., 1943. Price 6s. net.)

"A good book," writes Dr. Andrade, "which shall enable the student to acquire, without too much formal training in grammar, an adequate reading knowledge of scientific German, seems to be badly needed": and here we have it.

Because it is recognized that a knowledge of German is necessary to the equipment of a man of science, compulsory questions in that language are included in the papers set for the B.Sc. degree; and to Dr. Wiener, as tutor in German at London University up to 1939, fell the duty of preparing students to answer those questions. Finding that objections were raised, especially by the more advanced students, to existing books, he devised a system of his own which proved both acceptable and productive of good results.

This book is planned on the lines of that system and will, undoubtedly, fulfil the author's hope that it may prove useful not only to future students, but also to the practical scientist. It consists of four Parts, designed to give students a *reading* knowledge of German, and ends with an extremely valuable Vocabulary mainly of technical terms which will be appreciated by every man who sets himself to keep abreast of German thought and German discovery in the field of Chemistry and Physics.

Part I is a "Grammatical Introduction," consisting of six "Lessons" and ten Appendices. It covers 51 pages and is purely educational, giving a brief summary of the grammatical and constructional difficulties and the elements of scientific German. Parts II and III (73 pages) consist of long passages in Chemistry and Physics by German authors. Dr. Wiener stresses his opinion that long passages for translation are of far greater value than a number of short extracts. In Part IV the reader will find English translations, not unduly literal, of these passages.

This is a book to be bought by those to whom its special appeal is directed.

T.F.

THE INTERNAL COMBUSTION ENGINE.

Edited by A. H. FRANKS.

(Published by Sir Isaac Pitman & Sons, Ltd. 154 pp. 70 Illustrations. Price 7s. 6d. net.)

The title of this book is misleading as although most of the subject matter concerns the I.C. petrol engine, about 60 pages are devoted to the other mechanism of the motor car.

The treatment, though elementary, is clear, concise, practical and correct, and the illustrations are good.

The book should be of great help to owner-drivers, for whom it is evidently intended. It should also be useful generally for basic training in driving and vehicle maintenance, especially if used in conjunction with the makers' vehicles instruction books.

The engine fault-finding chart is unusual and should prove helpful to driver-mechanics.

A chapter is devoted to the C.I. engine and the book concludes with a chapter on reference books for further study of the subject.

W.M.

THE TRANSITION FROM WAR TO PEACE.

By A. C. PIGOU.

(Oxford University Press. Price 6d.)

This pamphlet has been sent us as a specimen of a new series following on the very successful *Oxford Pamphlets on World Affairs* and entitled the *Oxford Pamphlets on Home Affairs*. The Professor naturally deals with the prospects of trade and employment after the war. These seem to be epitomised in the passage " provided that the wage-policy of the Trade Unions and the monetary policy of the State are properly married together." With a restrained monetary policy " there is a limit beyond which the general average of money wage-rates cannot be pushed up except at the cost of creating unemployment." And an unrestrained monetary policy, " besides hitting very hardly all recipients of fixed money incomes, might well lead presently to a general distrust of the currency accompanied by violent soaring prices—that terrible ' galloping inflation ' experienced in an extreme form by Germany in the early 1920's and which threatens, not merely monetary, but also industrial, social, and political chaos."

F.E.G.S.

CORPORAL JACK.

By David Scott.

(Messrs. Faber & Faber, Ltd. Price 8s. 6d.)

A well-told escape story, said to be founded on fact. In France the Corporal was undoubtedly fortunate in his casual acquaintances and there his inherent pluck and good sense carried him through. In Spain things were surprisingly different, but again good fortune intervened or he would not now be alive to tell, vicariously, this tale.

F.E.G.S.

THE STRUGGLE OF THE SERBS.

By K. ST. PAVLOWITCH.

(The Standard Art Book Co., Ltd. Price 5s.)

Field-Marshal Lord Milne in a foreword to this little book regrets that hitherto the people of Great Britain have taken little interest in the potentialities and ambitions of this small nation which from personal contact he knows to be " a simple, light-hearted, peace-loving, and, as history has shown, courageous peasant nation, imbued with the highest ideals of patriotism."

Here the reader will find a sketch of its ancient history and the lurid tale of its sufferings at the hands of the Germans, Italians, Hungarians and Bulgarians during the present war ; of the ruffian Pavelic, the murderer of King Alexander, now made Governor of the newly created State of Croatia, and his atrocities ; and of the glorious resistance of General Mihajlovic. One can only hope that the day is not far distant when all the perpetrators of the appalling atrocities here narrated will be brought to book.

F.E.G.S.

MAGAZINES.

THE ENGINEERING JOURNAL.

The May, 1943, number of *The Engineering Journal*, the journal of the Engineering Institute of Canada, appears with a highly ornamental cover in honour of the 25th anniversary of its establishment. If it were judged only by its advertisements it would be a striking tribute to the Engineering progress of the Dominion. The number contains special articles by distinguished engineers on almost every branch of the profession and all show how greatly Canada is helping the war effort.

In introductory messages Mr. W. L. Mackenzie King expresses the opinion that "the engineering profession is in an exceptional position to aid in the nation's war effort" and Lieut.-General A. G. L. McNaughton writes "In this war of highly mechanized, fast-moving, armoured forces, engineering plays a greater part than ever before. Ours is a citizen army in which the vast majority of officers are civilians and, in the technical arms, it is engineering experience in civil life that has enabled them to handle their very diversified military jobs efficiently."

Our interest is naturally attracted by Major-General C. S. I. Hartzberg's short article on Military Engineering, with its pictures of the launching of a 140 ft. truss girder, a huge cement-mixing plant and a bull-dozer tractor levelling out rough ground. Owing to the greatly increased weights of modern weapons and also to the destructive effects of long-distance bombing, a never-ending flow of heavy equipment must be maintained from the base to the van of the army and sappers must be available all along the line to run and maintain the equipment. In writing of roads the General comments on the surprising way in which English roads have stood up to the severest military traffic, but suggests that this experience may be misleading when we come to other countries. At any rate damage done by bombing, diversions, approaches to military bridges, and tracks across beaches may give plenty of work to the sappers, often under fire.

Air landing fields and demolitions are touched upon and with regard to minefields and beach-clearing operations, work that requires a high standard of courage and skill, he considers that the maximum amount of protection possible must be provided to bring the engineers and their equipment forward.

The General next deals with Field Defences and Bomb Disposal; he also mentions the Tunnelling work of the Royal Canadian Engineers at "Gibraltar, and throughout this island from Land's End to John o' Groats and even further north in the Shetland Islands; the construction of permanent workshops, hospitals, airfields, roads, and many other structures." To which may be added water supply, the lighting of headquarters in the field, the construction of docks, the demolition and repair of industrial plants, etc., etc.

The average military engineer officer is nothing more or less than a civilian engineer trained as a soldier and engaged in the application of engineering knowledge to war.

F.E.G.S.

INFANTRY JOURNAL.

(*April*, 1943.)—This number contains interesting articles on *The Battle of El Alamein*, by Captain DeWeerd; *The Battle for Bataan*, by Clark Lee; *Psychology for the Fighting Man*, besides several others.

The article on *Psychology for the Fighting Man* and others following it in subsequent numbers have been prepared under the direction of a Sub-Committee of the National Research Council. The whole is to be published in book form by the *Infantry Journal*. The first article deals with "Hearing as a Tool in Warfare," and gives some simple rules to help men to get the most out of their ears, and to protect them from being deafened, temporarily or permanently, by very loud sounds.

A most valuable article, based on the caption:—"It takes an ear as well as an eye to fight a war well."

(*May*, 1943.)—The second article on *Psychology for the Fighting Man* deals with the Training of the Soldier. It dwells on the importance of speed in training, since the American army is mainly a civilian army made up of men who had given no thought to war until it actually threatened or broke out, whereas the enemy has spent years preparing for it. In order to speed up training it is necessary to do things right from the beginning. The correct way of studying books and manuals is explained, as well as the importance of memorizing, in preference to looking up text-books every time a reference is required.

Some articles of general interest are *SS in Arms*, by Dr. Vagts; *Bridgehead on the Irsha*, by Lieut.-Colonel P. W. Thompson, and *Dieppe*, by Colonel R. E. Dupuy.

(*June*, 1943.)—The third article on *Psychology for the Fighting Man* deals with Efficiency in the Army. A few rules are given for working on a mechanical job so as to get the best results for the energy expended. Fatigue is an enemy of efficiency, and complete rest does more for recovery than a mere change of activity. An instance is quoted of a British munitions plant where the reduction of the working week from 58 to 50 hours increased the hourly output by 39% and the total weekly output by 21%. Boredom should be avoided by providing variety in the work. The importance of sleep is stressed, but when soldiers must be kept going night after night without proper sleep, it helps them if they can take food at frequent intervals.

German Strategy in the Present Conflict. By Dr. H. Rosinski.

Whatever may have been the ultimate objectives of Hitler's schemes, there can be no doubt that his main purpose was an attack on Russia with the object of gaining the vast treasure-house of the Ukraine. He also hoped to exercise a controlling influence on the group of loosely federated states into which the Soviet Union was to be split up. The plan was considered technically feasible provided four indispensable conditions were fulfilled, viz.:

(1) economic control of the Danube basin;
(2) a free passage through Poland;
(3) active co-operation by Japan in the East;
(4) most important of all: benevolent British neutrality.

However, the combination of events that forced Hitler's hand in the summer of 1939 ended in a complete revision of his plans by plunging him into a war against Poland, France and Britain. He thus lost the signal diplomatic triumph he had hoped to achieve as the price of the conclusion of the Soviet pact. He was also compelled temporarily to align himself with his arch-enemy, Russia, against the powers whose neutrality he needed most.

By the speed with which he eliminated Poland he was enabled to avoid the dreaded risk of a war on two fronts, and to concentrate his attention on an attack on France. But, before doing so, he had to secure his northern flank against any chance of an allied intervention. The next step, therefore was, the invasion of Denmark and Norway.

This unexpected attack caught the Allies off their balance. In the writer's opinion they should have lost no time in driving the Germans out of Southern Norway before allowing them to consolidate their success. The risk of losing capital ships and transports would have been worth while in the circumstances.

In May, 1940, came the long prepared all-out attack in the west, ending in the complete collapse of France. Many military critics have considered that Hitler's most serious error was his failure to follow up the elimination of the northern group of armies at Dunkirk with an improvised descent on Great Britain, then in a state of almost complete military helplessness. But it is pointed out that the Germans had to consider the risk to their left flank from the Maginot line and the urgency for not giving the French time to reconsolidate their position.

The Germans now found themselves in a position for which they were not prepared, with the entire coast line from the North Cape to Bayonne in their hands, but without command of the sea. The risk of operating across the Channel against the very heart of sea-power, backed by the highly efficient Royal Air Force, was a very heavy one, nor was the *Luftwaffe* in a position to step into the breach.

As soon as the Russian leaders had recovered from the first shock of the unexpected collapse of France, and realized the danger to which their country was exposed, they started to concentrate forces on the German border. This compelled Hitler to divert a large portion of the army and air force intended for an attack on Britain to the Russian frontier.

It was not till the summer of 1941 that Hitler launched his attack on Russia, which had been planned six months earlier; but it was in the summer of 1940 that he missed his great opportunity. If, instead of pitting his forces against Britain, he had left small forces to watch the Channel and the Russo-Polish frontier, and had launched the bulk of his land and air forces into the Balkans and the Near East, he might have won not only the next round but the whole war. The entire British plan of campaign had been overthrown through the collapse of France; Syria was in the hands of Vichy collaborationists; German agents were active throughout the Near East; General Wavell had only a fraction of the forces which the Italians could combine against him in Libya and Ethiopia; the British Mediterranean fleet, handicapped by the loss of the French bases, had to face a numerically superior Italian fleet. If Hitler had concentrated his air attacks on Malta, Athens and Alexandria instead of bombing London, Coventry and Plymouth, and had forced his way with his land forces through the Balkans, the outlook for the British in the Middle East would have been a very gloomy one. Possibly Japan would have struck a blow in the Far East earlier than she did.

In 1941 Hitler launched his Russian campaign. He had hoped, by surprise and the unprecedented force of German blows, to throw the Russian leadership into such a state of confusion at the outset that it could never recover the initiative. But the German High Command made no attempt to adapt their technique to the Russian theatre of war, and, though they won victory after victory, their great central offensive (October to December, 1941) collapsed. In the summer of 1942 Hitler persisted in hurling his sixth Army against Stalingrad, whereas a much smaller force diverted to North Africa in support of Rommel might have enabled the latter to push through to the Nile Valley.

After discussing the courses now open to the Germans both in the East and in the West, the writer concludes with the assumption that a strategy of cautious and wise defensive action aiming at a draw by dividing and exhausting their opponents, such as Frederick the Great successfully carried out in the second part of the Seven Years' War, remains the Nazis' best and only hope.

Dig or Die. By Lieut.-Colonel W. C. Hall.

The value of slit trenches as a protection against dive bombers was impressed on the British throughout the Battle of Flanders and at Dunkirk.

The army in New Guinea and the Marines on Guadalcanal quickly became experts at digging in. The fox-hole gives more protection than the slit trench and was soon used almost exclusively by the Americans. The Marines found that the Japanese shovel, though a little heavier than the American entrenching tool, was a faster tool. They sometimes carried captured Japanese shovels in preference to their own entrenching tools. These shovels are spade-shaped, of fine steel with sturdy handles and sharpened side-edges for cutting.

Improvements in modern weapons have given the attack the power to crush any steel or concrete works. This was demonstrated at Sevastopol, where exceedingly strong works were organized in depth, and yet were blotted out one by one. On the other hand, in Stalingrad, where the mass of ruin and rubble caused by early bombing precluded the accurate location of Russian strategic points, the assault weapons could not be effectively employed. This shows the importance of camouflage of positions, rather than a reliance on their strength.

The increased accuracy and volume of high-angle fire and bombing has practically eliminated the shallow skirmisher trench as an effective shelter. The fox-holes dug by both sides at Guadalcanal were just as wide at ground level as the occupant's shoulders. The depth was the maximum permitting firing without strain. Where possible, the hole was enlarged at the bottom to permit sitting down. When properly constructed, these fox-holes are safe shelters from anything except a direct hit by a shell or grenade. Crouching in the bottom, the soldier is safe from crushing by tanks, provided there is a thickness of two feet of earth above the level of his head.

If the fox-hole is to be used for a considerable length of time, it is advisable to provide overhead shelter by digging a cave or covering an extension of the fox-hole. This is for comfort only, and to give rest during quiet periods.

The double fox-hole affords slightly less protection and is a little more difficult to conceal than the single fox-hole, but it has a number of advantages. It is a narrow trench about five feet long with elbow firing holes and ammunition niches. Edges should be rounded off to avoid dark shadows. All-round observation and defence are invariably easier if men are in pairs. The moral effect of working in pairs is an important consideration.

Weapons should be emplaced so that men can operate them from fox-holes. Also, if possible, there should be a cave or camouflaged hole with overhead cover for the concealment of the weapon and crew when not firing.

The local commander must decide whether spoil will be retained for the construction of parapets or will be removed. The present trend is towards the elimination of the parapet if it increases the difficulty of camouflage. Camouflage precedes construction.

Alternate emplacements should be prepared as soon as the original emplacements are completed. They should be as carefully prepared as the original emplacements.

Dummy emplacements are important, and should be prepared as soon as possible. They are only knee deep, but should be more conspicuous than the real trenches. They should be occupied occasionally, particularly during the early periods of enemy observation.

A.S.H.

REVUE MILITAIRE SUISSE.

(*February*, 1943.)—*Commentaires sur la guerre actuelle.* The Russian winter offensive was still progressing. The commentator recalls that he has frequently pointed out that at the height of the greatest German successes, the Russian military power had not been broken, but that the whole Russian strategy aimed at exhausting the German forces until the day should come when Russia herself might pass to the offensive.

In the winter of 1942, the accumulated reserves enabled the Russians to take advantage of the faulty position in which the Germans were placed due to their overboldness. In spite of the loss of the Ukraine and of the Donetz coal-basin, the great—almost limitless—industrial resources of Siberia enabled the Russians to build up vast reserves. All along, the Russians have known how to husband their resources; they have never flung their all into the battle. In spite of their huge losses, they have been left with enough to continue the struggle and to re-build, with a fresh year's output, a fresh force with which to strike.

On the Russian side, as on the German, this restoration of the equilibrium does not suffice to bring about the decisive result in a single campaign. The *blitzkrieg* methods do not work unless surprise and an overwhelming superiority of resources are at command. So it has come about in Russia that neither Russians nor Germans have so far been able to carry through to the decisive end the aims of their successive campaigns.

The commentator ascribes the German failure in 1942 to the audacity which struck at Stalingrad and the Caucasus at the same time, without the removal of the threat which impended across the Don. The battle of exhaustion at Stalingrad, so gallantly fought out by the Russians, sealed the fate of the German campaign of 1942. The attempt to extricate the Sixth Army by the counter-attack at Kotelnikovo marked the failure of Hitler's desperate effort. Thereafter, the Russians were able to sweep on and clear the Caucasus oil fields. But the time had not yet come for a general offensive. The resources accumulated did not suffice for that.

In North Africa, the British and Americans were still preparing. Rommel, although on the defensive, was still very aggressive. He was making skilful use of the vast space for manœuvre which he commanded. So also was General Montgomery.

The "invasion of Europe" scare was already beginning to occupy the minds of the critics. In 1941, the question had been: where will the next German blow fall? Now it was: where will the Allied Nations strike? The months of uncertainty have now passed.

(*March*, 1943.)—*Nouveautés et progrès dans l'instruction du service de renseignements de l'infanterie.* By Lieut.-Colonel D. Perret. The modern infantryman is no longer merely a rifleman. He is becoming a specialist like the gunner or sapper. He must therefore have training in the collection and transmission of information, and his units must be furnished with technical means of doing so. This article refers to the importance now attached to this training in the Swiss Army.

Le radio au service de l'infanterie. By Captain Delay. This article suitably follows the preceding one, and describes the employment of small wireless outfits, now carried by the infantry for use on reconnaissance patrols.

Commentaires sur la guerre actuelle. This month's commentary deals with the cessation of the Russian successes in the Ukraine, the German counter-offensive which carried them back to the Donetz, and the still successful Russian moves further north in the region of Rjev.

The Germans certainly saved their precarious situation in the south-east, and a transition period was setting in due to the thaw and the exhaustion of the Russian drive for the time being.

This interval was being used by the Germans to mobilise still greater reserves by further pressure on the occupied countries, to send many hundreds of thousands more workers to German munition factories, in order to release more Germans for the armies. Hitler hoped to create at least another hundred divisions by these means, for his summer campaign.

In North Africa, Rommel had gone back to the Mareth line, and had made his diversionary attack against the Americans. But he had only succeeded in delaying the end, and it is doubtful if he had expected to do any more than this when he struck out westwards.

(*April*, 1943.) *Nature et fondements de l'education militaire.* By Major E. Bauer. An extract from a circular issued to Swiss training schools and courses of instruction by Colonel Probst, who occupies a post corresponding to our Inspector-General of Infantry. Major Bauer introduces the extract with some comments. He points out that, now that the Allied Nations have overtaken the Axis in war production, the advantages which the latter had in weight of armour and mechanised striking power has been neutralised, and it is now a question of superior training, skill and courage. Brute force, backed by unlimited accumulations of weapons, gained striking successes, but it is now being opposed by higher courage, skill and more weapons.

Colonel Probst stresses the increased importance of higher training of leaders of all ranks. The leaders must also be the teachers. The highest degree of military education is required nowadays, to use the very specialised technical means available; and the keying up of all military virtues is called for from soldier and civilian alike.

Commentaires sur la guerre actuelle. The centre of interest has shifted from the Russian front to North Africa. The skill of Rommel in breaking away successfully and making his way back from the frontier of Egypt to the Mareth line is out-matched by the still more astonishing feat of the Eighth Army in advancing over such a distance and carrying its supplies with it. Rommel fell back on successive depots, destroying as he went and sowing minefields. Montgomery swept on, and still fed his troops. Rommel played for time, and, in spite of repeated hammerings, managed to extricate his forces and live to fight again until the final disaster in Tunisia. But Montgomery repeated again and again his successful outflanking movements, and if Rommel used space for successful get-away, Montgomery used space for consummate tactical skill. Until the ports of Tripoli were put in order, all supplies for the Eighth Army had to be brought overland from Egypt—and they had to reach Egypt via the Cape and Suez.

At the time of writing, the Axis forces had fallen back into Tunis and Bizerta, where it was expected they would hold out until further reinforcements could arrive by air.

The inability of the *Luftwaffe* to improve the situation gave rise to speculation as to whether it was or was not being reserved for a heavy reprisal against England.

On the Russian front, the operations on both sides had been suspended; and the Armies were being prepared for the summer battles.

W.H.K.

THE INDIAN FORESTER.

(*March*, 1943.)—It has been proved that *babul* or *kikar* (*Acacia arabica*) is best reproduced from seeds which have been swallowed by and ejected in the droppings of sheep and cattle.

Wood disc dowel joints have been adopted as a standard by the M.E.S., Central Command.

Sawdust forms a useful filling for hollow walls; being a good insulator, in case of fire it merely smoulders and does not aid the conflagration, in fact by giving off smoke it may act as an alarm signal.

It is not often that we as Sappers have to make barrels, although we often use them. A brief description of their manufacture is given by the Utilization Officer, Forest Research Institution, Dehra Dun.

(*April*, 1943.)—From an article by J. V. Karamchandani, it seems that petrol is as hard to obtain in India as it is in this country, and producer gas is coming more and more into use. Exhaustive experiments are tabulated in his article *Charcoal for producer gas plants*. It seems that casuarina, an import from Australia, now extensively grown in Southern India, gives the best results; 1.4 lbs. of charcoal are needed per mile, the cost of which is a quarter of that of the petrol required for the same distance.

The Rescue of a rhino records how one of the species was hopelessly bogged in a marsh, and was pulled out by the united aid of two pairs of bullocks and 100 villagers. Alas, there seemed to be no spark of gratitude in the animal.

Indian kapok has been proved, if unadulterated, to be as good as, or even better than, the variety previously imported from Java.

Dry rot cannot occur in timber unless there is a moisture content of 20%, but the fungus producing it has pipe-like roots which may serve to convey water from a damper source to drier timber which may so be attacked and eventually destroyed.

F.C.M.

CORRESPONDENCE.

THE PROTECTION AND DEMOLITION OF OIL INSTALLATIONS.

Stricklandgate House,
Kendal.
6.7.43.

To the Editor, *The Royal Engineers Journal.*

SIR,

In the very instructive article in the June *Journal* on "The Protection and Demolition of Oil Installations," mention is made of the undue extravagance of "concussion" charges in destroying closed steel vessels and oil storage tanks; alternative methods are suggested, none of them very easy.

It would be interesting to know whether any experiments have been made in destroying such vessels or tanks by hydraulic means—i.e. a bursting charge lowered into the liquid contained in the vessel—or pumped there.

The writer used to start his Field Coy.'s annual demolition course with a demonstration of the effect of one service detonator exploded in a petrol tin full of water. The purpose of this was to instil a wholesome respect for detonators, but as a demonstration of the distribution of pressure by hydraulic means it was even more interesting. The petrol tin invariably "bursts asunder in the midst."

A half slab of guncotton, detonated in an ordinary house cistern, open at the top and filled with water, once gave an even more spectacular effect: a complete side of the cistern hurtled through the air, narrowly missing the spectators. The cistern was completely destroyed—each side shearing off along the line of the rivets.

Surely quite a moderate charge—say 10-20 lb. guncotton, lowered through the man-hole into the liquid in an oil tank, would have a similar effect, bursting the tank irreparably. Possibly some of your readers may already have had experience of such a method. If so, it would be interesting to know the charges used, and the effect.

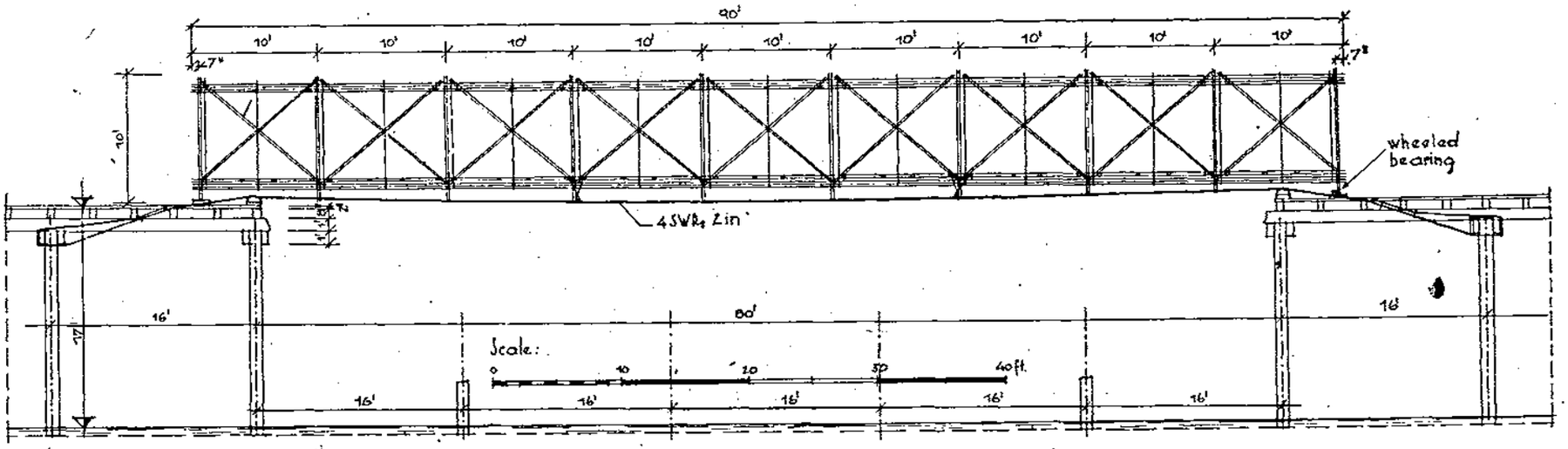
Yours faithfully,

W. E. BRITTEN, *Lieut.-Colonel.*

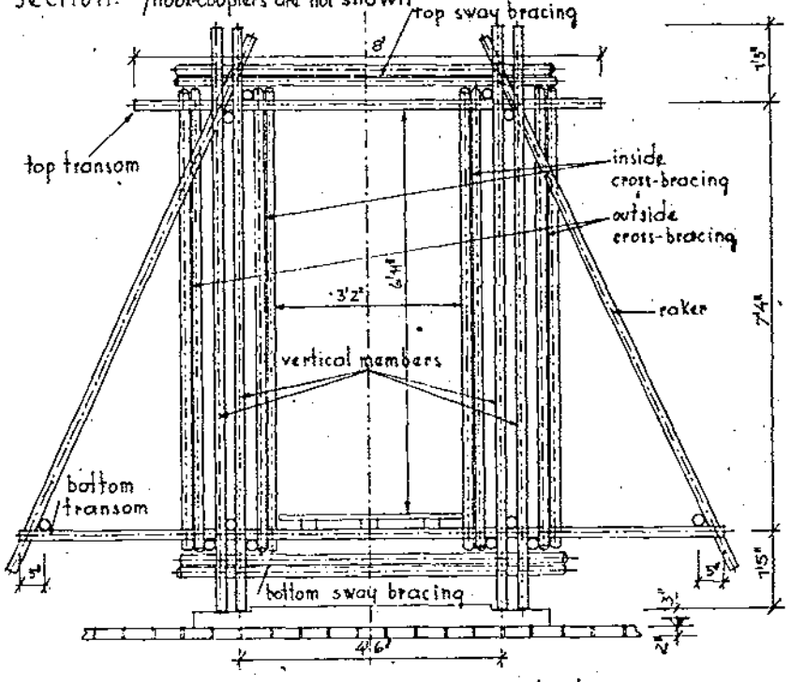
PLATE III.

Improvised Scaffolding Bridge.

Elevation:

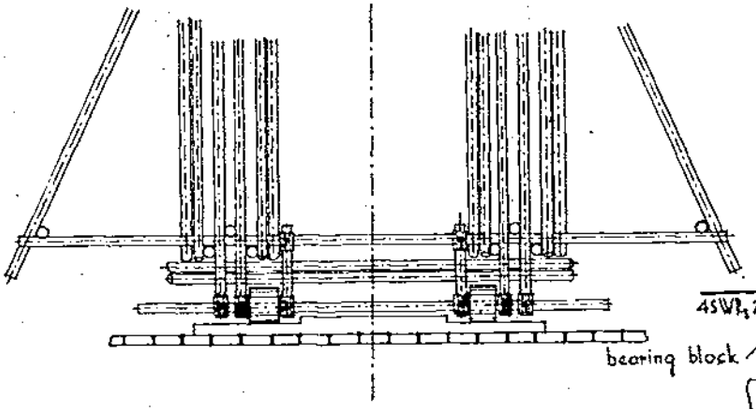


Section: /hook-couplers are not shown

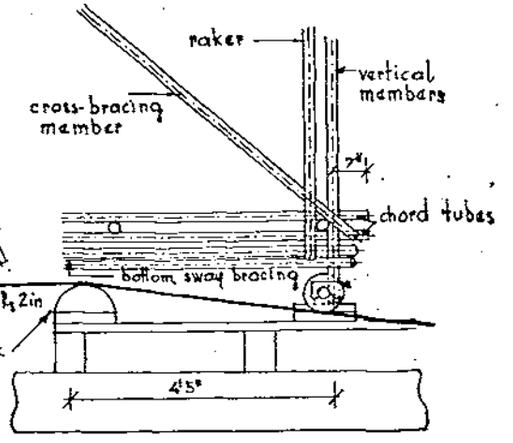


Wheeled bearing: /only bearing's hook-couplers are shown.

Axis Elevation: Tail End.



Side Elevation:



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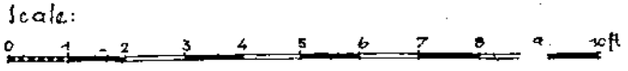
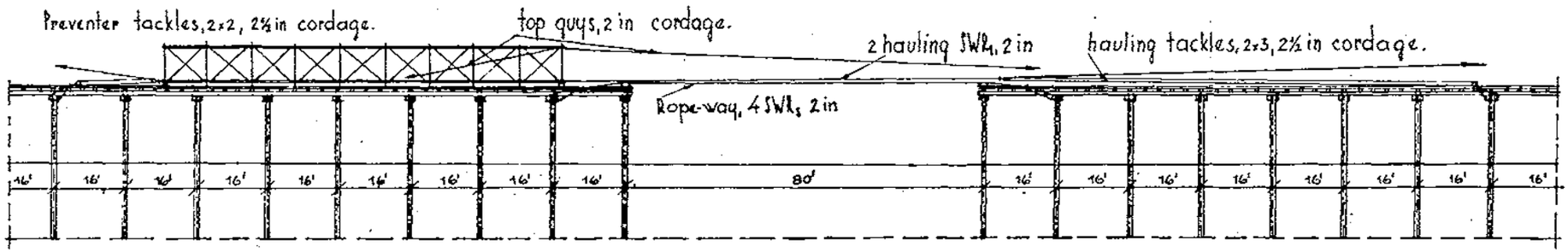


PLATE IV.

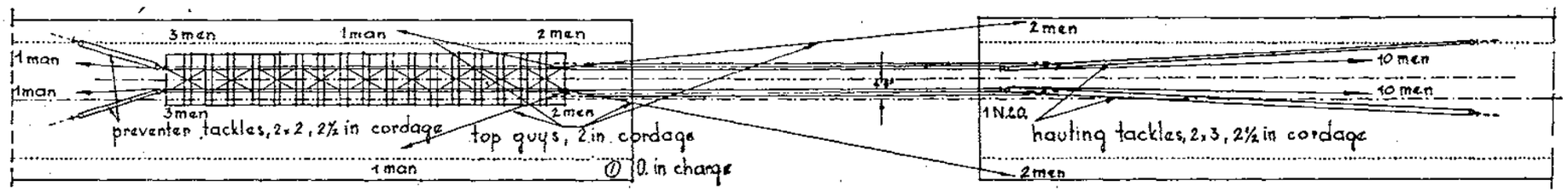
Lay-out of launching gear.

Elevation:



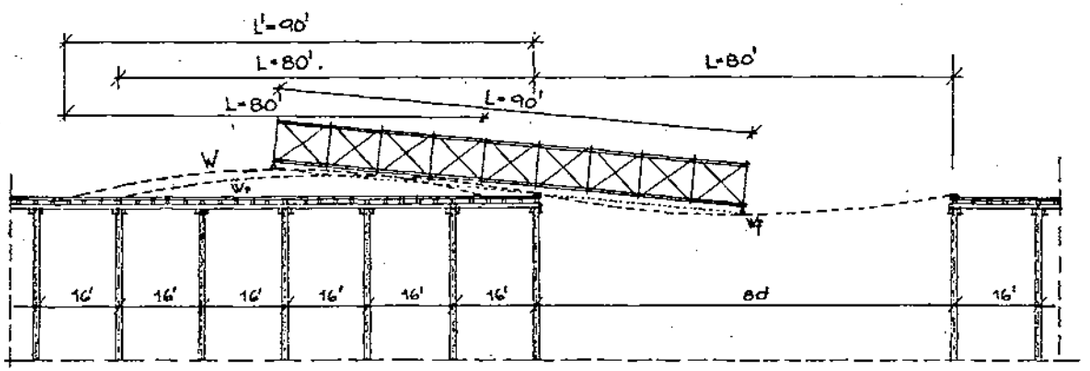
Plan:

Scale: 0 10 20 30 40 50 60 70 80 90 100 ft



General idea of launching.

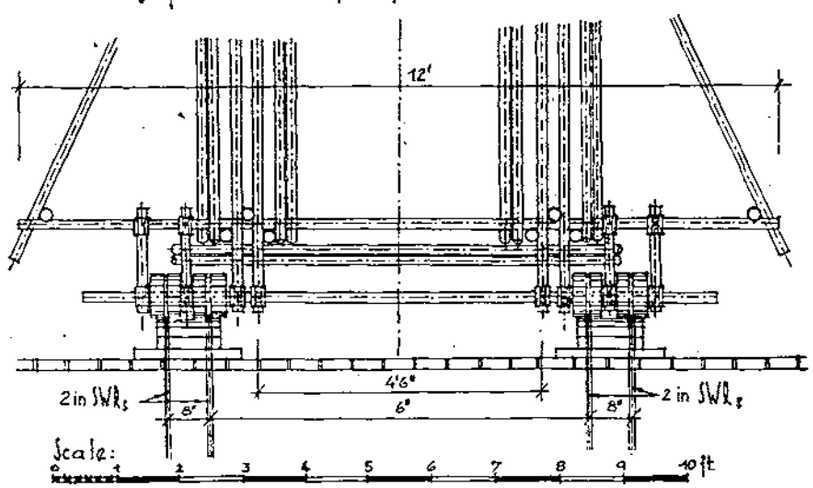
Section:



Scale: 0 10 20 30 40 50 60 70 80 ft

W_f – launching way of the front-wheels.
W_r – —"— —"— of the rear-wheels. for 80ft span bridge.
W – launching way of the rear-wheels for 90ft. span bridge.

Launching front-wheels. / only bearing's hook-couplers are shown.



Scale: 0 1 2 3 4 5 6 7 8 9 10 ft

Invitation to tea

Shortage of fresh milk . . . the need for using tinned milk . . . the rationing of tea and sugar . . . all these war-time restrictions make it impossible for N.A.A.F.I. to serve tea "such as mother used to make" in its canteens.

In order to make the best use of the ingredients available, N.A.A.F.I. is launching a seven-point plan to ensure that the tea sold is of the highest possible standard.

An invitation is issued by N.A.A.F.I. to all Institute Committees to attend tea-testing meetings in their canteens. The Committee Members will then have an opportunity of sampling tea made according to the standard recipe, and will be able to submit their own criticisms and suggestions.

OTHER POINTS IN THE PLAN INCLUDE :

- Instructional talks to the staff.
- Regular tasting of the tea by all N.A.A.F.I. officials visiting Institutes.
- The issue of a special booklet to the staff on tea-making.
- Special courses for training staff before they are permitted to make tea in the canteens.

NAVY, ARMY & AIR FORCE INSTITUTES,

Ruxley Towers, Claygate, Esher, Surrey.