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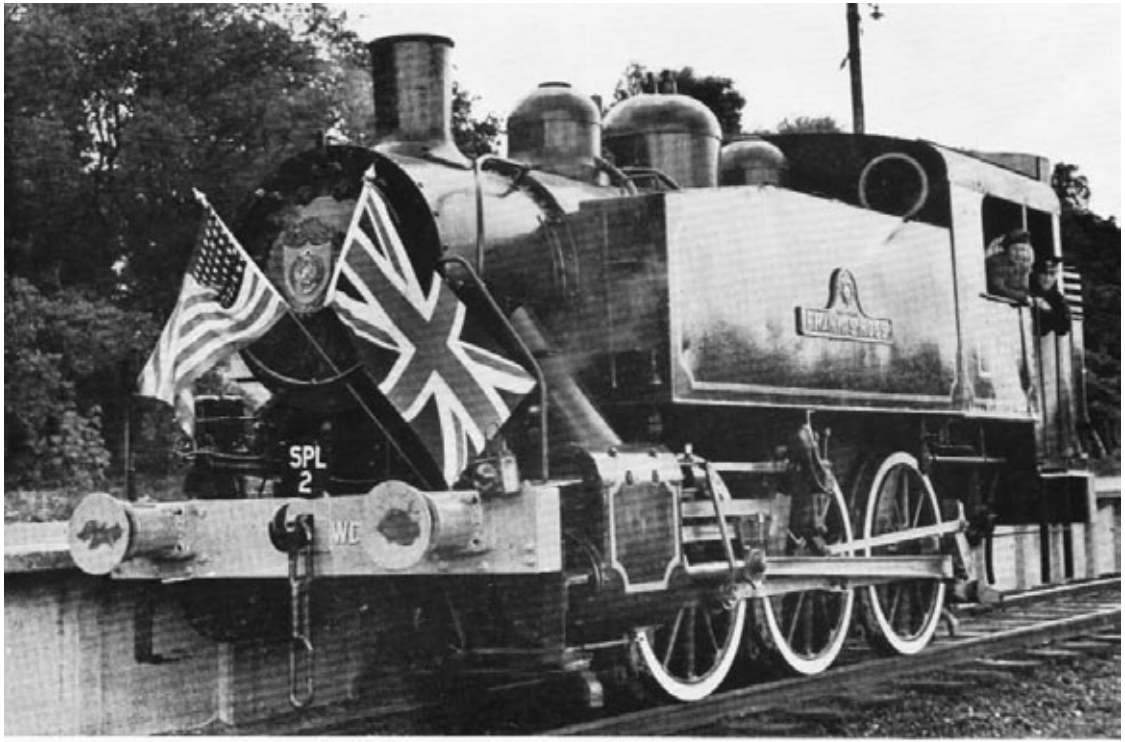
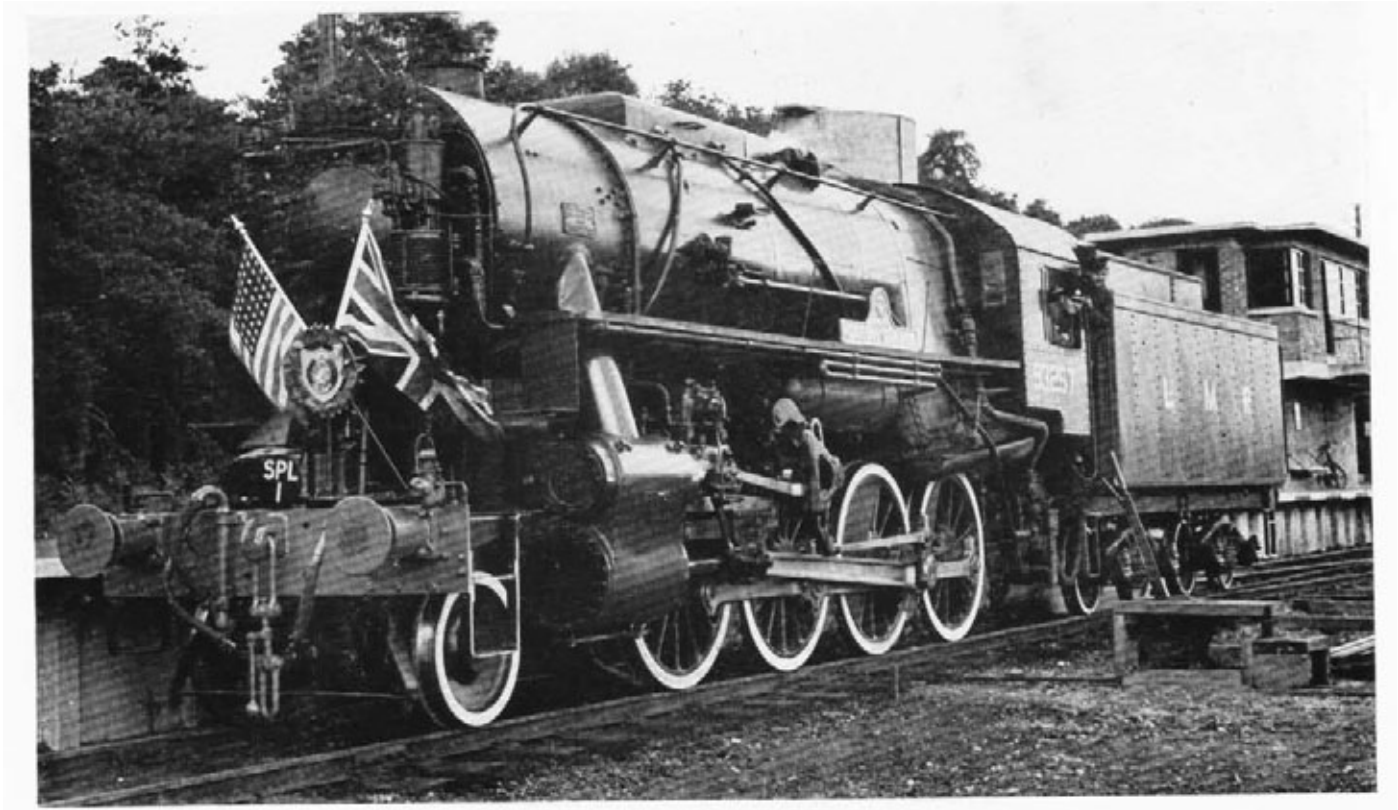


American 0–6–0 locomotive named *Maj.-Gen. Frank S. Ross.*

Naming ceremony of American locomotives at Longmoor 1



American 2–8–0 locomotive named *Maj.-Gen. Carl R. Gray, Jnr.*

Naming ceremony of American locomotives at Longmoor 2

NAMING CEREMONY OF AMERICAN LOCOMOTIVES AT LONGMOOR

Submitted by TRANSPORTATION TRAINING CENTRE, R.E.

THE equipment at the Transportation Training Centre, R.E., at Longmoor, now includes two American locomotives of the standard types brought to Europe during the war by the Transportation Corps of the U.S. Army. These two locomotives, a 2-8-0 freight engine and a 0-6-0 shunting engine were, on 6th June, 1947, named respectively after two Senior American Transportation Officers—Major-General Carl R.Gray, Jnr. who was Director-General of the Military Railway Service in North Africa, Italy and North West Europe and Major-General Frank S. Ross, who was Chief of Transportation in the North West Europe Theatre.

The naming ceremony was carried out by Lieut.-Gen. Sir Francis P. Nosworthy, K.C.B., D.S.O., M.C., Representative Colonel Commandant, Royal Engineers, in the presence of Major.-General Edmond H. Leavey, Chief of Transportation, U.S. Army, who was on a visit to this country.

Lieut.-Gen. Sir Francis Nosworthy said :—

" During the war of 1939–45 one of the most outstanding factors from which victory was achieved was the high level of co-operation and integration which existed between the Armed Forces of the Allies. This was most marked in the case of the Forces of the United States of America and ourselves and in particular between our respective Transportation Services. We all know also, the vital assistance given so freely by our great ally in materials and every kind of equipment.

" On the occasion of the very welcome visit to the Transportation Training Centre, Royal Engineers, of General Leavey, Chief of Transportation, U.S. Army, the first item on the programme is a very tangible example of this co-operation and assistance ; the naming of two American locomotives—two from the many hundreds which were sent to the battle fronts from the United States.

" The names selected for these two locomotives are those of two American Transportation Officers in the Western theatres ; officers whom the Transportation Service of the Corps of Royal Engineers will always remember for their ever-willing co-operation in the difficult tasks which faced those responsible for the Transportation needs of the Allied Armies in North Africa, Italy, and North West Europe.

" These two locomotives which have been exchanged for two British locomotives of similar types will, whilst being used to train future railwaymen of the Royal Engineers, always be a symbol and constant reminder of the great help we received from the Transportation Corps of the U.S. Army.

" 2-8-0 *Locomotive.* I name this locomotive ' Major-General Carl R. Gray, Junior,' late Director-General of Military Railway Service in North Africa, Italy, and North West Europe.

" 0-6-0 *Locomotive.* I name this locomotive ' Major-General Frank S. Ross,' late Chief of Transportation, North West Europe theatre."

Following the naming of the locomotives, General Leavey unveiled two memorial plaques in the Garrison Church, Longmoor, which bear the names of six men of the Transportation Corps, U.S. Army, who died whilst their units were stationed at Transportation Training Centres in this country.

Major-General E. H. Leavey said :—

"The two tablets which I have been asked to unveil were made in the Workshops at Longmoor by the men of 755 and 763 Railway Shops Battalions, U.S. Army, in memory of six men who died during the time those units were stationed at Longmoor and Weston.

"This Church already contains memorials to the men of the British Transportation Service who fell in the War of 1914–18, and the placing of these tablets in a place of honour in your Church will perpetuate the spirit of co-operation and determination in achieving victory during the crucial years of the last war; a spirit particularly marked between those responsible for Military Transportation.

"On behalf of the Transportation Corps of the U.S. Army I would like to express my pleasure at being asked to unveil these tablets, which I now do with the earnest hope that their presence here will help to cement the friendship of our two great nations."

On the conclusion of these ceremonies the inspecting party, which included the Engineer-in-Chief, the Director of Movements, the Director of Transportation and the Chief Engineers Southern Command and Aldershot and Hants District, visited the different activities of the Centre including the Transportation Museum, Workshops, Running Shed, Signal School and Movement Control model room. During the afternoon a tour of the Longmoor Military Railway was made.

INDIAN BEACH GROUPS IN THE LANDINGS IN MALAYA

By COLONEL D. W. PRICE, C.B.E. and COLONEL J. R. H. ROBERTSON

INTRODUCTION

WHEN 34 Indian Corps, under the command of Lieut.-General O. L. Roberts, C.B.E., D.S.O., landed in Malaya in September, 1945, the two beach groups included in the force both happened to be commanded by sapper officers, the joint writers of this article. This arrangement although fortuitous was not altogether inappropriate. Many of the problems that arise on a beach, or in a beach maintenance area, require an engineer to solve them. It was for this reason that a number of engineer units were included in the Indian Beach Groups. Before this account of the fortunes of the beach groups in the landings in Malaya proceeds further, it may be of interest to record the engineer units which worked with them.

41 *Indian Beach Group*

78 Indian Field Company (K.G.V's. O. Bengal Sappers and Miners).
213 Indian Stores Platoon (K.G.V's. O. Bengal Sappers and Miners).
14 Indian Engineer Battalion.
723 Indian Mechanical Equipment Platoon.

46 *Indian Beach Group*

24 Indian Field Company (Royal Bombay Sappers and Miners).
489 Indian Stores Platoon (Royal Bombay Sappers and Miners).
733 Indian Mechanical Equipment Platoon.

History

The history of Indian Beach Groups reflects all the vagaries of fortune of the war in South-East Asia. Of the six groups raised between 1943 and 1945, only one saw active operations in an amphibious role, three were disbanded, one was turned into a Forward Airfield Maintenance Organization and one was only raised in time to take part in the unopposed landings in Malaya.

In July, 1943, with operations overseas in view, the Indian Expeditionary Force was formed. It was to contain five beach groups. Their strength amounted only to about 1,900 all ranks each and they had little mechanical equipment.

During the early part of 1944 this force, redesignated as 33 Indian Corps, was drawn into the Burma campaign to meet the Japanese offensive and had to abandon its amphibious ambitions. The five beach groups were left in the somewhat disinterested care of Southern Army. There seemed to be no prospect of their being used in an amphibious role for some time, and Burma shortly claimed three of them as reinforcements for the 14th Army. By the end of June, 1944, only 41 and 45 Beach Groups remained.

The Japanese offensive was decisively defeated after three months of hard fighting and the stage was set for the advance into Burma when the monsoon was over. For this the 14th Army would have to rely on air supply on a scale never before attempted, and beyond the capacity of existing airfield maintenance organizations. 45 Indian Beach Group was selected to make good the deficiency and was turned into a Forward Airfield Maintenance Organization.

While all these things were happening, it was decided to increase the strength of the Indian Beach Group and give it more mechanical equipment, to enable it to handle 1,000 tons of stores a day. The composition of a beach group on this revised establishment is given in Appendix "A." It consisted of twenty-two different units of a total strength of just over 3,000 all ranks.

There were three R.E. units, a field company, a mechanical equipment platoon and a stores platoon. The battalion finding the labour to work on the beaches and in the dumps could be either infantry or engineers. The use of an engineer battalion for this purpose was occasioned only by the great shortage of infantry in the Indian Army. The engineer battalion of a beach group was not intended to have an engineer role.

41 Indian Beach Group, the one group remaining at that time, was scarcely reorganized on the new basis before it was embarked for service in the Arakan. There it took part in all the landings, first at Akyab, then at Myebon, Kangaw, Ramree, and Letpan. From the Arakan it proceeded to Rangoon where it operated the port for the first two weeks of occupation.

Plans to Land in Malaya (Sketch "A" on p. 291)

Meanwhile, in the places where such plots are hatched, plans were being made to profit from the recapture of Burma by making an advance towards Singapore with the forces that had now become available. For this, combined operations would be necessary, and the need for more beach groups became apparent. It was decided to raise 46 Indian Beach Group, and, when the opportunity offered, to change 45 Indian Beach Group back to its amphibious role.

By June, 1945, the objective for the next step towards Singapore had been selected. 34 Indian Corps was formed and given the task of landing in Malaya. For this it would need two complete beach groups and part of a third. 46 Indian Beach Group was then completing its training and would be available. 41 Indian Beach Group was to be brought back from Burma to be

re-equipped and mounted from India. 45 Indian Beach Group would reorganize and train in Burma and part of it would be deployed from there.

Planning was carried out in Delhi and, later, in Bombay, the main mounting port. The plan involved two assault landings, which, owing to limited naval resources, would have to be separated by an interval of three days. On D Day, 25 Indian Division, with 46 Indian Beach Group under command, was to land at Morib, twenty-eight miles south of Port Swettenham by road, and one brigade of 23 Indian Division was to land at two places some fifteen to twenty miles further south and at Sepang, up a small creek between mangroves. On D + 3, 23 Indian Division, less one brigade, with 3 Commando Brigade and 41 Indian Beach Group under command, was to land near Port Dickson. 5 Indian Division was to follow up at Morib, which was also to receive a part of 45 Indian Beach Group to augment the resources on the beaches.

The objectives for the D Day assault were Port Swettenham, the airfield at Kelanang and the crossing of the coastal road over the Sepang River. It was also hoped that the brigade securing Sepang would be able to take Port Dickson by D + 3. The landing on D + 3 was to enlarge the bridgehead southwards and to provide a base for the advance on Singapore.

The Beach Maintenance Area near Port Dickson (Sketch "B" on p. 293)

Beaches

Good beaches are rare in South-East Asia. A combination of a good beach and an ideal beach maintenance area would be beyond the limits of probability if it had not in fact occurred. Between Port Swettenham and Singapore there are really only two stretches of sand that could be described as suitable landing beaches. They are both in the shallow bay that bends south from Port Dickson, to Cape Rachado. One of them, by a fortunate coincidence, leads directly on to one of the very few places on all the swamp-bound, mangrove fringed Western coast of Malaya where the hinterland is well drained and served by roads.

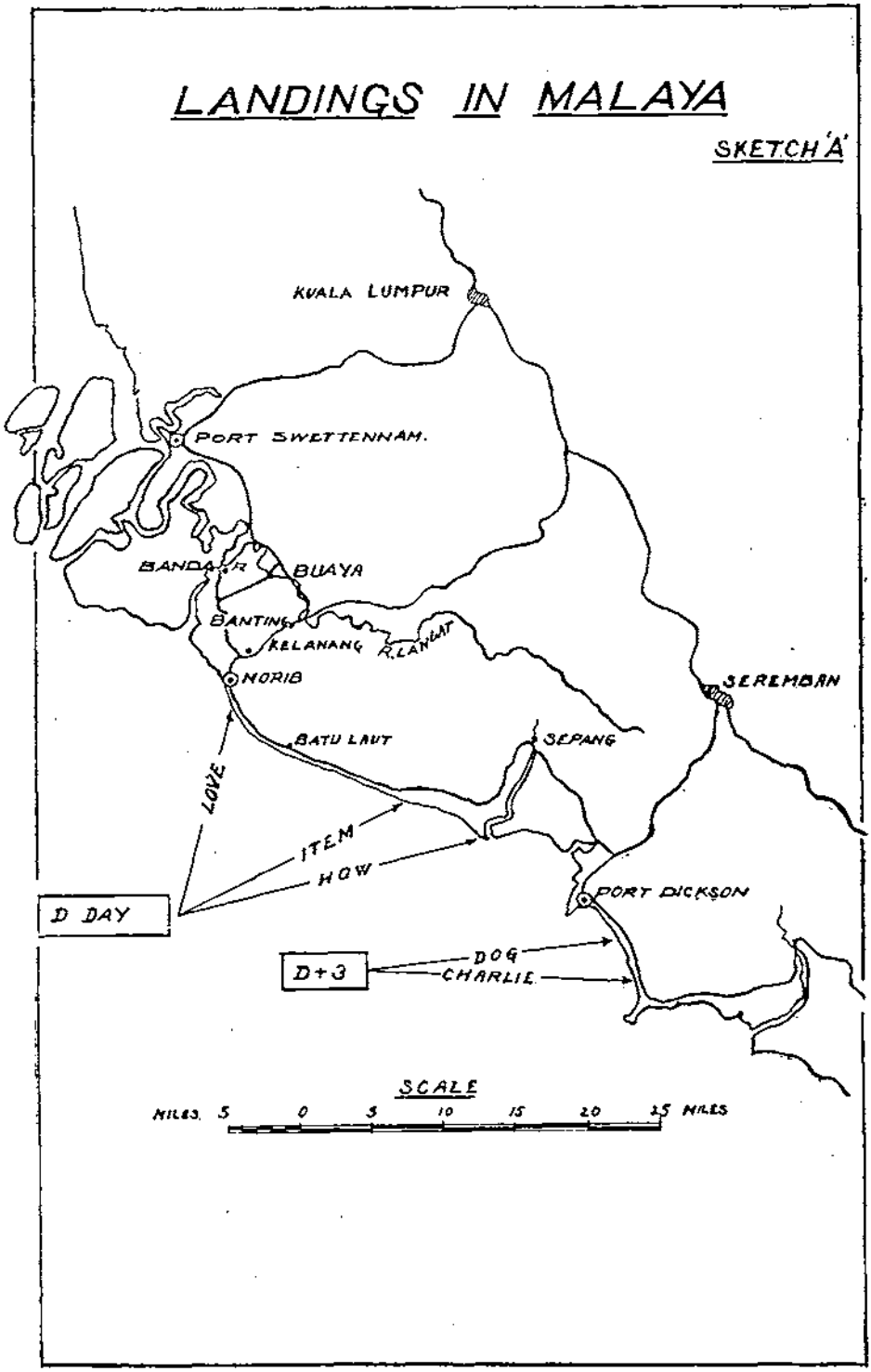
"Charlie" Beach was the kind of beach that one had thought only existed in pictures of American landings in the Pacific. Even the stereo-gazers of H.Q. "SACSEA" promised a happy dryshod landing. It was planned to use this beach for vehicles.

"Dog" Beach, two miles further north, was of the kind that any seaside resort would be proud of. Steeply shelving at the top it flattened out at low water in an expanse of white sand of alluring smoothness. This seemed to be just the place for craft to dry out comfortably. It was planned to land stores at "Dog" Beach.

No good word can, however, be said for the beaches selected for the landing of 37 Indian Infantry Brigade on D Day. "How" Beach was no more than a flat shelf of mud, half a mile or more wide at low water, and backed by mangrove. It was thought just possible to land infantry here in L.V.T., but it was considered quite unsuitable for landing vehicles or stores. "Item" Beach appeared from air photographs to provide the only place between Sepang and Morib that offered any promise of being able to take vehicles and stores. It did not promise much, it is true: it was very flat, some three hundred yards wide at low water, contained numerous runnels, was obstructed near the shore by old tree stumps and showed every indication of being muddy.

Hinterland

Behind "Dog" beach lay the area occupied by the Malay Regiment and Federated Malay States Volunteer barracks before the war. They had been


LANDINGS IN MALAYA
SKETCH 'A'
KUALA LUMPUR
PORT SWETTENHAM.
BANDAR
BUAYA
BANTING
KELANANG
R. LANGAT
NORIB
SEREMBAN
BATU LAUT
SEPANG
LOVE
ITEM
HOW
D DAY
PORT DICKSON
D+3
DOG
CHARLIE
SCALE
MILES 5 0 5 10 15 20 25 MILES

used by the Japanese as a N.C.Os.' Training School. A fortuitous encounter with the late Commanding Officer of the Malay Regiment in Bombay provided a wealth of detailed information that not even the best air photographs could have given. There was promise of every civilized comfort and convenience being available.

" Charlie " beach appeared from air photographs to be scarcely less well served. Bungalows of the week-end holiday type were spaced at convenient intervals in clearings in the rubber and coconut that backed the beach. Entrance drives led off the main coastal road to these bungalows and appeared to offer numerous exits from the beach.

The coastal road behind " Item " beach lay about 300 yds. inland and was separated from the coast by a belt of coconut palms. There appeared to be space under the trees sufficient to receive the small tonnage of stores required for the maintenance of 37 Indian Infantry Brigade. An estate road offered an apparently suitable exit from the beach to the coastal road.

The Landing

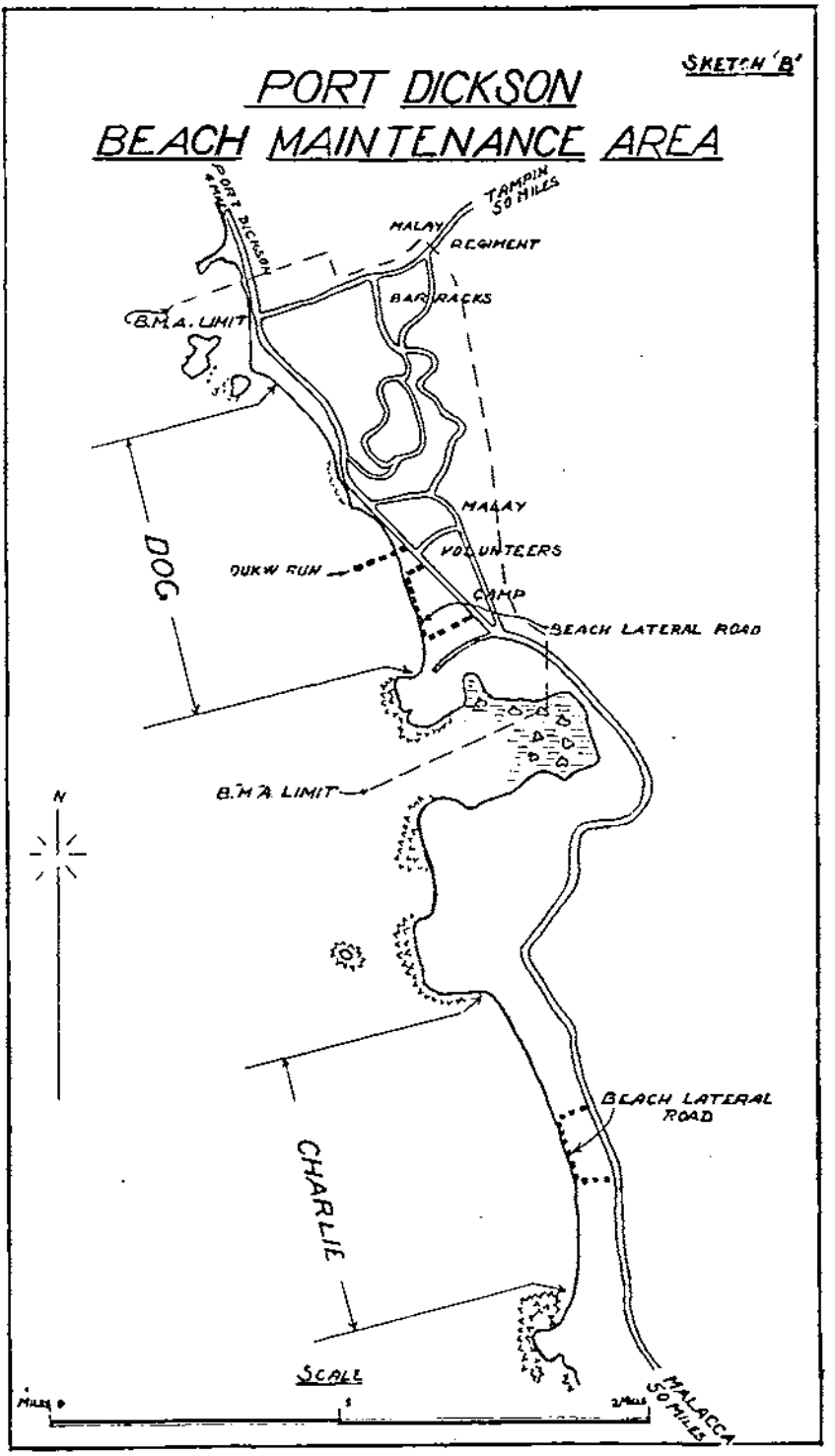
The detachment of the beach group landing on " Item " Beach included a Beach Commander with a small staff, one company of 14 Indian Engineer Battalion, half a dozen " Dukws," a couple of bulldozers and a small party from the workshops for de-waterproofing and to deal with drowned vehicles. The company of engineers had the dual task of laying a temporary roadway from each of three L.S.T. and the handling of the stores. The roadway was to be of the type known in India as " Muckamuck." It consisted of panels made up of double bamboo paling sandwiched between a layer of coir matting and a layer of A.R.C. mesh, the latter serving as the road surface.

A drill had been evolved for the rapid assembly and launching of the " Muckamuck " while the L.S.T. dried out, and the engineer company was practised in it before sailing. Unfortunately the ships had to sail without the necessary length of steel wire rope to haul out the roadway, and it therefore became impossible to lay it until the tide fell. Even if the beach had been up to expectations, it would in these circumstances have been difficult to land all the vehicles and stores in one tide, which was all the time available. But the beach turned out to be very much worse than expected. Soft mud was only just covered by a thin and treacherous layer of sand. These distressing conditions were aggravated by the fact that, contrary to orders, some vehicles attempted to drive ashore before the roadway was laid and got bogged in the very mouth of the L.S.T. It was therefore decided to attempt the discharge of only two L.S.T., the third being sent to Morib. The two L.S.T. were only partially discharged by the time that the tide had come in again and were floated off and also sent to Morib. The detachment of the Beach Group rejoined on D + 3 at Port Dickson.

The landings on D + 3 went according to plan—less the opposition. The gradient of " Charlie " Beach was just as predicted. Eager L.S.T. surged up the beach and swung their doors right into the trees. On " Dog " Beach infantry were landing dryshod from such unusual craft as L.C.T. and making their way inland along well preserved laterite tracks to the main coastal road.

The Second Key Plan

Ideal though the Beach Maintenance Area proved to be, reconnaissance led to a number of changes in the First Key Plan. It was quite clear that the hospital should go into the fine buildings of the Malay Regiment barracks. The Supply dump would have to be evicted, but there was an even more suitable area, just behind the beach, that had evidently once contained the regimental mule lines. In exchange for a picturesque but rather rugged area


SKETCH 'B'
PORT DICKSON
BEACH MAINTENANCE AREA
PORT DICKSON 4 MILES
TAMPIN 50 MILES
MALAY REGIMENT
BARRACKS
B.M.A. LIMIT
DOG
DUKW RUN
MALAY VOLUNTEERS CAMP
BEACH LATERAL ROAD
B.M.A. LIMIT
N
CHARLIE
BEACH LATERAL ROAD
SCALE
MILES 0 1 2 MILES
MALACCA 50 MILES

behind the barracks the P.O.L. dump was offered a sandy stretch under some coconut palms, between the coastal road and the sea. The General Transport Company had been given an area which turned out to be thickly covered with undergrowth, and the C.R.I.A.S.C. put in a plea for the gravel-surfaced, level space that had been the Volunteers' parade ground, as the need for dispersion and concealment had passed. A few strokes of chinagraph on talc and the changes were agreed and confirmed.

Beach Exits

For the first two days the dumps had little to do. Few stores could be landed until the ships carrying vehicles were cleared. Nearly 1,300 vehicles led, incidentally, by two E.N.S.A. recording vans crossed " Charlie " Beach during this period. The initial landing had been made in heavy rain and more fell during the next night. The ground between the beach and the road, which ran parallel to it and 200 yds. inland, could never have been otherwise than swampy, but the Japanese had allowed all the drains to silt up and their outfalls on to the beach to become blocked. The rain and heavy traffic turned it into a morass.

Vehicles were landing so fast that little could be done beyond patching the worst places and trusting to the Beach Group Workshops recovery section to do the rest. It was not for some days that the exits could really be put in order. To deal with the emergency a corduroy road was constructed to provide the main exit, and a couple of subsidiary exits of Sommerfeld track were laid. No P.S.B. nor coir matting was available and the latter exits very soon collapsed into the mud. Nothing reliable could be provided until the whole area was drained. The existing drains were therefore cleaned out and additional ones dug. The outfalls on to the beach were cleared and improvised sluices were constructed in order to keep the sea out at high water.

It was some time before the ground began to dry up. It then became possible to lay a lateral road of timber on a foundation of sand (bulldozed up from the beach) along the head of the beach. Each end of this road was connected to the main coastal road with a further length of timber roadway. Later some of this was replaced by metal obtained from a local quarry. As in all road making, the secret of success was keeping the water out—in this case, by digging drains, raising the level of the road formation and, most important of all, by keeping the sea out.

" Charlie " Beach at high water was too narrow to allow vehicles to move along it. The road at the head of the beach had to serve as the beach lateral road. In several places along this road spurs led off to timber hards laid down to about mean high water mark. Below that, portable mats, or sandwiches of Sommerfeld track and coir lashed to and enclosing a mattress of poles were used. These were laid, as required, to connect the hard to the ramp of any craft discharging vehicles. They were recovered after use, rolled up and stacked at the head of the beach. No vehicle could be relied on to cross the beach without this assistance, as the top layer of sand was thin and treacherous, barely covering a bottomless depth of black slime. Most of the engineer work on " Charlie " Beach was done by an additional field company, which was placed in support of the Beach Group.

Meanwhile the rate of landing stores on " Dog " Beach had begun to mount and was approaching 1,000 tons per day. A considerable volume of traffic was passing through the beach area. As behind " Charlie " Beach, the drains were all blocked up, but the ground was firm and sandy and road making could proceed on methodical lines in its own time.

The only real problem on " Dog " Beach was the location of the " Dukw run." Below the change of slope of the beach there were extensive patches

of soft clay lightly covered with sand. The covering seemed to vary with each tide. What was firm going one day became a slough of despond the next. " Dukws " entering or leaving the water frequently got bogged. The solution was found by building up with a bulldozer a formation of sand running from the top of the beach down to low water and covering it with coir matting and P.S.P. This form of construction stood the strain of storm and tide without difficulty. The edges of the " Dukw run " were buoyed to indicate its limits when submerged.

Cranes

It was not till fourteen days after landing that any cranes appeared on the beach. This was due to some saboteur in the Indian Movements organization sending the cranes to Port Swettenham and the drivers to Singapore. But now a variety of unexpected cranes began to arrive. A mechanical equipment company located in the Port Dickson area offered a R.B. 19 and two R.B. 10's, and a couple of two-ton crawler cranes and three Coles cranes were landed about the same time on " Charlie " Beach. The crawler cranes were of unknown ownership, but were immediately appropriated and assembled by the Beach Group. During the following week four of the Beach Group's Trackson Swing cranes (1½ ton crawlers) arrived from Port Swettenham and a Neal's crane, landed across the beach, provided a welcome addition to the small number of wheeled cranes available. These were followed by two of the Beach Group's two-ton crawler cranes. There were then available a total of eight crawler and four-wheeled cranes, excluding those on loan from the mechanical equipment company. The arrival of the cranes had an immediate effect on the rate of landing stores, which up till then had shown great daily variations, depending on how difficult the stores were to manhandle. The daily tonnage of stores handled for the next twelve days averaged 1,000 tons, the designed capacity of an Indian Beach Group. By the end of this period the number of ships in the anchorage had been reduced from twenty-eight to three and the discharge was then limited by the number of hatches that could be worked and not by the capacity of the beaches.

Beach Organization

The amount of apparent activity on a beach is rarely any indication of the actual output. In fact great activity is often a sign of poor organization. An onlooker arriving on a well run fully developed beach would hardly notice anything going on at all—perhaps a line of half a dozen L.C.T. each with a crane jib swinging over it, some lorries in a couple of parks at the head of the beach, two or three policemen and nothing else. All the men would be working inside the craft, and the cranes and the vehicles being loaded would be there too. At intervals a loaded lorry would emerge from a craft and an empty one from one of the parks would be directed by a policeman to take its place. No dumping of stores on the beach should ever be allowed except to meet a real emergency.

Unfortunately this ideal can only be obtained if there is a proper balance between labour, transport and mechanical equipment. For the first three weeks 41 Indian Beach Group was always short of transport, particularly of the type suitable for carrying pontoons, long lengths of timber and bridging equipment. Much of this had to be dumped at the head of the beach in order to clear craft. All would have been well had not a stormy night coincided with the peak of high water springs. Much damage was done to pontoons and assault boats, and salvage of large numbers of water-logged sand-filled pontoons presented a serious problem. They were eventually taken to the R.E. dump on transporters borrowed from the mechanical equipment company providing the R.B. cranes.

Daily Allocation of Resources

Provided the allocation of labour, transport and mechanical equipment is correct a beach group runs itself. The daily readjustment of these resources was therefore a matter of some moment and in 41 Indian Beach Group was retained in the Commander's hands.

The running of the " beach port " was co-ordinated by the Beach Executive Committee. The Chairman was the Beach Group Commander and the other members included the Senior Naval Officer Landings (S.N.O.L.), the Senior Officer Ferry Control (S.O.F.C.), the O.C. of the Port Operating Group and the Principal Military Landing Officer (P.M.L.O.). The committee met daily at 3 o'clock in the afternoon in the Control Headquarters to hear reports of the state of discharge and the estimated availability of craft for the next day. Based on this information an allocation of craft and " Dukws " was made to ships for the following day's work.

The Beach Executive Committee was followed by a Staff conference at Beach Group Headquarters to decide on the plan of operations for the next day. Labour, transport and mechanical equipment were allotted accordingly.

Snags

Previous paragraphs have described an ideal area for beach maintenance. The only real problem was the construction of exits across water-logged ground and was solved by drainage. There were however a few snags for which no solution could be found. Two were geographical and the third could best be covered by the euphemism " operational necessity."

There was a sand bar off " Dog " Beach which precluded the beaching of L.S.T. at any time and limited the use of the beach by L.C.M. and L.C.T. to a short period on either side of high water. At neaps it was difficult to bring L.C.T. in at all. The effect of this bar was, therefore, that L.C.T. drying out had to remain beached for one complete tide and L.C.M. could only make one beaching per tide.

Owing to the shallowness of the Port Dickson Bay the anchorage was about five miles off-shore. This had no effect on the turn-round of craft, which was in any case completely governed by the tide. It did, however, impose a very considerable turn-round for " Dukws." " Dukws " would go to sea at first light and continue until nightfall. During this period many " Dukws " completed five round trips (which is the equivalent of a sea passage of fifty miles) in addition to fifteen miles by road delivering stores to the dumps.

The third obstacle to the attainment of an even flow of vehicles and stores from ship to shore was the use of Port Dickson and its beaches for the re-embarkation of troops to go to Java. The export of stores and re-embarkation of personnel and vehicles cannot be done without using craft, beach space, labour and transport, which would otherwise have been available for imports. Sorting commodities for export and stowing them in craft always takes longer than discharge and consequently employs transport for a longer time. In effort expended it was found that one ton of exports was the equivalent of two tons imported. Days on which a high tonnage of stores was exported nearly always produced a low tonnage of stores imported.

Concurrently with the landing of stores a complete division with its vehicles and equipment, plus a tank regiment, were re-embarked. The only outside assistance available was the loan of two platoons of transport for about a week to help in the concentration of troops in the Port Dickson area and the delivery of rations to victual ships and craft for the voyage. These were, however, taken away long before the need for them had passed. It often occurred that all the transport of the beach group, including " Dukws," was employed on the re-embarkation of troops.

THE BEACH MAINTENANCE AREA AT MORIB (Sketch "C" on p. 303)

Introduction

46 Indian Beach Group, unlike 41, were not "old sweats" at the art of beach development and organization.

They were born, in the sense that they received a Commander and a H.Q. office, on 16th April, 1945. The last component unit joined in the middle of June. The Beach Group was then between three and five months old on D Day and, of their twenty-two units, only four knew what a Beach Group was before they joined.

In addition to their youth, the Beach Group suffered from the fact that no sooner had they started training than they were moved from one side of India to the other, and lost a precious three weeks of what time there was in which to train.

Their task in the invasion was to land the personnel and vehicles first of 25 Indian Division, then of 5 Indian Division and then of the bulk of the Corps troops of 34 Indian Corps. After landing this portion of the force, they were to maintain it through the beaches until Port Swettenham should be sufficiently developed to allow the beaches to close.

Reasons for Choice of Morib Beaches for D Day Assault

Two essential features of the Corps Commander's plan were the early capture and development of Port Swettenham, and of the airfields there and at Kelanang. The D Day assault had therefore to be made across beaches as close to Port Swettenham as possible and certainly north of the vulnerable bridges carrying the coastal road over the River Sepang.

So the planners, after looking wistfully at the beaches south of Port Dickson, and then at the Sepang bridges, turned with a shudder to study the seven-mile stretch of coast between Batu Laut and Morib. There was no question of choosing the best beach. It was merely a question of choosing the one that was least bad. "Jig," "King" and "Love" sectors all looked horrid on the map and worse in air photographs, but "Love White" and "Love Red" at least appeared to have a sandy surface. A mangrove swamp could be seen just north of Morib itself and clumps of mangrove on the southern beaches, but just south of Morib the only trees close to the beaches were coconut palms and casuarinas, the latter of which grow, for choice, in sand.

It was known that a spit, thought to be of sand, ran underwater in a north westerly direction across the front of the beaches from a point about two miles south of Morib. This spit lay about half a mile off-shore at the critical point and might prevent the beach being used at all.

So the Powers decided to send a Combined Operations Pilotage Party to find out whether the spit would prevent the beaching of L.S.T. and to test the quality of the beach surface.

The report of this party, which was received towards the end of June, was to the effect that the spit was not a serious obstacle to the beaching of L.S.T. at and around high water springs, that the channel between spit and beach was negotiable by L.S.T. and that the beach surface was of fine but firm sand.

Everybody cheered up a lot at this news and felt that at last a small silver lining had appeared among the clouds surrounding Morib. Little did they realize that the C.O.P.P., who had only had time to make one run up the beach, had taken their samples and tested the depth of sand on the only little bit of good beach. This was pure bad luck and nobody's fault but it lulled everyone into a feeling of security from which they were rudely awakened when the first craft beached on D Day.

"Love White" and "Love Red" beaches were therefore chosen for the

landing of vehicles and stores. Since the Seaview Estate, of mixed rubber and palm trees, lay at the back of the beaches and was certainly no worse than any other potential area between Batu Laut and Morib, it was selected for development as the Beach Maintenance Area. One advantage it had was that made roads ran along three of its sides. Nowhere in the Estate could the ground be seen in air photographs, through the thick overhead cover, but people who had lived in the neighbourhood in peace-time thought that the soil was sandy.

The correctness of these decisions was later proved by ground reconnaissance carried out at leisure after the beaches had closed. "Love White" and "Love Red" are the least bad beaches; the Seaview Estate is the least bad B.M.A.

Divisional Plan for the Assault

The plan for the Morib assault was briefly as follows.

The assault was to be made with two brigades up, 53 Indian Infantry Brigade on the right through "King" beaches, 51 Indian Infantry Brigade, less a force of all arms called "Langatforce," on the left through "Love" beaches. All vehicles to land through "Love" beaches and to pass inland along the road to Port Swettenham.

The first natural obstacle inland was the River Langat and, in order to ensure the early capture of the crossings over it, "Langatforce" was to assault in L.V.T. and some craft up the river to seize crossings at Bandar, while a force of infantry from 51 Brigade was to assault in amphibians across the beaches and inland by road to seize crossings at Buaya and the light bridge at Banting. C.R.E. 25 Indian Division was then to establish class 40 ferries across the river.

All amphibians to be used by 51 Brigade in the assault were to be L.V.T. but on the urgent representations of the C.R.E. of the Beach Group that the use of 44 L.V.T. on the road inland from Morib would cut it to pieces and stop the passage of wheeled vehicles along it (it was the only road inland), it was decided that, for the assault, the Beach Group would lend forty-four "Dukws" to 51 Brigade.

The forty-four "Dukws" were under no circumstances to go north of the Langat and get lost. None of them did but two other "Dukws," which were loaded with R.E. stores and which should have stayed on the beach, somehow evaded the police and advanced inland at high speed. They finished up in Kuala Lumpur and can be said to have unofficially "liberated" that city.

The landings were to be preceded by a heavy bombardment but the C.R.A. promised to avoid, as far as possible, hitting the main road. He was adamant, however, about the building which had been picked as Beach Group H.Q. and which he had earmarked for the attention of one battleship.

Increments to the Beach Group

The original operational plan, before it was modified as a result of the Japanese surrender, envisaged the landing across the Morib beaches of some 52,000 men, 4,700 vehicles and 5,500 tons of stores. This meant a stores discharge rate of 1,800 tons a day. Since a Beach Group is only designed to shift 1,000 tons a day a detachment of 45 Beach Group, some 1,264 strong, was placed under command for the operation, bringing the total of Beach Group personnel landing on D Day to over 4,000. The party from 45 Beach Group was to include 434 sappers.

Planning

Detailed planning followed the natural course of all Combined Operations planning—a series of nasty shocks caused by cuts in ships and craft and sudden non-availability of stores. Each cut was followed after about two days

by a partial restoration of the cut ships and then followed again by a bigger and better cut. For some reason, as soon as a ship has been selected for an operation, the gremlins get at her, she starts to leak and her propellors fall off, always into very deep water. Since the ships in which we were to sail had to come all the way from Europe they were exposed to gremlin attack for quite a while and we suffered accordingly.

It was clear from the start that the success of the Beach Group was going to depend, even more than normally, on the Sappers and it was decided that the Sappers were to be given priority over all other units, except the hospital, in their demands for stores, equipment and above all " Dukws." As everybody always wants " Dukws " and as the Beach Group Commander was himself a Sapper, this decision, was greeted with murmurs about " Trade Unions."

Effects, on the Plan, of the Jap Surrender

The increasing clearness, throughout late July and August, of the Jap intention to surrender, resulted in considerable changes in the overall plan for the invasion of Malaya.

These changes had repercussions which were fatal to the Beach Group's chance of carrying out their task in full.

5 Indian Division, and with them the detachment of 45 Beach Group, were withdrawn from the Corps order of battle. This meant a loss to 46 Beach Group of 1,264 men, including a sapper effort of two Engineer Companies, one platoon of a Field Company and a Mechanical Equipment detachment, eighty-nine " Dukws " and a lot of R.E. stores.

Two L.S.T. were snatched from the Division at the last moment and, as the vehicles which were to have sailed in them then had to be loaded into something else, those vehicles were crammed into the remaining L.S.T. at the expense of " Muckamuck " panels.

Each L.S.T. was to carry enough panels to make a roadway 300 yds. long. When as many of the displaced vehicles as possible had been crammed in, the 300 yds. of " Muckamuck " had been reduced to 100 yds. or less.

The number of L.C.I. (L) available for the discharge of personnel from ships was also very much reduced. This resulted in a slow build-up of Beach Group personnel on the beach. By H + 4 hrs. there should have been 1,970 such personnel on the beach, but in fact there were only about 800 ashore by that time. All tasks therefore got badly " out of step," were late in starting and difficult to co-ordinate. Some Beach Group units were over 14 hours late in landing.

The store ships which had been loaded for war had to be discharged for peace. Nobody wanted ammunition but everybody wanted E.F.I. stores. The task, in fact, became one of producing butter before guns out of ships loaded with guns on top of butter. Ships had to be " picked over " and this slowed discharge.

Owing to the change over from war to peace, officers landed with a very increased scale of baggage, all of which had to be handled by the Beach Group. One all-service trio, consisting of one Army, one Naval and one R.A.F. officer had to hire fifteen coolies to help carry their baggage, as the Beach Group worms turned and refused to touch it.

The Landing

The first waves of the Brigades and Beach Groups landed on D Day according to plan and up to time. The only opposition, and that passive, which was encountered came from a high-ranking Jap officer who, by choosing just the wrong moment to come down to the beach to discuss surrender terms, caused one of the biggest traffic blocks of all time.

After the first waves the rest of the Division and of the Beach Group came ashore as fast as the limited ferry service would let them. The landings for this reason did not, whatever the newspapers may have said, go off " with clockwork precision " and they were regrettably wet.

So far the beaches looked quite nice and orderly, all the beach signs nicely displayed in accordance with the best Combined Training Centre traditions, parties busily reconnoitring here and there, sappers prodding hopefully for mines and the Naval Beach Commando brewing up its early morning " char." Then along came the first L.C.M. and L.S.T. with vehicles, the C.T.C. exercise atmosphere departed and the fun began.

Opening " Love White " Beach

The Beach Commander and his team landed at the right place and the right time (H + 15). Their initial reconnaissance showed that the ground immediately behind the beach, with the exception of a 60-yds. stretch at the northern end, was marshy and unsuitable for vehicles or stores. In the possible 60 yds. stretch the back of the beach was covered with a tangle of fallen palm trees and casuarinas, except for two bays, each 25 to 30 ft. wide. These bays were quickly connected to the coastal road and exits established.

The beach itself was clearly unsuitable for the landing of vehicles as it consisted of a skin of sand, 3 to 4 inches thick, over soft mud, and over large patches the mud was exposed. The Beach Commander and Beach Master therefore agreed that vehicles should not be unloaded until beach roadway had been built out to them. While the Beach Commander was organizing this, a Senior Naval officer arrived and ordered all vehicles to land at once. Before they could be stopped they tried to do so and all bogged down well over their axles in 4 ft. of water. Two " Dukws," two L.V.T. and three dozers which went to their assistance also bogged down. All of these except two dozers and all the vehicles from the L.C.M. were recovered by the evening.

The state of the lower part of the beach was such that not even a jeep could cross it unaided, but discharge of vehicles was continued during the two hours each side of high water, when craft were able to beach well up.

On the evening of D Day " Love White " Beach was extended at the expense of " Love Red " by some 300 yds., thus giving it a reasonably workable length of 400 yds. with exits at each end.

Opening " Love Red " Beach

This Beach Commander and his team also landed on time. The beach had been selected for the beaching of L.S.T. and was to be the main vehicle beach.

Owing to the early beaching of the L.S.T., the distance they beached below H.W. mark and the length of the beach it was not possible to carry out an adequate prior deep-water reconnaissance and they beached blind.

As the beach labour did not arrive till much later than had been expected, the Beach Commander asked the O.C. Troops on each L.S.T. to arrange for the unloading of " Muckamuck " and to have it laid on the beach for the vehicles to cross. In some cases this was done but in the majority the panels were thrown out haphazardly and no attempt to lay them as a roadway was made. The Beach Commander also instructed the O.C. Troops on the L.S.Ts. not to start discharge till ordered by him to do so.

Initially only one exit was opened up from " Love Red " beach. Part of this was an existing road serving the Rest House. The connexion to it from the beach ran first over sand, at the immediate back of the beach, and then

over a wide patch of marshy clay. A passage across this patch was kept open first with Sommerfeld track over coir, and when this rutted, with corduroy of 5 in. ballies, a stock of which was found in the rest house.

Unfortunately the O.C. Troops on the L.S.Ts. did not obey the order to wait for the Beach Commander to give the order for discharge and started on their own initiative. There were large patches of soft mud on the beach and this, combined with the fact that "Muckamuck" had not in all cases been laid, led to a welter of fifty-two vehicles being stuck in the mud up to their frames—not far from the low water mark. This difficult position was aggravated by the facts that one recovery D8 was among the vehicles bogged, both recovery "Dukws" were bogged on "Love White" and a high proportion of the tractors of the Mechanical Equipment Platoon and the remaining recovery D8 became bogged shortly afterwards in their attempts at recovery. The final result was that fifty vehicles were not recovered on D Day and were swamped by the incoming tide.

It says a lot for the efforts of 46 Beach Group Workshops and 733 Mechanical Equipment Platoon that these vehicles and those stuck in "White" Beach, a total of eighty-three, were all eventually recovered with the exception of one three-tonner which was sat on by an L.S.T. and pushed down into the beach till its top was flush with the surface! Of the remainder, seventy were fully repaired and put back on the road, even though some had been under water for several tides, and twelve which were recovered, but not repaired, all received major structural damage during recovery, one three-ton lorry was pulled in half. Such damage is not surprising as the vehicles were sunk so deep and the mud was so tenacious, that a team of four T.D. 14's and two T.D. 9's had to be used to recover some of them.

For the second and subsequent flights of L.S.T. the beach proved reasonably satisfactory, only one more vehicle being lost from an L.S.T. This vehicle was recovered and repaired. The reason for this later success was that a route had been discovered, by the Beach Commander, which followed the crest of a runnel from the L.S.T. beaching point, in a wide curve to the north, to the original exit.

After the losses on the first tide, the only later losses of vehicles on either beach were due either to the fact that the driver disobeyed instructions and tried a route of his own, or to the fact that the craft carrying the vehicle beached at a point other than that to which it was ordered.

Existing Roads

For ease of description all roads existing or developed in the Beach Maintenance Area will be referred to below by the proper names by which they were called in the operation. These names are shown against the various roads in Sketch "C." It will be noted that, in the description of existing roads, some are referred to in the present tense, some in the past. The former are those roads which survived the traffic in, more or less, their original states, the latter are those which had to be re-made throughout.

Coastal Road and High Street

These are fair all weather roads approximately 18 ft. wide and consisting of a 3 in. bituminous surface on light soling. Verges are grassy, sloping and soft and the haunches are weak. Verges are bounded on both sides by drainage ditches which are tidal and which flood on to the verges at high water springs. Culverts under these roads are of the concrete box type.

Roads and ditches had clearly received little maintenance during the Jap occupation but damage to the road surface was negligible.

Preston Street

This was a limited all-weather road approximately 10 ft. wide, with a 2 in. surface of waterbound macadam which had been sprayed with tar in places. The road was ditched on both sides and the grass verges were narrow. Ditches were overgrown and blocked and the road surface had already broken up in places. One major culvert was of the concrete box type.

Rest House Road

This is a limited all-weather road approximately 12 ft. wide and having a 3 in. bitumenized surface on light soling. It crosses the main drain over a concrete box culverting incorporating a sluice gate. Verges are steep and narrow and for part of its length the road runs over a marsh.

Potters Bar, Strand, H.Q. Road and Hospital Road

These roads served a Nunnery and two good week-end bungalows and were of better construction than had been expected. They consisted of a 2 in. bitumenized surface on light soling and were in good condition, except that the side drains were often blocked. "Potters Bar" later suffered from the facts that it is slightly lower than the others and that the passage of vehicles from "Love White" Beach gradually lowered the height of the bank between road and sea till the sea flooded over part of the road at high water springs to a depth of 18 in.

Verges to all these roads were steep and narrow.

First Key Plan

The original plan was based on the information, from a reliable contact, that the soil in Seaview was sandy and, when reinforced with Sommerfeld track, capable of carrying vehicles. It envisaged the construction of two roads joining Coastal Road to Preston Street and serving dump areas astride them. From these roads spurs would be led off into the dumps.

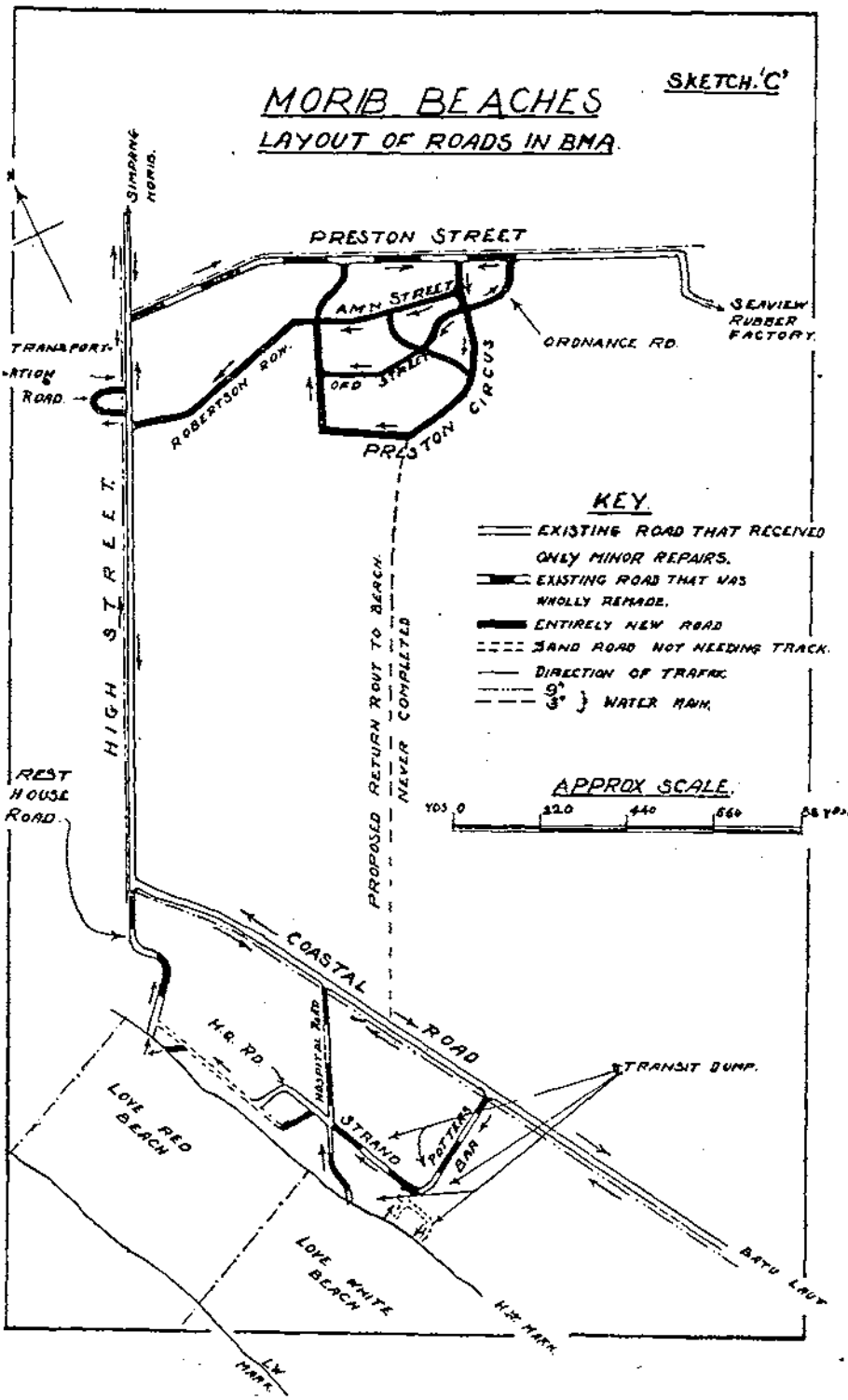
In addition a circuit ride was to be cleared for use by L.V.T. This ride was to be sited so that it ran alongside the dump areas but not through them. L.V.T. using the ride would therefore do no damage to the dumps, internal dump circuits or main roads.

Second Key Plan

The reconnaissance of the area between the beach and Coastal Road was satisfactory. The roads were quite good, buildings still stood, the ground was fairly dry (it was a nice sunny day). It was at once decided that, as far as this area went, the First Key Plan stood, except that the Hospital should be moved from Seaview into some Jap barrack blocks south of the road.

The party then crossed Coastal Road and advanced into the darkness of the Seaview Estate. They walked 50 yds., looked round and then tore up the First Key Plan. The place was like a marsh, criss-crossed with open drains which you couldn't see and fell into because the undergrowth was so thick, the soil was wet peaty mud over liquid mud and there was lots of nice standing water. The two roads which had been planned were completely impracticable.

The party, however, pushed on, fighting their way through the tangled undergrowth and over the drains till they came to a small area, about sixty acres in extent, which had been cleared. In this clearing an existing track was found which ran in the shape of an irregular letter D whose upright was Preston Street. This track, which became Preston Circus, was slightly embanked, about 10 ft. wide and with an earth surface which showed some traces of stone. It was carried over the drains by timber bridges, all about Class 2.


SKETCH 'C'
MORIB BEACHES
LAYOUT OF ROADS IN BMA
SIMPANG MORIB.
PRESTON STREET
AMN STREET
ORDNANCE RD.
SEAVIEW RUBBER FACTORY.
TRANSPORT
ROAD
ROBERTSON ROW.
ORD STREET
PRESTON CIRCUS
HIGH STREET.
PROPOSED RETURN ROUT TO BEACH.
NEVER COMPLETED
KEY.
EXISTING ROAD THAT RECEIVED ONLY MINOR REPAIRS.
EXISTING ROAD THAT WAS WHOLLY REMADE.
ENTIRELY NEW ROAD
SAND ROAD NOT NEEDING TRACK.
DIRECTION OF TRAFFIC.
9" 3" } WATER MAIN.
APPROX SCALE.
YDS 0 220 440 660
REST HOUSE ROAD
COASTAL ROAD
H.Q. RD.
HOSPITAL RD.
TRANSIT DUMP.
STRAND
POTTERS BAR
LOVE RED BEACH
LOVE WHITE BEACH
H.W. MARK
L.W. MARK
BATU LAUT

The party shook the sweat out of its eyes, stared and cheered up slightly. Here was the beginning of the making of a B.M.A. The area was very small but peace had broken out and the need for dispersion of stores had ceased.

In view of the traces of stone in the surface, it was decided that the specification for Preston Circus should be double A.R.C. or Sommerfeld track, on coir, with bamboo paling under the track at what appeared to be weak places. The Circus was 90 per cent complete to this specification by 10·00 hrs. on D + 1 and traffic was admitted.

Break up of Existing Roads

Coastal Road and High Street

Coastal Road broke up in only two places, High Street in six. No breaks other than damage to haunches appeared before D + 6. This latter damage was due to the fact that the area originally planned for the de-waterproofing of vehicles proved to be impassable and de-waterproofing had to be done on the road, vehicles pulling to one side for the purpose. The first symptom of surface break up was the appearance of fine cracks in the surface. Shortly after, the surface would break up suddenly and completely over a short length, ruts up to 18 in. deep forming very quickly.

Repairs were effected either by cutting out the bad patch and filling it with stone or by laying corduroy of rubber logs with a broken stone and P.B.S. surface. Broken haunches were repaired by filling with stone and revetting.

Potters Bar, Strand and Hospital Road

These roads, with part of Coastal Road, formed the transit dump circuit. The early breakdown of Preston Circus forced the Beach Group to develop large-scale transit dumps and the transit dump circuit had to take far more traffic than had been intended. So fast was the flow of stores into the transit dumps and so few and difficult were the off-loading points, that some vehicles had to go round the circuit two or three times before they could be accepted for off-loading.

Potters Bar was the first to go and the surface collapsed simultaneously almost throughout its whole length. The early failure of this road was due to the fact that L.V.T. had strayed on to it. In the case of the more badly broken and deeply rutted places the method of repair, which had to be done under traffic, was to level off the existing surface and lay corduroy with a surface of A.R.C. mesh. In places where the damage was not so bad " Mucka-muck " panels were laid on the surface till they broke up. The panels were then removed, one by one at night, and corduroy substituted. Some panels survived from D + 3 to D + 52. Strand and Preston behaved in the same way and were repaired in the same way as Potters Bar. Hospital Road, which didn't break up until stone was available, was repaired chiefly with stone.

H.Q. Road, which must have been used by over 1,500 vehicles, survived undamaged to the end.

Behaviour of Preston Circus and Stores Roads

Preston Circus began to rut very badly as soon as it was used, especially in the places where bamboo paling had been laid. These places were weaker and the bamboo paling, which had been made with worm-eaten female instead of sound male bamboos, crushed under the first " Dukw."

Initially an attempt was made to keep the ruts filled up with logs and with broken bricks. This proved to be inadequate and on the evening of D + 1 the specification for the Circus was changed to two thicknesses of A.R.C.

mesh or Sommerfeld on double bamboo paling on coir in the better places and corduroy for the rest.

Transportation Road, Ammunition, Ord and Cross Streets were made to the same specification as the Circus. Robertson Row and Ordnance Road were heavy corduroy throughout.

Landing of Stores

Slowly but steadily, as more and more roads were built and as craft became available for the carriage of stores as well as vehicles, the daily stores tonnage mounted till on D + 12 the 1,000 tons per day figure was passed. Thereafter the daily tonnage declined till on D + 16, the last day of working it was 836 tons. This decline was due to the fact that craft were now being taken away in increasing numbers to work in Port Swettenham or to go to Java. Had these withdrawals and the withdrawal of a number of " Dukws " not been made the daily tonnage figure would undoubtedly have remained above 1,000 tons, which is the rated capacity of a Beach Group over normal beaches.

Summary

Up to its knees in mud on the plage on Moribund-sur-Mere, 46 Beach Group landed a total of 42,651 personnel, 3,968 vehicles and a daily average of 700 tons of stores. As the Beach Group's rather scurrilous daily newspaper, *Loud and Clear* put it, " the old sweats of this outfit, who have lived in many an oriental B.M.A., admit Morib to touch a new all-time full cream bottom as far as B.M.As. are concerned. From which you can take comfort. Considering everything, we aren't doing too badly."

APPENDIX " A "

Composition of an Indian Beach Group

Headquarters.

Engineers.—Field Company. Stores Platoon. Mechanical Equipment Platoon.
Signals.—Beach Group Signal Section. Cipher Sub-Section.
Basic Battalion.—Infantry (or Engineer) Battalion.
Supplies and Transport.—H.Q., R.I.A.S.C. Supply Section (Supplies). Supply Section (P.O.L.). General Transport Company (Amphibian). General Transport Company Workshops. Three Fire Fighting Sections.
Ordnance.—Ordnance Beach Detachment.
I.E.M.E.—Beach Group Workshops.
Provost.—Beach Maintenance Provost Unit.
Labour.—Pioneer Company.
Miscellaneous.—Reception Camp.
Attached.—R.I.N. Beach Commando. R.A.F. Beach Unit.

The War Equipment Tables of Units in the Beach Group included the following mechanical equipment and cranes:

Tractors—D4 with angledozer and winch	..	2
D7 with angledozer and winch	..	8
D8 for recovery	..	4
Armoured Recovery Vehicles (T5)	..	2
Cranes—Trackson Swing (30 cwt.) ..	..	4
Wheeled Cranes	..	9

"Q" IN THE ITALIAN CAMPAIGN, 1945

By MAJ.-GEN. A. C. DUFF, C.B., O.B.E., M.C.

I. INTRODUCTION

TWO articles entitled "'Q' in the East African Campaign, 1941" appeared in the *R.E. Journal* in December, 1942, and September, 1943, respectively. The following is an attempt to round off a trilogy by some comments on the administrative aspects of the closing campaign in Italy in 1945.

There is a story that in the summer of 1940 Mussolini, hesitating whether to enter the War as Germany's ally, inquired of the Oracle at Delphi what the result would be should he do so ; and that the Oracle replied that the Italian Army would win in the long run. By the time the long run ended, and Italian resistance collapsed in anticipation of the Allied landings at Salerno, Mussolini may have learned something about oracular utterances and the British Army had certainly learned a great deal about war. On the administrative side, beyond doubt, the amateurs had become professionals. Looking back on the East African Campaign of 1941, and remembering how we then approached the problems of maintaining a force in the field during a swift and prolonged advance, our ignorance and our success alike appear remarkable. We had no precedents to follow and no manuals for our guidance. Dunkirk was so recent in time and so remote in distance that the lessons of that campaign had not then reached us, even assuming that much could be learned from a campaign so entirely dissimilar. It was a case of making it up as we went along ; trying any methods which our ingenuity could suggest ; discarding those which did not work and exploiting and developing those which did ; all of it empirical in the extreme. By the time the campaign was over a body of knowledge had been collected as to how certain situations could best be met and how certain things could best be done, and this body of knowledge was then transplanted to the Western Desert and North Africa for further test and trial. By 1945 most administrative problems could be met by a routine solution : a solution which had been proved to produce satisfactory results and could reasonably be expected to produce them again. Some interest attaches to seeing how the embryonic ideas of 1941 had developed by 1945.

Before beginning the story of the campaign in Italy some explanation is needed of the meaning applied to the letter "Q" placed at the head of this article. "Military Administration" would not be a correct description, for many of the "A" problems are excluded. On the other hand mention is here made of certain "A" problems—in particular the problems of the handling of Prisoners of War—which are dependent for solution more upon "Q" than upon "A." A more appropriate heading could be found by borrowing the American term "G-4," the fourth Section of the General Staff, which includes Movements, Signals and Medical, as well as the ordinary British "Q" Services ; or even by appropriating the term "logistics." Perhaps, however, it is better to sacrifice accuracy in the interests of familiarity.

An apology is also needed for attempting to isolate and examine separately certain particular problems which had to be faced by Commanders and their Staffs. Such treatment may give the impression of a Staff system divided into watertight compartments labelled "G," "A," "Q," etc., each dealing in

isolation with its own particular subject. If this is a true picture of any headquarters then there is something wrong with that headquarters. It was certainly not true of A.F.H.Q. Although the problems here discussed were administrative in kind, yet their handling was the business of the Staff as a whole.

II. Tactical Situation in January, 1945

(See Map at the end of this article.)

By the end of 1944 the campaign in Italy appeared to be not far from a stalemate. The Allies' attempts to reach the River Po before the onset of winter had failed and the whole of the Po Valley was still in German occupation except for its extreme south-east corner; and heavy drains had been made upon the Allied armies, in particular upon the French and American components, for Formations to reinforce the effort of 21 Army Group in France.

In January, 1945, the two Allied Armies—8th Army (British) and 5th Army (American)—lay stretched across Italy in a line roughly east and west from the Northern Adriatic to the Ligurian Sea. The right flank of 8th Army covered Ravenna and Rimini and the main-line railway as far as Faenza. Thence their line swung back into the hills and joined the right of 5th Army to the south of Bologna. 5th Army continued the line south-westward through the mountains, covering Pisa and Leghorn before reaching the sea.

Climate and terrain were alike unpleasant. One is apt to think of Italy as a land of sunshine and warmth, and south of the Apennines the picture is reasonably accurate; but north of the Apennines, and still more so in the mountains themselves, the winter is long and severe. The passes are often snow-bound and in the Po Valley snow and ice are of frequent occurrence. This differentiation of climatic conditions must be one of the reasons for the superior vigour and hardiness of the inhabitants of Piedmont and Lombardy as compared with the Neapolitan and the Calabrian. Both in the plain and in the mountains the movement and the concentration of troops presented great difficulties. The plain where the bulk of 8th Army lay, on the edge of the Po Valley, is intersected by a series of rivers running down from the Apennines and further obstacles to movement are offered by the canals dug to carry away floodwater. The land is all either orchard or arable, and in winter becomes so waterlogged that the movement of wheeled vehicles except on the roads is hardly practicable. In the mountains the case is even worse, for the gradients are so steep that wheeled vehicles are strictly confined to the roads. Lorry traffic on the roads was consequently very heavy, and we had to rely on jeeps and on pack animals for forward distribution.

Operational control of the two Armies was vested in H.Q. 15 Army Group at Florence. General Mark Clark had recently assumed command of the Army Group, in succession to General Alexander who had moved to Allied Force H.Q. to replace General Maitland Wilson as Supreme Allied Commander.

15 Army Group control covered only the areas of the two Armies which composed it. Italy, south of 15 Army Group boundary, was covered by a static lay-out, British and American, directly controlled by A.F.H.Q. This static lay-out, which is discussed later on in this article, included the Bases of the two Armies and the ports through which the Bases were supplied.

A.F.H.Q., the Headquarters of the Supreme Allied Commander, was located in the Royal Palace of Caserta, fifteen miles north of Naples.

III. Allied Force Headquarters

A.F.H.Q. deserves some comment, for it was a truly remarkable organization.

A.F.H.Q. was the instrument through which the Supreme Allied Commander exercised command not only of the Armies, British and American, in the Theatre, but of the Naval and Air Forces also. This first attempt at an "integrated" H.Q. took shape in 1942 when the Allied landings in North Africa were undertaken, and its first Commander was General Eisenhower. The underlying theory was that wherever possible all appointments on it, from the Supreme Commander downwards, should be functional and not national; the selection depended upon the suitability of the officer, not upon whether he was British or American. Practice followed theory fairly strictly, but there were certain corollaries; in particular it was obviously desirable that within any one Section or Branch there should be a reasonable balance between the two nationalities, and consequently in any section, or branch, of which a British Officer was head it was normal to choose an American Officer as his Deputy, and vice versa. This bi-national system and the need to maintain a balance tended to swell the size of the H.Q., and by the end of the war A.F.H.Q. was enormous; but it did work.

Argument at A.F.H.Q. was frequent and fierce, as it is bound to be at any big H.Q. in war-time; the soldiers would set about the sailors, or the sailors set about the airmen, or the politicals set about all three of them; yet no matter what the argument was it never resulted in a national line-up, British versus American.

At first sight there would appear to be ground for a comparison between A.F.H.Q. and S.H.A.E.F., the Supreme Headquarters set up for the control of Allied Operations in north-west Europe, again under General Eisenhower's command. There was, however, one essential difference; A.F.H.Q. exercised administrative as well as operational control; S.H.A.E.F. did not. S.H.A.E.F.'s administrative role was to co-ordinate, and 21st Army Group was administered direct by the War Office. A.F.H.Q. had administrative control, and the Chief Administrative Officer at A.F.H.Q. was responsible to the War Office for the administration of 8th Army. This vitiates a comparison. Which system is preferable must depend upon the circumstances of the case, but when other things are equal smooth working is more likely to result when all executive control, operational and administrative, is vested in the same H.Q.

It must be remembered that an officer appointed to Supreme Command of the Allied Forces in any Theatre was not appointed by, nor responsible to, the Government of his own country. He was appointed by the British and American Governments in consultation, and he was responsible to the Combined Chiefs of Staff in respect of all inter-Allied matters. Thus the C.A.O. had to serve three masters in dealing with administrative affairs. Purely British items were referred to London; purely American items were referred to Washington; and inter-Allied items were referred to the Combined Chiefs of Staff, also centred in Washington. The number of inter-Allied items was very large, and the Combined Chiefs of Staff was from its nature a body not adapted to giving quick decisions on administrative matters; so that it was often necessary to make the decision locally, take whatever action was required, and ask the Combined Chiefs of Staff for covering approval.

The British and American staff systems differ widely, and either one or other had to be adopted for general use at A.F.H.Q. The American system

was the one chosen, with some slight modification. This is not the place to examine the two systems and compare their merits, but many British Officers who have experience of both think that the American system is, on balance, the better of the two, and that the best answer would be a compromise between them. For present purposes it is enough to say that the American Staff is divided into five Sections ; G–1 corresponds roughly to a combination of our M.S., A and 2nd Echelon ; G–2 is Intelligence ; G–3 is our Operations, Training and Staff Duties ; G–4 is our Q but also includes Transportation, Signals and Medical ; and G–5 is Civil Affairs. As far as office procedure is concerned the main difference lies in the American use of the " Staff Study." Under the British system a senior officer when called upon to make a decision is presented with a file, or a number of files, in which the references have been flagged, and a minute from the Staff Officer responsible. Under the American system he is given instead a Staff Study, consisting of a preamble to say what it is all about, copies of the relevant letters in the files, the opinions of all Sections and Services directly or indirectly concerned, and a draft telegram or letter which he is asked to approve. The Staff Study has one great merit : it gives the necessary information in an easily digestible shape and thus enables the Commander to form his opinion in the minimum of time. Against this, however, its preparation is slow and involves much clerical work which would not otherwise be required ; and for this reason its use should be restricted to very senior officers.

One solid advantage provided by an integrated A.F.H.Q. was a telephone service equipped and operated by Americans. Its efficiency, judged by British standards, was astonishing, and one became accustomed to the pleasant idiom " You're welcome," to which there is no British equivalent.

One modification introduced into the American Staff system at A.F.H.Q. was the appointment of a Chief Administrative Officer. Under American practice all five Sections of the Staff are directly responsible to the Chief of Staff, who is himself responsible to the Commander. At A.F.H.Q. the British practice was followed of relieving the Chief of Staff of administrative responsibility by providing a Chief Administrative Officer, directly responsible to the Commander and controlling G–1, G–4 and G–5 (A, Q and Civil Affairs). The C.A.Os.' subordinates were a good deal more numerous than this would suggest, for both G–1 and G–4 could not, from their nature, be integrated Sections and were each split into their British and American components. And to these had to be added the integrated Sections ; G–4 (Movements and Transportation), Petrol Section, Coal Section, and such outliers as the Local Resources Board. At the C.A.Os.' conference, which he held every morning, there were seldom fewer than twelve officers in the room. Another and very important Section under his control was the Logistical Planning Section, which to some extent served him as a Secretariat.

One final comment on A.F.H.Q. is that the Italian Campaign was only one, although the biggest, of its responsibilities. During the period we are here discussing, the affairs of the British forces in Greece were anxious and difficult, particularly on the political and administrative sides ; operations were taking place along the eastern coast of the Adriatic in conjunction with Marshal Tito's forces ; and North Africa, although moribund, was still under A.F.H.Q. command.

IV. Outline Narrative, January, 1945—September, 1945

This is not an attempt to write a history of the final campaign in Italy. For those who want to study the battle in the Po Valley there is General McCreery's detailed account in the *R.U.S.I. Journal* for February, 1947.

The following outline narrative is intended only to provide a background against which the administrative problems may be examined.

In January, 1945, the Italian front appeared to be at a dead-lock, nor were matters improved by the arrival in February of orders to send away to 21 Army Group in France further substantial reinforcements including the whole of the Canadian Corps and the Canadian Units which maintained and "backed" it. In the face of this the Supreme Commander's decision to mount a full-dress attack was a bold one. Numerically we had no superiority over the enemy and our forces were much less homogeneous, but other factors were in our favour. In guns and armour we had the advantage. In the air we had achieved such a degree of superiority that our own communications were virtually immune from interference, while the German communications could only be operated to a fraction of their capacity: their main-line railway to Germany, over the Brenner Pass, was interrupted daily and every bridge over the Po was destroyed. Probably the most important factor of all was that in Germany the end was clearly approaching, and the German Armies in Italy knew that no matter how gallantly they fought—and they fought gallantly—it could make no difference to the result.

After one or two minor preliminary operations the main attack was launched by 8th Army on the evening of 9th April. It was made on a two-Corps front, between Lake Comachio and Route 9—the main road running north-west from Rimini to Bologna. 5th Army, up in the mountains, followed suit on 14th April. On the night of 20th April the Germans evacuated Bologna and at dawn on the 21st the city was entered almost simultaneously by Polish, American and Italian troops.

That was the end of the immediate battle, but the German Army although defeated was still mainly intact. During the following week it was destroyed. Allied troops, part of the American 10th Mountain Division, crossed the Po on 24th April. On the morning of the 25th the Commander of the 76th German Panzer Corps surrendered, and by that evening some 50,000 prisoners were in Allied hands. Thereafter the battle became a race to the north. One American Divisional Commander began his daily situation report: "I don't believe that God Himself knows where my forward units are." On 28th April German envoys arrived by air at Caserta to ask for terms of surrender, and the general surrender took place on 2nd May.

Eighth Army had been engaged in heavy fighting from 9th to 20th April. One of the most noticeable features had been the very low casualty rate, and another had been the enormous expenditure of gun and mortar ammunition. The latter, to some extent at least, explains the former.

Once the Po had been crossed the whole of 8th Army was no longer needed for the drive northward, nor could it have been maintained. The Polish Corps was therefore withdrawn into reserve near Bologna where there were multifarious duties to be carried out, in particular the guarding of prisoners. 5th Corps followed up through Udine to the Italian frontier and went on into Austria. 13th Corps turned aside right-handed to Trieste, where General Freyburg took the German surrender on 2nd May. Then followed a pause which gave an opportunity for the necessary transition from a basis which was purely operational to one which was mainly static. H.Q. 15th Army Group, whose rôle had been solely operational, moved to Verona and there disbanded. H.Q. 5th Army also disappeared, and U.S. elements from it and from H.Q. 15th Army Group moved into Austria to form the H.Q. of the American Zone of Occupation. H.Q. 8th Army also moved into Austria, to Klagenfurt, to form the H.Q. of the British Zone. And A.F.H.Q. began to ponder where

it should and could be best located to discharge its functions during the difficult period which was bound to lie ahead.

On 24th July Lieut.-Gen. Sir B. H. Robertson, Chief Administrative Officer at A.F.H.Q., left for Germany at twenty-four hours notice to become Deputy Military Governor, and was succeeded by the writer of this article. As we are both R.E. Officers, and as this is the *R.E. Journal*, it is perhaps permissible to mention that our first war-time partnership had begun when we met in East Africa as Lieut.-Colonels in June, 1940, and that our second war-time partnership ended when we said good-bye in Italy as Lieut.-Generals in July, 1945.

V. British Administrative Responsibilities and Problems

From this point onwards an attempt must be made to isolate the British responsibilities of the Administrative Staff, as opposed to Allied responsibilities, although, as may be gathered from the foregoing, it is far from easy to do and may tend to create an unreal picture.

The case of 8th Army was fairly straightforward for, although it included large Allied components, in particular the Polish Corps, it was entirely British-administered. 5th Army, however, although predominantly American, included a number of British Formations, and for this reason a British increment was added to the American Staff at Army H.Q. This increment had executive responsibility and was not merely for liaison duties.

The British Administrative Staffs at 8th Army and 5th Army dealt directly with A.F.H.Q., as H.Q. 15 Army Group was not responsible for administration. It was a long way, however, to A.F.H.Q. at Naples, while H.Q. 15 Army Group at Florence was only a few miles from 5th Army H.Q. and comparatively close to 8th Army H.Q. ; so an administrative staff with a Brigadier A/Q at its head was attached to H.Q. 15 Army Group to co-ordinate administrative matters between the two Armies and to act as the eyes and ears, and often as the voice, of the C.A.O. at A.F.H.Q. Although it carried no executive responsibility its work was invaluable, particularly when the main battle was over and the forward movement of the Armies began to gather momentum.

In the rear of the area of the two Armies the rest of Italy was covered by a static lay-out, British and American, directly subordinate to A.F.H.Q. Its organization would have been simple if only it had been possible to draw a line through Italy dividing it into two clearly defined portions, one British and the other American, but this unfortunately was not possible. Broadly speaking the east side of Italy was British, and included the ports of Ancona, Bari, Brindisi and Taranto, while the west side of Italy was American and included the ports of Leghorn and Naples ; but a whole series of special cases had to be met. To quote only one of the more important, strong American Strategic Bomber Forces, based on the Foggia group of airfields and supplied through Bari, created an American enclave in the middle of an area otherwise British ; the drain on Bari reduced the already inadequate capacity available in the ports on the eastern coast, and so part of the port of Naples had to be made over by the Americans for British use ; nor was it possible to deal with Rome except on an inter-allied basis.

Another complication was due to the difference between British and American practice in the organization of a L. of C. Area. In accordance with British practice the British territory was sub-divided into two or more Districts—the number varied from time to time—and each District Commander was directly responsible to A.F.H.Q. In accordance with American practice, however, the American territory was controlled by a single organization known as the Peninsular Base Section, whose Commander was directly

responsible to A.F.H.Q. Thus the Commander of the P.B.S. had no "opposite number," and had to deal in parallel with two or more British Commanders, and this involved A.F.H.Q. in a good deal more co-ordination than would otherwise have been necessary.

Within this static lay-out there had been built up the Allied Bases. Bases of this size cannot be described as located at definite places ; the series of depots and installations were spread all over Southern and Central Italy, the usual governing factors being port and rail capacity. Speaking generally, however, the British centres of gravity were Naples and Bari, and the American centres of gravity were Naples and Leghorn.

Such was the British administrative set-up. Now it is time to examine some of the principal British administrative problems.

(1) *The Administration of Allied Contingents*

In no other theatre of operations were the Allied Forces composed of so many different nationalities. The two biggest components were the British and American, but Formations varying in size from a Division to a Corps were provided by the New Zealanders, the South Africans, the Indian Army, the Poles and the Italians themselves. This list excludes smaller contingents such as the Brazilians and the Jewish Brigade, not to mention non-combatant troops from Europe, Asia and Africa. To take first the Dominion contingents, although they were for the most part armed, equipped, fuelled and fed from British resources in the Theatre of Operations, yet they could never be entirely so maintained. At least one essential item—reinforcements—had to come from the Dominion in question and could come from no other source, and there were always certain particular things which the Dominions preferred themselves to provide : the New Zealand type battle-dress was a case in point. In consequence each Dominion had its own small Base where reinforcements were held, casualties were collected, and stores kept ready for forward despatch. It all worked out smoothly but in dealing with any Dominion contingent one has to tread a little cautiously, for to the Commander of the contingent the final court of appeal is not the British Government but the Government of that Dominion ; and should he feel that he is not getting a fair deal, even over such matters as the allotment of accommodation, he may murmur thoughtfully that it is a question in which his Prime Minister might be interested.

That particular possibility did not hold good where the Indians were concerned, and perhaps the most difficult problem they presented lay in the provision of rations. Beef was ruled out because of religious objections and it was extraordinarily hard to acquire enough sheep and goats to allow even a small issue of fresh meat. The Italian flocks had been heavily depleted during the war and the survivors had been driven into the mountains for safety, and even when we could find them we had to exercise moderation in the use of requisition in view of the reasonable requirements of the civilian population. We sent buyers to Sardinia and to North Africa and we were even receiving large consignments from the Sudan. It is alarming to think of the costed price of a goat sent from Khartoum to Northern Italy.

The administration of the Poles was comparatively simple. In the same way that the Americans assumed responsibility for the maintenance of the Brazilians, so the British, though on a much larger scale, assumed responsibility for the maintenance of the Poles. Everything required by the Polish Corps was found from British resources, nor was there any need for a separate system for their reinforcements, for latterly there was no source of supply of Polish Nationals from outside Italy. One trouble in dealing with the Polish

Corps was naturally the language difficulty, and another was the political relationship between them and the successive Governments of their country. Neither of these, however, can be described as administrative matters. The internal administration of the Polish Corps was in the hands of the Poles themselves, and it was efficiently carried out.

Lastly came the administration of the Italians and this gave more trouble than the administration of the rest of the Allies put together.

In January, 1945, there were three main categories of Italian soldiers serving in, or with, the Allied Forces. First came the combatant troops, the five "Gruppi", each "Gruppo" something between a strong Brigade and a small Division. They were not first-class fighting troops but they were good enough to hold quiet sectors of the line and thus allow other Divisions to be withdrawn for rest and training. Their arms, equipment and clothing were a British responsibility; their feeding was a combined British, American and Italian responsibility; and their administrative "backing," provided by the Italian Government, was virtually nil.

Then there were the co-operators; former prisoners of war who had elected to "co-operate" with the Allies. About half of them were looked after by the British and the other half by the Americans. Each Power was responsible for clothing its own co-operators, but their feeding was a joint responsibility. And then there were the non-co-operators, straightforward prisoners of war, who worked for us and who were entitled to the ration scale appropriate to their status. Add to this that the Allied Navies and Air Forces each had their own private armies of Italians of one kind or another, and that these again were divided into combatant, co-operator, or other categories, with varying ration scales and varying sources of supply for their clothing and equipment.

The amount of time spent by the G–4 Staff at A.F.H.Q. in trying to rationalize and implement these multifarious scales was deplorable. Nor were the British and Americans always in agreement, for each wanted, not unnaturally, to avoid including in the Italian ration scales items of which its own stocks were low. The resultant instructions were so diverse that local Commanders, perhaps fortunately, seldom took much notice of them and contented themselves with making sure that any Italians under their command got enough to eat; and quite a good answer too. The whole business rubbed in the lesson that good military administration demands simplicity in outline rather than logic in detail.

It would be interesting, but would take too much space, to examine the question of how far, and upon what conditions, an Allied contingent is worth its price. Extra manpower is at first sight a welcome present, but a little calculation may make one suspect that it will entail such a piling up of overheads and such a diversion of administrative resources required elsewhere that it will become a liability rather than an asset.

(2) *The Organization of Occupied Territory*

Any Commander who mounts an attack has to make his plans not only for ensuring that the attack is successful but also for the next steps after the attack has succeeded. The uppermost thought in his mind will usually be how to enable his forces to maintain their momentum and to continue their forward movement. In the particular case of the attack mounted in the spring of 1945 it was anticipated that the battle would be fought in the Po Valley, either south or north of the river itself; but the final objective was inside Austria, some 200 miles distant, across the plain of north-eastern Italy and through the mountain passes of the Julian Alps.

Those who had to do the planning worked on the assumptions that the attack would be successful and that the battle would be won in the Po valley—assumptions which turned out to be correct. There were four major administrative matters which had to be planned before operations began, and put into execution as operations proceeded. These were, first, the forward extension of the static lay-out ; second, the restoration of forward communications ; third, the development of ports which fell into our hands ; and fourth, the handling of prisoners and captured material.

The forward extension of the static lay-out as the advance progressed was essential in order that the Commander 8th Army should be free to concentrate on pushing ahead and should not have to keep looking over his shoulder to make sure that things were not going wrong behind him. To effect this the rear boundary of 8th Army was moved forward in a series of bounds and at each bound a belt of territory ceased to be an 8th Army responsibility and passed under a District Commander responsible to A.F.H.Q. Before the attack began two District Commanders, complete with staffs and signals, had been detailed for this purpose and had been relieved of all, or most of, their former duties. Their H.Qs. were established close behind the Army boundary, ready to move forward at short notice, and they had had ample time to plan in detail how they would organize and sub-divide their new commands when the moment came. As a result of this planning they made lists of the administrative and technical units they would require—the number of units amounted to hundreds—and these units were pulled out from the rest of Italy by A.F.H.Q., moved northward, and concentrated under the command of District H.Qs.

The timing of the process of moving forward and taking over as the attack progressed, required, obviously, the very closest co-ordination between Army H.Qs. and District H.Qs. By the time that our forward troops were on the Austrian frontier one District H.Q. was established in Ferrara and the other on the outskirts of Milan, and it was they and A.F.H.Q. who were responsible for the immense amount of work to be done in clearing up the mess throughout the Po Valley.

The restoration of forward communications was a matter of the first importance if the success of the initial battle was to be fully exploited. We knew from bitter experience that the German demolitions were likely to be comprehensive and thorough. During their retreat from Naples to the Gothic line they had destroyed every bridge, large and small, along the railways and the main roads, and the terrain over which they would next have to withdraw offered even greater opportunities for demolition, not to mention the damage, possibly even greater, which would be done by our own bombing. First there were the Po bridges, and the Po is the largest river in Italy ; then the bridges over the series of rivers which run from the Alps eastward to the sea, parallel to the Po and north of it ; and then the bridges and tunnels on the road and railway which run through the mountain passes from Udine to the Austrian frontier. Our anticipation was realized and every bridge of importance had to be restored or replaced. Figures showing what this entailed are given in the article by Maj.-Gen. N. A. Coxwell-Rogers entitled " An Outline of Engineer Work in the Italian Campaign," in the *R.E. Journal* for September, 1946. The preliminary planning had to provide not only for the provision of the quantity of bridging required but also for its transport forward.

Port development was given an even higher priority than the restoration of forward communications. The latter process was bound to take a matter of weeks and probably of months, but it was always possible that a port might

fall into our hands relatively undamaged and be taken into use in a matter of days and developed as a forward Base. There were only two ports to interest us on the Adriatic coast, Venice and Trieste. These were both good propositions, modern, fully equipped, and fitted for bulk handling of oil, though what condition they would be in when we arrived was another matter. Our resources would not suffice to develop and operate both of them, so we decided to go for Trieste as our forward Base and to leave Venice mainly for the use of civilian traffic. Air photographs, maps and charts of Trieste and its surroundings were studied and a detailed lay-out prepared for the necessary depots—Ammunition, Ordnance, R.E. Stores, Supplies and Petrol, the Hospitals, the Reinforcement Camps, the R.N. Shore Establishments, etc. Lists were made of the units required for repair, maintenance and operation, and their equipment and the units themselves were concentrated near Ancona, ready to move forward either by sea or by road, as circumstances might indicate. When the time came, however, it turned out that we had made a mistake in deciding to go for Trieste rather than Venice. The decision had been made on the grounds that Trieste was the better port of the two and that its use would shorten the road and rail haul into Austria by about a hundred miles, but we had not anticipated, and indeed hardly could have anticipated, the political situation which arose in Trieste. The city was entered almost simultaneously by New Zealand troops from the south and Yugoslav troops from the north, and the Yugoslavs immediately claimed that Trieste had ceased to be Italian and had become Yugoslav by right of conquest. This line of argument was not acceptable to either the British or the American Governments and there was more than a possibility of the Yugoslavs attempting to secure their desires by a *coup-de-main*. Yugoslav troops on one side and British and American troops on the other side stood glaring at each other, and indeed this state of affairs went on for more than a year ; and ordinary prudence forbade the setting up of a forward Base in a place which might at any moment become a battle-field. Trieste had to be used to some extent or the maintenance of 8th Army would have been impossible, but instead of developing it as an advance Base we used it only as a " sea-head " for stores in transit and put nothing on the ground. Instead we concentrated on Venice. By 20th May, a key plan had been prepared and a Siting-Board was held to examine it on the ground. We were fortunate in finding both ports relatively undamaged, but we were less fortunate in the thoroughness with which the Germans had mined the approaches.

The handling of prisoners and captured enemy material presented another major problem which had to be planned in advance, and as far as prisoners were concerned we could estimate with some precision what the numbers were likely to be. Assuming that the Germans were completely defeated south of the Alps, as in the event they were, very few of them would be able to escape over the precarious and damaged rail and road communications into Austria, and the number of prisoners we should expect would be approximately the same as the number of German troops in Italy, and that was nearly 1,000,000. The Americans would take half of them, but looking after even 500,000 prisoners is no light commitment.

The first principles in the normal handling of prisoners of war are close custody behind barbed wire, immediate examination by Intelligence Officers, and segregation of Officers from other ranks. In dealing with 500,000 men taken prisoner in a period of three weeks, all these principles would be completely impracticable. The essential conditions which we had to fulfil were that the prisoners should get food and water and should not be allowed to roam at will over the countryside, and if these conditions were to be ful-

filled we should have to keep them in their own Formations, under their own officers, and concentrate them in some area where the water supply was adequate and to which we could bring food. The area we selected was in the Po Valley, south of the river and close to our rail-heads. When the German surrender came all the German formations and units were directed to march to this area, complete with their own transport, their own hospitals, and such rations as they could bring with them. This arrangement worked out quite well in practice and it gave us the breathing space we needed before we were able to find the time and staff for a proper sorting out and regularization.

Captured enemy material took even longer to sort out than captured enemy personnel. The task of discovering what there was to sort was an enormous one in itself, and there were so many claimants to it. For rations and clothing the best claim was that of the Germans themselves, and the drain on our own resources was to that extent relieved. These, however, represented only a small fraction of the vast quantity of war material which fell into our hands. Not much of it was of direct use to the British Army, though the large numbers of captured vehicles helped to make good our own vehicle wastage. A complication which very soon appeared was that a considerable proportion of the material was of Italian origin and manufacture and had been bought or requisitioned by the Germans, and to this the Allied Commission laid claim on behalf of the Italian Government. Nor were the French and Yugoslavs backward in discovering items alleged to have originated in their respective countries. Perhaps the most difficult case of all was that of captured ammunition. It was of no value to us ; it could only be made over to the Italian Government if it was first broken down into scrap, a long process ; it could seldom be blown up in situ without simultaneously blowing up some neighbouring village ; and moving it to seaboard and dumping it in deep water demanded more freight capacity than we could afford. It took us six months to finish the business, and it entailed an appreciable loss of life, both British and Italian.

(3) *The Maintenance of 8th Army*

During the month of May and the first half of June the maintenance of 8th Army presented a critical problem.

The general lay-out of 8th Army was 5th Corps in Austria, round Villach and Klagenfurt ; 13th Corps in Venezia Giulia, between Trieste and Gorizia ; and Army H.Q. and Army Troops round and in rear of Udine. Putting the requirements of a Division at 350–400 tons a day, excluding their petrol, the Army required between 3,000 and 3,500 tons a day for its ordinary maintenance. Nor was this all, for in view of the threatening situation in Trieste the Army had to prepare not only to carry out occupation duties but also, if necessary, to fight. After their long and rapid advance their own resources were exhausted and to make them ready for battle they required in addition to their daily maintenance a build-up of about 15,000 tons, and required it urgently. Everything they needed was available in the Base Areas in Italy ; the problem was how to move the tonnage from the Base Areas to 8th Army.

Movement by sea was the ideal. We had the necessary shipping, and there was ample port capacity for out-loading in Ancona, Bari, and Naples ; but unfortunately the tonnage which could be received in the Northern Adriatic ports was very small. Trieste could only accept landing-craft until the main channel was swept clear of mines, nor could we risk, owing to the political situation, putting on to the quays at Trieste anything which could not immediately be cleared away inland. This limited the tonnage coming into Trieste to about 500 tons a day. The position in Venice was worse still, for no

shipping or craft could enter until the two entrances to the Lagoon had been swept, a process which would at best take weeks.

Movement by rail was temporarily unworkable. Our railheads were still round Bologna, south of the Po. Until the new bridges over the Po were completed, a major piece of engineering, no through movement was possible. Nor was it practicable to tranship across the Po and shuttle thence northward, for the rail had been broken at half a dozen other river crossings.

Movement by road was not seriously hampered by demolitions, for the broken road bridges had been replaced by Baileys as 8th Army moved forward and the road surfaces were in surprisingly good condition. The trouble was over the mileage which had to be covered. From rail-heads round Bologna to the centre of gravity of the 8th Army at Udine was 150 miles. Call this a lorry turn-round of at least four days, allowing for loading and off-loading. Then a lorry carrying two tons would produce half a ton a day, and to produce 3,000 tons a day would require 6,000 lorries. Admittedly we had a great deal of transport but not as much as all that. The south of Italy had already been drained of transport in order to support the battle and could produce little more, so it fell to 8th Army to squeeze out every lorry they could raise, chiefly by "grounding" reserve formations and borrowing their second-line and part of their first-line transport, and setting them to haul from Bologna forward.

Movement by air was only invoked when it became apparent that the best we could do by a combination of other means was to keep level with the requirements of daily maintenance without contributing anything to the build-up which 8th Army—and in particular 13th Corps—urgently needed. Movement by air would be available for a short time only, for the American Bomber Squadrons, on which we had mainly to depend, were already preparing for re-deployment to the Far East. The other essentials, however, were ready to hand. The group of airfields round Foggia could be used for loading and taking off; the group of airfields round Udine could be used for landing and unloading. Weather conditions at that time of year were bound to be tolerably good. The weakest feature of the situation was that we had never before in Italy attempted air supply on a large scale and did not know what the snags were likely to be. They proved to be numerous.

The first and worst of our many mistakes lay in not setting up at A.F.H.Q. a special centralized Army/Air Control to handle the whole business. In the absence of such a control the despatching end was the responsibility of A.F.H.Q. and the receiving end was the responsibility of 8th Army and its attached Air H.Q.—Desert Air Force. The result at times was not far from chaos. It was the business of 8th Army to provide at the receiving airfields the labour to unload the aircraft and the transport to clear the stores, but for the first week it was: "Never the time and the place and the loved one all together." The lightly-built Italian runways cut up under the weight of the heavy bombers and went out of action first at one of the Udine airfields and then at another; the aircraft were diverted to other airfields all unknown to the waiting transport and unloading parties; senior Air Officers far away at A.F.H.Q. asked indignantly whether the Army really expected the pilots and crews to unload the aircraft by themselves. An airfield where things had gone wrong could be an astonishing sight; in the morning an airfield with a concrete runway down the middle; during the day busy with a stream of aircraft landing, turning off the runway, unloading as soon as they could find an open space, and taking off again; and in the evening a vast dump of unsorted stores, pierced only by a single narrow lane.

Getting this tangle straight took a good deal of hurried travel by air on the

part of Q and Air Staffs, but it was done. In three weeks a lift of 12,000 tons had been delivered, and was handsomely acknowledged by the Army Commander.

During this difficult period while the maintenance of 8th Army depended upon ringing the changes successfully on movement by land, sea, and air, there was one consoling thought: that on the day that the mine-sweeping into Venice was completed and the first ship could come in, our troubles would be over. The port of Venice was almost undamaged and as we were able to get at it from the landward side we could ensure that all was in working order and decide on the detailed lay-out of the forward Base. The main-line railway from Venice to Udine and on to Klagenfurt had not been extensively destroyed and we had it open and in operation well in advance of the opening of the port. And so it proved, and all was well until the next crisis came, and it was the next crisis which gave rise to the birth of "MEDLOC."

(4) *The MEDLOC Routes*

MEDLOC stood for Mediterranean L. of C. and it included all means of movement between the Mediterranean and Great Britain. It covered freight as well as personnel, but the movement of freight was small and presented no serious problems, while the movement of personnel was on a large scale and bristled with difficulties.

It was the end of the war in Europe which produced the crisis. Until then personnel movement between Great Britain and Italy had consisted only of reinforcements coming out and a trickle of men going home on Python—return to Home Service after a fixed period abroad—or on leave. The allotment of leave during the war was so small in Italy that no one could count on it; it was a lucky soldier who, lying in his fox-hole in the snowy Apennines, found himself tapped on the shoulder and his Sergeant saying: "Get back to Company H.Q., my lad; you're for home leave."

The situation was completely changed by the ending of the war, for it then became imperative to find means to give leave to all men at the very least who had been abroad for more than two years. But there was more to it than that. Demobilization was in sight, as well as an improvement in Python, and although the rate was still unknown, the numbers were bound to entail personnel traffic to the U.K. far in excess of anything we had previously handled. If we were to keep up the morale of the troops in Italy and to maintain discipline—and these thoughts were uppermost in the minds of senior officers who remembered the demobilization period of 1919—it was imperative both that whatever rate of release was laid down should be honoured in full, and that an adequate programme of leave should be arranged.

What means were there at our disposal for doing so? First there was the all-sea route from the Italian ports to the ports of Great Britain, but shipping was acutely short all the world over, the turn-round was nearly a month, and there was no hope of carrying more than a fraction of the traffic offering. The same considerations applied, though in a lesser degree, to MEDLOC A, which was the route by sea to Toulon and thence by rail to the Channel Ports and by sea again to England. After some discussion with the War Office it was decided that MEDLOC A should be reserved for traffic to the U.K. from the Far East and Middle East and that the requirements of Italy should be met by developing MEDLOC B and MEDLOC C.

MEDLOC B was a rail route from Italy to the Channel Ports; the Italian terminal was at Milan, whence it ran through Italy and Switzerland into

France and then northward. MEDLOC C was a rail route from Austria again to the Channel Ports ; the Austrian terminal was at Villach, whence it ran through the American zone of Austria and then through Germany. The problem in each case was how the route could be most quickly organized and brought into use.

The railway tracks were there and in reasonably good order but everything else had to be produced from scratch. To name only some of the essentials, rolling-stock had to be begged, borrowed or requisitioned ; transit accommodation had to be built or adapted on a very large scale at Milan and Villach, not only for men but for women—A.T.S., W.A.A.F. and Nurses ; feeding halts along the line had to be constructed, equipped and staffed ; medical arrangements had to be made ; train paths had to be agreed with American H.Q. in Germany, and the train paths we wanted were competing with the demands of the American re-deployment ; Swiss francs had to be extracted from a reluctant Treasury to pay for the passage of troop trains through Switzerland ; and on the last stage of the journey, the trip across the Channel, our traffic was in direct competition for shipping with the corresponding traffic from the British Army of the Rhine.

Arrangements such as these could not be made overnight and it was bound to be a matter of weeks before both routes were working to capacity. Meanwhile 8th Army discovered a most useful safety-valve by running road convoys through Austria and Germany to the Channel Ports. Not very much traffic could be carried by this means but it was a great deal better than nothing, and it was got going much more quickly than either of the rail routes could be. It was only practicable until such time as the snow came down on the mountain passes in Austria, but by then the rail routes were in operation and the necessity for it had ceased. Another safety-valve during the difficult period was provided by aircraft, working from airfields in southern Italy to airfields in the U.K. During the late summer they were carrying up to 10,000 men a month, but as the autumn came on and the number of days in the month on which air travel to the U.K. was practicable decreased, the numbers carried ceased to be worth the administrative overheads entailed.

The MEDLOC routes carried their peak loads in the mid-winter. So brief was the need, in spite of its urgency, that MEDLOC B began to close as soon as the peak was passed, and early in May, 1946, it was closed altogether.

VI. Conclusion

September, 1945, seems a suitable point at which to break off this account of events in Italy and of the administrative problems which were involved. At that point we were embarking on the long and tedious process of clearing up and closing down everything in Italy south of the Apennines, and disposing of the vast accumulation of stores and supplies, vehicles and workshops, hospitals and camps, which had supported the Allied Armies throughout the campaign. The only remaining commitment was the maintenance for a further indefinite period of 13th Corps, half British and half American, in Venezia Giulia, and arrangements had to be made for this commitment to be removed from the Allied Bases in Southern Italy and transferred elsewhere. We estimated at the time that it would take a year to complete the process of closing down, and its completion would be accomplished when we ceased to use the port of Naples for military traffic, either in or out. This estimate of a year proved to be correct within a month. There were plenty of pitfalls but nothing went seriously wrong. We must have been either clever or lucky, or perhaps a bit of both.

We were throughout handicapped by having to keep A.F.H.Q. at Caserta. As early as January, 1945, long before the end of the campaign, it was clear that A.F.H.Q. was much too far in rear of the Armies it controlled ; but A.F.H.Q. was such a huge organization—nobody was ever quite sure of its overall strength including transport, signals, etc., British and American, but it was alleged to have been round the 10,000 mark—that to move it presented a major operation and to find a new location for it was extremely difficult. In the event we remained at Caserta until the fighting was over. Thereafter the right location for A.F.H.Q. was obviously Rome, for during the period of treaty-making and of closing down our commitments Rome was bound to be the centre of all political activities and most of our administrative business. By the end of the summer the size of A.F.H.Q. was rapidly diminishing and we planned to move it to Rome in October. Unfortunately political objections were raised at the last moment and were pressed so strongly that the proposal had to be abandoned, and A.F.H.Q. had to function as best it could from a place which became more and more unsuitable as time went on.

It is curious and interesting to compare the methods and standards of administration of the forces which took part in the campaign in East Africa in 1941, and of the forces which took part in the final campaign in Italy in 1945. The scale of course had vastly increased—the numbers of men involved were ten times greater—but it was not only a matter of scale. For instance in East Africa we carried our petrol about in flimsy four-gallon tins ; or rather we failed to carry it about, for loss by leakage was sometimes as high as 30 per cent. In Italy we used packed petrol in the forward areas only, and it was packed in jerricans, good solid reliable containers which could be used over and over again ; except in the forward areas petrol was handled in bulk and pumped through hundreds of miles of pipe-lines laid for that purpose. Or again, in East Africa in the early stages our only means of moving stores forward from the Base was by M.T. convoy along execrable roads, and every evening a small conference of the Q Staff was held to decide what should be loaded to go up the following day. Compare this with Italy where we had at our disposal transport by sea, rail, road and air, and priorities of movement were decided weeks in advance on formal and detailed lists put in by each Service. The most important difference of all, however, was that during those four years improvisation from day to day had slowly settled down into a regular and recognized routine. The machine had run itself in.

Now in 1947, the machine has been dismantled. If and when another war comes how is it to be reassembled, inevitably in haste, and put into running order again ? That task would be formidable enough in all conscience, but it becomes even more so when it is remembered that the machine which filled the bill in 1945 already needs modification to bring it up-to-date. The indications are that in future we must disperse our administrative resources of every kind over much wider areas ; it may even be that such ideas as " a port " and " a line of communications " must be discarded. It will be a case not only of reassembling the machine but of making drastic alterations to it.

To work out the answers to such problems, at full scale and in practice, is quite impossible. All we can do is to think, to plan, and to experiment. There is, however, one measure which seems to be practicable and which would be of immense help to the administrative staff, and not to the administrative staff only, no matter what form the new machinery may take. That measure is to aim at the highest possible degree of standardization in doctrine, organization and equipment, between the Armed Forces of Great Britain, of the Dominions, and of the United States of America.


AUSTRIA
SWITZERLAND
KLAGENFURT
VILLACH
UDINE
GORIZIA
TRIESTE
MILAN
VENICE
YUGOSLAVIA
RIVER PO
FERRARA
GENOA
BOLOGNA
RAVENNA
FAENZA
RIMINI
PISA
FLORENCE
LEGHORN
ANCONA
ADRIATIC SEA
CORSICA
ROME
FOGGIA
CASERTA
BARI
NAPLES
SALERNO
TARANTO
BRINDISI
SARDINIA
SICILY

THE ARMY TRANSPORTATION SERVICE

(A lecture delivered by BRIGADIER R. F. O'D. GAGE, C.B.E., M.C., at the Joint Services Staff College, on 21st April, 1947)

I SUPPOSE that every outside lecturer who addresses you endeavours to impress upon you the importance of his own particular branch of the service. It will, therefore, come as no surprise when I commence by saying that the Transportation Service plays an important, and in many cases a vital, part in the conduct of military operations. I shall endeavour to justify this assertion in the course of my lecture.

First of all to define Transportation. In army parlance Transportation covers docks, railways and inland waterways; it does *not* cover air transport, road transport, nor transport in sea-going ships.

The Army possesses a Transportation Service consisting of specially trained personnel to take all executive action in connexion with its transportation needs; these personnel are provided from the Royal Engineers and are formed into specialist units and establishments designated as R.E.(Tn.).

In peace-time the Army has little use for a Transportation Service since its requirements can normally be covered quite adequately by existing civilian undertakings. Major movements have of course to be arranged and planned by the staff and notified in advance to the railway company, shipping agent or other party concerned, who then provides the necessary transportation in exchange for a railway ticket, warrant or other form of agreement. Even when civilian resources are inadequate it is extremely difficult to supplement them with military resources, except as a long-term measure and at the risk of causing civil unrest and precipitating strikes. In these circumstances, coupled with financial stringency and manpower shortage, it is scarcely surprising that the Transportation Service of the regular Army in peace is a small concern, though it has been almost agreed that some 15,000 skilled men shall be included in our auxiliary forces in the post-war period. By placing reliance on civilian agencies the Army is accepting a risk of failure in peace, for such agencies not infrequently cease to function at times of industrial dispute or civil unrest. On the other hand there is considerable advantage in having a large reserve in our auxiliary forces for it is from civilian life that we must obtain the skilled and experienced technicians. In the regular Army in peace-time the average soldier is so young and training facilities are so restricted that it is not possible to produce really experienced transportation men in considerable numbers. For example, the average age at which a man is permitted to take charge of a train on a civilian main line is about thirty-five; most soldiers have left the Army long before they attain that age.

In time of war, however, the transportation situation is liable to be very different. Civilian agencies are likely to be completely impotent for long periods in captured enemy countries or liberated territories, apart from the fact that they almost certainly will have suffered severe damage and dislocation due to the impact of war. Even in those regions not actually in the war zone

military traffic is often so much greater in volume and of such a different nature from peace-time that it is far beyond the capacity of civilian agencies to handle it unaided. In these circumstances the Army must possess, in war, a Military Transportation Service of a size commensurate with its commitments, if the conduct of operations is not to be prejudiced. In the late war by VJ Day the Transportation Service (including Indian and Dominion troops) reached a total of 146,000 men—about one-third of the size of the whole Corps of Royal Engineers—including 4,000 officers of whom only thirty-four were regulars. This figure is somewhat startling—representing as it does, the equivalent of nine divisions of fighting troops ; but it was not excessive and in fact paid a handsome dividend in terms of tonnage moved in support of operations.

To state that military strategy is dependent upon transportation is almost a platitude. One of the main objectives of any commander-in-chief is to cut the communications of, and deny the use of bases to, his opponent ; and conversely to secure and develop adequate communications for his own armies. Throughout the late war the plans for the launching and subsequent maintenance of every campaign were conditioned to a large extent by the capacity of the transportation facilities that existed, or could be developed. Indeed, it is inconceivable that any commander would embark on an operation without considering transportation and its influence on the military situation.

As an illustration of the scale of transportation commitments in war the operations of 21 Army Group in North West Europe afford a good example. In this campaign the Transportation Service, assisted by unskilled labour and civilians when available, discharged 5,487,600 tons of military cargo, opened, reorganized and operated 1,020 miles of railway with an average daily lift of 18,000 tons reaching a maximum of 40,000 tons, and controlled or operated a fleet of 6,000 craft on the inland waterways. To move 40,000 tons daily by road an average distance of one hundred miles and return empty would have needed about 30,000 three-ton lorries and 30,000 drivers plus a large maintenance and repair organization. This was a bill which would have been far beyond the resources of 21 Army Group and, to quote the words of no less an authority than Major-General de Guingard in his recently published *Operation Victory*, " Without the railways and the Port of Antwerp, even given the transport and administrative resources of Third U.S. Army, I very much doubt whether we could have kept that sized force maintained at full operational scale east of the Rhine."

How is the Transportation Service organized to perform its role in war ? In a theatre of operations Transportation is one of the " Q " Services, headed by a director who, in common with other directors, is responsible to the principal administrative officer for the efficient working of his service. As the head of one of the R.E. services he is also responsible to the E.-in-C. (or Chief Engineer) in the latter's capacity as co-ordinator of all engineer activity in the theatre. His responsibilities in this connection are related principally to the efficient and economical use of engineer resources in men and material, to keeping E.-in-C. advised of Transportation progress and estimated future requirements, and to administrative matters affecting the Corps of Royal Engineers.

The branch of the staff with which the Transportation Service is most intimately concerned is the " Q " Movements branch, which is responsible for co-ordination on behalf of the principal administrative officer. It is of the utmost importance that these two shall work together in the closest harmony at all levels and in fact attempts were made in one or two theatres during the war to combine them into one organization called " Mov. and Tn." It has

been decided that this organization will not be perpetuated since there is a need for Q(M) staff and Tn. service just as much as for Q(Maint) staff and S. & T. Service. The Transportation Service is responsible for providing the means of movement, but it is the Q(M) staff who decides what shall be moved and it is obvious that these two must be closely co-ordinated if the best use is to be made of available capacity.

A Transportation Directorate will usually be divided into three main branches—Railways, Ports and I.W.T.—each headed by a deputy, or even a director, with a number of sub-branches for dealing with the various forms of activity in detail (See Tables A and B). The control of Transportation activities is usually more centralized than in the case of other Services for the reason that Transportation is largely concerned with through traffic which takes little account of local military boundaries. The basic reason, of course, is that railways and waterways are long and thin whereas military areas are round or square. This state of affairs does sometimes give rise to difficulty when local commanders feel that they should have some say in the conduct of Transportation activity within their own territories ; but the fact is that where through traffic is concerned it is impossible to decentralize control to any great extent without loss in efficiency.

The method by which the Transportation Service executes its allotted tasks is similar to that adopted by other services. Specially trained units with the requisite equipment and stores, are deployed where they are wanted, according to the known or anticipated incidence of Transportation commitments. The first of these commitments is " Docks." In recent years the word Docks has been replaced by " Ports " as more clearly descriptive of the commitment. The Transportation service may be required to work on beaches or in open roadsteads and moreover is responsible for all technical matters connected with the general operation and maintenance of ports, so the word Docks does not fully represent its activities.

In port working, the Transportation Service is responsible for :—

(1) Discharging M.T., stores, and equipment from ships to craft or quay, and for loading from quay to road or rail transport.

(2) Maintaining equipment, cargo handling gear, cranes, etc., required for use in the port.

As a result of long experience the capacity of port operating units is known and for purposes of calculation may be taken as 800 tons *or* up to 570 vehicles per squadron per day. Failure to achieve this figure is nearly always attributable either to rough weather or to lack of clearance facilities rather than to inability to get that amount of cargo out of the holds. Like any other activity ship working should be properly planned, by people who know their business, with the object of discharging the ship in the shortest possible time with economical use of resources. For example, the typical stores ship has one hold very much larger than any of her other holds ; in such a case the proper plan for discharge is to concentrate maximum sustained effort on the big hold and to phase work on the other holds in such a way that they are all empty by the time the big hold is empty. This point is mentioned because Transportation has often been criticised for failing to get to work promptly on all the holds of a ship as soon as it arrives. Anyone who feels qualified to criticise ship discharge should withhold his criticism until he has ascertained what is the plan for work and the reasons for it.

There is a catch phrase that " The ship always beats the shore." Generally speaking this is true, though, like all rules, there are exceptions to it. More often than not the limiting factor in port working is clearance by road and

rail and ability of depots and dumps to receive, rather than ship discharge. In many cases it is sound practice to discharge for sixteen hours a day and to clear for twenty-four, but it is quite useless to clear for twenty-four hours a day unless depots are geared to keep open and to accept stores throughout the twenty-four hours. This is a matter that calls for co-ordination by the staff and by local area commanders.

In an overseas port there will usually be representatives of the Ministry of Transport and of the Sea Transport Service, both of whom are vitally interested in the rapid turn round and management of merchant shipping and it is therefore necessary for the Transportation Service to work in close contact with them, especially as the provision of much of the cargo handling gear is a responsibility of the Sea Transport Service.

The planning of the repair and development of ports is a responsibility of the Transportation Service though the actual execution of the work is done by engineer resources allotted by the Chief Engineer. It is worthy of note that there is no case on record in recent years of a captured port which was unable to receive and discharge some ships by the time seaward access had been cleared of mines and other obstructions, though the complete repair of the port to full capacity often took a long time when demolitions were extensive.

The division of responsibilities for repair of ports as between the Royal Navy and the Army is set out in a War Office and Admiralty Pamphlet entitled " Principles for the Operation and Control of Captured or Liberated Ports." Briefly, the Army is responsible for work above L.W.M. and the Navy for work below it. This means that the Navy is responsible for providing seaward access and for removing wrecks or other underwater obstructions to navigation, and the Army plan must therefore be closely related to naval potentialities. It is obvious, for example, that the Army must not embark on the repair of a quay until it is clear that the navy will be able to provide seaward access to it. In practice, many obstructions are partly above and partly below water mark and a decision as to responsibility for clearance has to be taken by mutual agreement in the light of local conditions. Generally speaking any clearance involving removal by flotation is undertaken by the Admiralty Salvage Department but removal by other means is arranged jointly by the Navy and the Army.

Whilst the capacity of a port depends primarily upon its physical characteristics, such as the number of berths where ships can discharge alongside or at anchor, the working efficiency as a whole is dependent on good management, sound organization, and an intimate knowledge of local conditions.

However good and careful the planning may be a perfect organization can only emerge from experience, and it is quite safe to assume that the capacity of a captured port will rise by about 50 per cent during the first month of occupation, as a result of experience, and apart from any physical repairs or developments that may have been undertaken.

The second Transportation commitment is " I.W.T." This includes lighterage in ports, and even when there are no canals or navigable rivers it may be a large commitment. The capacity of a port, particularly in the early stages, can often be greatly augmented by the use of lighters, thus enabling ships to be discharged at anchor as well as, or instead of, at alongside berths. The number of serviceable lighters in a captured port is usually quite inadequate and it is therefore necessary for Transportation to import tugs and lighters as well as I.W.T. crews to man them. The I.W.T. organization includes workshops for maintenance of craft and these must be set up early, for craft soon go out of action unless properly and regularly maintaind.

Photo. 1.—Naples after occupation in September, 1943. Repairs to damaged Quay face, in progress.

The Army Transportation Service

Photo. 2.—Bridge over the Albert Canal at Herenthals. View of damage after German withdrawal.

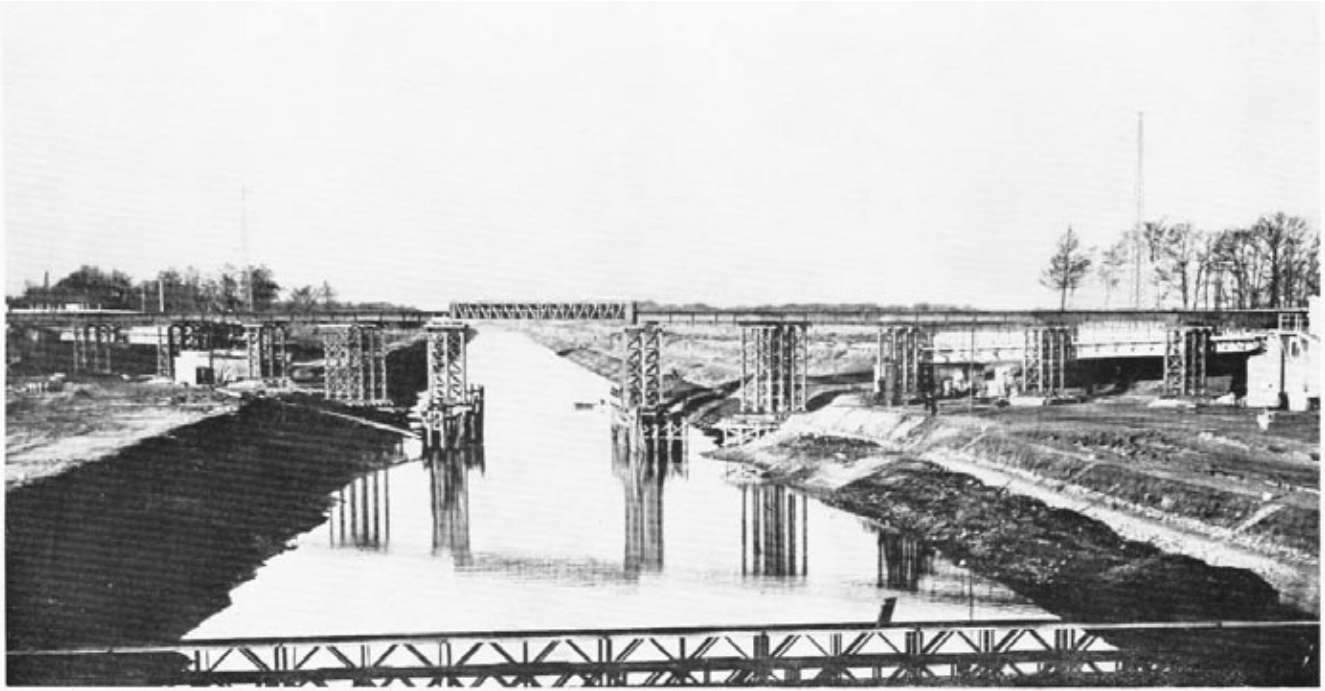


Photo. 3.—Bridge over the Albert Canal at Herenthals. View after reconstruction, with U.C.P.B. Through Span, 40 ft. Sectional Bridge and Standard Trestling.

Photo. 4.—Haifa-Beirut-Tripoli Railway. Launching Unit Construction Railway Bridge spans.

The extent of the Transportation commitment on inland waterways depends upon geography, but it may be taken that where water transport forms an important part of the local transport system the Transportation commitment will be a large one. For example, in Burma and the low countries I.W.T. was a large undertaking; in Algeria and Southern Italy it was small.

The third and possibly largest commitment is "Railways." Despite the vast expansion of road and air transport, railways still stand unrivalled in their capacity to convey heavy loads over long distances at high speed. It is interesting to note that administrative plans for nearly every assault operation during the late war assumed no railway service for about ninety days. And yet in every case some sort of railway was working by D + 14; and long before D + 90 the whole administrative build up upon which the ability to prosecute operations depended was conditioned largely by railway capacity.

The first thing to do with a captured railway is to repair and reopen the various routes, yards and sidings. Given an adequate supply of railway engineers and mechanical equipment this is a straightforward task and it can be done in a much shorter time than was thought possible a few years ago. The limiting factor is nearly always the repair of major bridges or tunnels, but the development of Unit Construction Railway Bridging (see Photos 3 and 4) has enabled bridges to be repaired at a speed which would have been thought fantastic even in 1939. For instance, the Rhine crossing involved a new bridge half a mile long over running water 20 ft. deep. This bridge was built and opened in one month from the date on which the site was captured. Demolished tunnels probably provide the greatest headache, especially when they are through sand or wet ground, and few competent engineers would have the temerity to give an estimate of the time required for repairs in such circumstances. It is, however, one thing physically to repair a railway but quite another to organize and operate it to give a regular and reliable railway service. A modern railway is a highly technical and complex organization, and even under favourable conditions it is a slow and painful business to reorganize its operation once it has been thrown out of gear. This task is one of the main preoccupations of the railway troops in war and it is just as important as the more spectacular task of repairing bomb damage or demolished bridges. It usually takes the form of complete military operation, followed by a process of gradually handing back responsibility to the civilian authority as soon as the latter can be reorganized and put to work.

The feature of a railway which is of most interest to the Army as a whole is its capacity, and it may therefore be as well to discuss a few of the more important aspects of this. Broadly speaking the capacity of a railway L. of C. is measured by the product of the number of trains that can be run over it and the size of these trains. The number of trains is, in the first instance, limited by the length of the longest block section. For example, on a single line with a block section taking forty minutes to traverse, it is theoretically possible to run one train each way every eighty minutes—or eighteen trains a day maximum. In practice it is seldom possible to operate more than about 60 per cent of the theoretical maximum, so in this case the practical limit is about eleven trains each way per day. One way to increase this limit is, of course, to reduce the length of the sections by constructing new crossing stations and signal cabins.

The size of the trains is limited by the ability of available locomotives to haul and brake them up and down the maximum gradients, or in some cases by the length of the loops at passing stations. These can be increased either

by importing more powerful locomotives within the limits imposed by the strength of bridges and rails and sharpness of curves; or by extending the length of passing loops if the latter is the limiting factor. There are a number of other factors, any one of which may be limiting, of which the following are commonly encountered—Number of available locomotives; running shed and maintenance facilities; number of train crews; stocks of coal and water supply; terminal facilities for loading and unloading; and wagon supply. The way to increase the limit imposed by any of these factors is self evident, except in the case of wagon supply for that is a rather more complicated matter which to a considerable extent lies outside the control of the Transportation Service.

It must be remembered that a rail wagon, like a motor lorry, is performing no useful work except when it is moving under load. The main object of anyone using a railway should, therefore, be to keep the wagons moving and thus improve the "turn-round." It is obvious that the average number of wagons that can be placed for loading per day is the total number of wagons divided by the average turn-round, and therefore any reduction in turn-round will increase the number of wagons available for loading. The time of turn-round is influenced by two groups of people—the railway operators and the railway users. The railwayman can improve turn-round by speeding up trains, by reducing time spent in sorting and marshalling yards and by holding the minimum pool of empty wagons. The user can improve turn-round by loading and unloading wagons quickly, by keeping his demands as regular as possible (for irregular demands involve a larger pool of empties than would otherwise be necessary) and by estimating his requirements correctly. Most people in the Army realize the importance of quick loading and unloading, but not all realize that to demand wagons and fail to use them is a worse crime than to load slowly, for in the former case wagons are doing nothing useful for a day at least; in the latter they are held up for a few hours only.

In war there is nearly always a wagon shortage. More often than not the solution lies in improving the turn-round rather than in importing more wagons and possibly adding to the congestion on a system which already possesses as many wagons as it can conveniently absorb. The organization of a proper system of wagon control is one of the principal preoccupations of the railways branch of a Transportation Directorate and it is a subject of fascinating interest. The situation in Belgium soon after its liberation in 1944 affords a good example. At that time there was the usual wagon shortage and it was therefore decided to apportion the available wagons among the three principal users—British Army, American Army and civil traffic; each being responsible for using its own wagons to the best advantage for its own purposes. But an analysis of traffic revealed that the Americans were moving loads from Antwerp to South Belgium and sending empties back; civil traffic was moving from South Belgium to France and returning empty; and British traffic was moving up from France to Antwerp and returning empty. In fact there was a clockwise movement of loaded wagons and an anti-clockwise movement of empties. By arranging for the British to give empties to the Americans, the Americans to civil traffic, and civil traffic to the British the anti-clockwise movement was eliminated and everyone was able to have nearly twice as many wagons as before. The moral is—Wagon supply must be centrally controlled by experienced railwaymen.

It may be as well to mention coal and water. A main line locomotive will use something like five tons of coal per day. On a well developed rail system the coal consumption amounts to thousands of tons per day, and when this has to be imported it may well conflict with the import of other military

stores. There were many occasions during the late war when the capacity of railways was in danger of being restricted by a shortage of coal.

It is perhaps not generally realized that steam locomotives are very large consumers of water. The figure is about one hundred gallons per mile, or 10,000 gallons per engine per day. A railway using 1,000 engines would need at least 10,000,000 gallons a day delivered at convenient points along the system and so stored that any locomotive can fill up in not more than five minutes. This may produce a very large engineering commitment and there have been many occasions when lack of water has imposed a limit on railway capacity. The Western Desert Railway is a good example and it was not until a pipe-line had been constructed and some diesel engines were substituted for steam that water supply ceased to impose a limit on the capacity of that line.

The quality, as well as the quantity, of water is of importance. Water for regular use by locomotives must be clean and free from substances liable to damage the boilers. When a new source of supply is to be used it will generally be necessary to have the water analysed by an expert to determine the steps necessary for its purification and in many cases the installation will have to include plant for sedimentation, softening and purification which may well prove to be a larger commitment than the actual provision of the requisite quantity of water.

There are many other technical factors that affect railway operation but I have said enough to indicate that efficient railway management is a highly complex business. It is therefore not surprising that a railway is a somewhat inflexible machine and can only function satisfactorily when it is offered a regular load. Fluctuating demands can only produce inefficient working and tend to throw the whole system out of gear. It is therefore of great importance that the Director is kept advised by the Staff of any anticipated operational or administrative plans that will have repercussions on the railways, for it is only by having ample warning that it is possible to adjust railway operating arrangements to meet changing conditions. Conversely, the Staff must give due weight to the advice of the technical Director for he is, or should be, best able to forecast what the Transportation Service can and cannot produce and to place before the staff the various alternative courses open to them so far as railway usage is concerned and the advantages and disadvantages of each.

The Staff usually require two things of a railway—first that it shall be open for traffic quickly and second that it shall give reliable service.

In war, speed in construction or repair will normally take precedence over economy in use of resources. It must, however, be realized that time saved in actual engineering work may not represent a net saving if the difficulties of operation are unduly increased. Short and long-term considerations must be fairly balanced and it requires a nice judgment to decide whether it is better to produce a bad railway quickly, or a good railway that will give maximum service with minimum trouble less quickly. The Transportation man will always recommend the good railway, but it is necessary that technical officers realize their responsibilities to the army in this respect and do not allow technical considerations to outweigh military considerations to such an extent that the prosecution of operations is prejudiced.

The tonnage of military stores used by the Transportation Service is not large compared with the tonnages required by other Services, but unfortunately much of it is awkward to handle and there are many heavy lifts. Such items as locomotives, tugboats and large cranes require special shipping arrangements and special arrangements for off loading. During the war,

however, great progress was made in shipping this sort of equipment in sections which could be readily reassembled in the theatre. This greatly eased the shipping problem but it did of course involve delay in getting the machines to work and threw a heavy load on the workshops responsible for re-erection in the theatre, often working under difficulties and with inadequate facilities. Hitherto the Transportation Service has had its own stores organization, but it has recently been decided to incorporate this in the organization of the Director of Engineer Stores who will have a special section for handling items peculiar to Transportation.

The Director of Transportation remains responsible for forecasting and scaling stores requirements. In fact this is one of his principal preoccupations, for without adequate stores and equipment the Transportation Service can achieve little.

In war, it is essential that the forecast of Transportation stores required for a military operation is made at the earliest possible stage in the planning. It is not sufficient to plan months ahead for such items as locomotives and tugboats that will probably be required in the early stages of the campaign. Sufficient time must be allowed for the ordering and construction of such equipments, and yet more time for their shipment by sections and for their reassembly in the theatre.

The maintenance of proper statistics forms an important part of Transportation management. Information on such matters as the tonnage handled (by commodities) is required by the staff regularly to enable them to control the general administrative situation. Statistics covering such matters are usually compiled by the Q(M) staff, though much of the information on which they are based may have to be produced by the Transportation Service. It is most important to ensure that only one set of statistics covering any particular subject is published officially. If two, or more, sets are published there are bound to be discrepancies which can only produce a lack of confidence in the minds of the recipients. From the technical point of view statistics afford a valuable indication of the efficiency with which a transportation system is being worked, not so much as a source of mutual admiration for results achieved but as a measure of improvement over a period.

Statistics on such matters as wagon turn-round, engine mileage, rate of discharge of ships, etc., serve as an indication to the Director of those aspects of the operating situation which are inefficient and are in need of his direction or assistance. It must be remembered, however, that statistics are of no value unless like is compared with like and they must therefore be interpreted intelligently in the light of existing local conditions.

Another matter that is liable to be of great importance to Transportation is finance. In war the usual view is that money does not matter. That theory, however, does not apply to Transportation for the reason that Transportation policy is invariably directed towards the earliest possible resumption of control by civilian agencies, with the object of releasing military manpower for future commitments. A civilian agency will not, and indeed cannot, work for the Army or anyone else unless it is paid. It must have cash to pay the wages and salaries of its employees and to make its day-to-day purchases. On the longer term view it must have funds for maintenance, renewals, purchase of stores for stock and possibly even for such things as pensions and interest on capital investments. The simplest way of dealing with all this is to pay for services rendered at agreed rates (e.g., so much a ton) but it is the hardest thing in the world to settle a rate that will satisfy the rapacity of the civilian management and at the same time guard the interest of the British taxpayer. Negotiations on such matters often last for months or years and give much

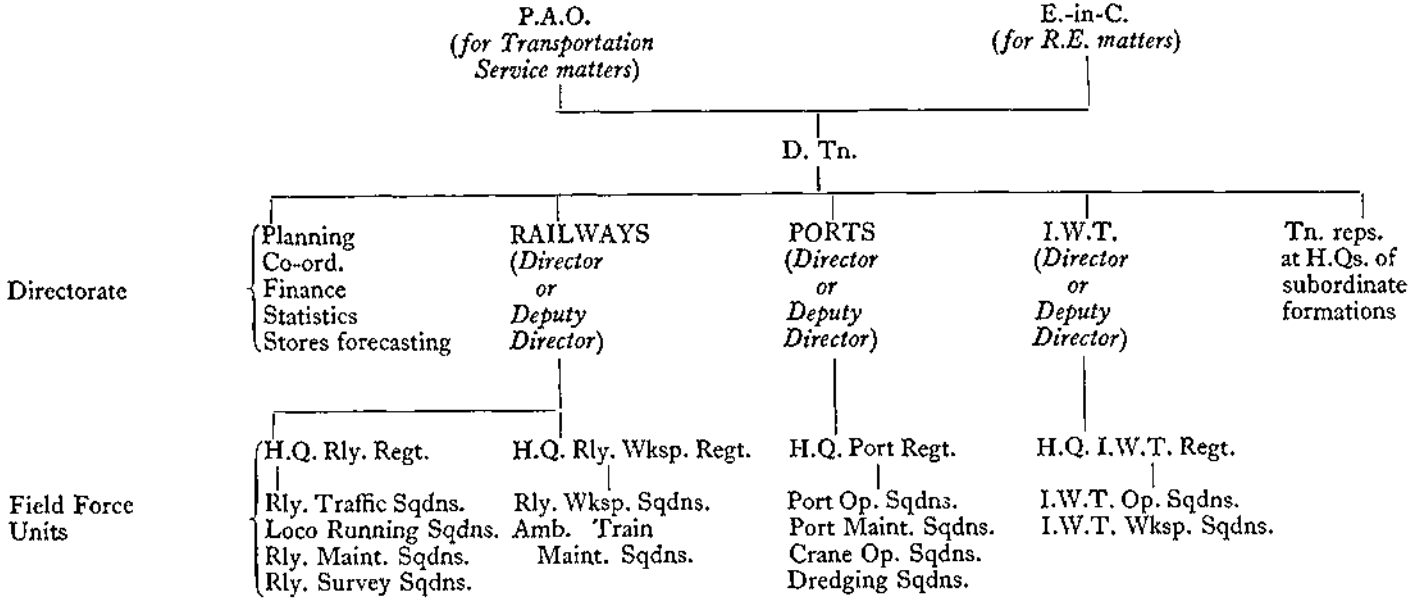
occupation to financial pundits. From the point of view of the D.Tn., however, it is essential that the civilian agency shall be paid enough, firstly to ensure that the undertaking can carry on at all, and secondly, to offer a financial inducement that will be sufficiently attractive to make the agency work in an efficient manner. All this may occupy much of the time of a D.Tn. on active service and his H.Q. will certainly include some expert accountants to handle the detailed negotiations. Who pays what when an American troop train is hauled by a British engine with a French civilian driver ?

I have told you briefly what the Transportation Service has to do for the Army and how it does it. As I have already explained, the Transportation Service in peace is a comparatively small concern and in consequence there is a tendency to belittle or even to neglect it. The danger of this is that there may also be a tendency to belittle it in war, and that is a most serious matter ; for any commander or administrative staff officer who neglects his Transportation Service will very soon find himself in trouble. For every military operation there must be a proper transportation plan and history affords plenty of examples where the lack of such a plan has had serious repercussions on military operations. Like any other Service, Transportation needs guidance and co-ordination by the Staff, but it also needs support and consideration. In all administrative planning due weight must be given to the recommendations of the Director of Transportation. There will often be occasions when it is necessary to overrule his recommendations and in all such cases it is his duty to ensure that the consequences are properly represented to, and appreciated by, the Staff. I hope that there will never be a Director of Transportation who will decline to do what the Staff tell him to do. Equally I hope that there will never be a Director who is forced into some line of action which he knows to be wrong and who fails to represent the probable consequences, if necessary on the highest level.

The personnel of the Transportation Service get little limelight, and see little of the glamour of active operations, but for those who are technically minded it offers employment of the greatest variety, of vital importance and of captivating interest.

In conclusion, I would remind you that we are but one branch of the Corps of Royal Engineers, a Corps whose record and traditions go back into the dim past of military history.

TABLE A.—TYPICAL ORGANIZATION OF TRANSPORTATION SERVICE IN AN OVERSEAS THEATRE



Notes (1) Staff branch for Transportation Service matters is Q(Mov.).
(2) Number of squadrons per Regiment varies according to incidence of work.

TABLE B.—R.E. (TRANSPORTATION) UNITS—STRENGTH AND FUNCTIONS

(As now Proposed—but not yet Approved).

Unit	*Strength*		*Function*
	Off.	*O.R.*	
RAILWAYS			
H.Q., Railway Regiment	16	110	Controls about 200 miles of rail L. of C. and commands all R.E. (Tn.) Units employed on it.
Operating			
Railway Traffic Squadron	7	360	Provides staff for stations, yards, signal boxes, and trains.
Locomotive Running Squadron	8	316	Provides locomotive crews and maintenance staff for running sheds.
Maintenance			
Railway Maintenance Squadron	7	299	Maintains railway track and bridges and undertakes minor new works.
Mechanical			
H.Q. Railway Workshop Group	5	33	Operates railway workshops.
Railway Workshop Squadron	6	386	
Ambulance Train Maintenance Squadron	7	165	Carries out running maintenance of ambulance trains.
Survey			
Railway Survey Squadron	7	62	Surveys new railway lines and rail-served depots.
PORTS			
H.Q. Port Regiment	16	89	Technical control of ports.
Port Operating Squadron	8	383	Provides personnel for discharging cargo and vehicles from ships.
Crane Operating Squadron	4	119	Used in Combined Operations for handling stores in the beach area.
Port Maintenance Squadron	9	274	Maintains cranes, cargo handling gear and equipment in a port.
Dredging Squadron	?	?	Dredging in ports and navigable waterways.
I.W.T.			
H.Q. I.W.T. Regiment	8	43	Controls port lighterage and inland water traffic.
I.W.T. Operating Squadron	7	294	Provides crews for tugs, barges and lighters for use in ports or on inland waterways.
I.W.T. Workshops Squadron	9	211	Carries out repairs and maintenance to tugs, barges and lighters.

Note.—Provision and maintenance of telephones and telegraphs used exclusively by Transportation are undertaken by R.C.S. units attached to Transportation for the purpose.

April, 1917.

BACKGROUND TO THE PALESTINE PROBLEM

By BRIGADIER A. J. KNOTT, O.B.E.

IT has been said that the only valid right which a people can establish to part of the earth's surface is that of long occupation and that all other considerations should give way to this one. If one race has lived in a particular part of the world for longer than any other race, and has withstood attempts on the part of other races to oust it from its territory, then its ownership of that land should be established beyond all doubt.

In the case of Palestine the position is, unfortunately, confused. Points of view about that country vary considerably. The business magnate or the economist may be chiefly interested in it as the outlet of the important supplies of Middle Eastern oil to the Mediterranean, and some strategists may share this view, expressing concern also about the future of the port and harbour of Haifa. At the other extreme are those who think of Palestine mainly in terms of the Holy Places, the sanctity of which is to them of paramount importance. In-between are thousands of people whose knowledge of the country and personal interest in it are equally small and who think of it chiefly as a corner of the world where Jew and Arab are perpetually fighting, to the embarrassment of the Government and, now, of the United Nations. Many other factors have arisen in comparatively recent times to obscure the issue. Money has been spent on the development of the country, its industries and its social services. Promises have been made, or assumed to have been made, by interested powers. The population has varied in the relative strengths of its component races. All these and other developments are important to those concerned with the country today, but before passing judgment on the basis of them it is as well to refresh the memory regarding the past of Palestine and to seek to establish the fundamental claim of one party or another on the basic foundation of length of occupation.

In Old Testament times and earlier there was no geographical term for the whole of what we now call Palestine. There were provinces or kingdoms or cities, such as Philistia and Canaan and Jerusalem, but no state or territory of Palestine. Sir George Adams Smith wrote of the country that " it has never belonged to one nation and probably never will," and therein lies some at least of the tragedy. As far back as records can be traced the seaports on the eastern shores of the Mediterranean were the haunts of the pirates and traders from the sea powers of the Levant. Gaza had connexion by land with Egypt and was the port for the caravans from Arabia. But, while Old Testament history illustrates the story of those times in that part of the world, it is important to realize that the story of Israel or Canaan, as told in the Bible, is not the story of Palestine. The story of the larger area which now goes by that name was inevitably bound up with the history of her neighbours, particularly of Egypt and Arabia, at whose gates the disputed territory lay.

One of the earliest events that can be fixed in the very confused story of early times in that part of the world is the invasion by Egypt in about 1700 B.C., when their expeditions went as far afield as the Euphrates. About the same time Indo-Iranians came down from the north of Syria and left their mark

as far south as Jerusalem. Inevitably the peoples of Palestine, small and weak compared with the great empires and powers of those days, wavered between allegiance to Egypt and to her other neighbours, but her kingdoms and cities could not unite and form a common front against the invader, from whichever direction he came. For a time they found some leadership in the Israelites, but they soon quarrelled with the people of Judah, and no one king could hold the whole country for long, as Saul, David and Solomon all found in turn.

The temporary strength which came from union could not stand against the might of the Assyrians, and in the seventh century B.C., they dominated the country. Then Egypt rose again, to be defeated in turn by the Babylonians. Next came Persia, when Cyrus captured Babylonia in 559 B.C. and Palestine and Syria became parts of one of the greatest empires of antiquity. The Jews of Palestine, it seems, tried to reconcile their own faith with their duty to their conqueror by hailing him as the appointed of Yahweh, their own prophet and saviour, but Cyrus was not interested. He would not allow himself to be worshipped by them, but was otherwise tolerant and even beneficent to the Jews, until the time came when there was trouble in Egypt, Phoenicia and Cyprus, and Palestine shared with these other dominions the wrath of the ruler.

As the might of the Eastern Empires faded, the West stepped in and Greece became the predominating power in the Mediterranean. The centre of interest and activity shifted westwards as Tyre and Gaza fell to the Greeks and Palestine became part of Alexander's dominions. He was followed by the Ptolemies, who saw in Palestine chiefly a source of more revenue and of valuable timber from the forests of Lebanon, but their Egypt soon became dissolute and lost her position of importance in the world. Antiochus, who next ruled Palestine, was determined to enforce his own religion throughout his territories and thus provoked one of the earliest resistance movements in history. While many of his subject races submitted, the Jews stood out for their own faith and traditions and, led by Judas Maccabeus, resisted staunchly. Their technique was markedly similar to that employed in the resistance movements of the recent war—surprises, night raids, rapid movements from one part of the country to another, all that goes to make up what we now call guerilla warfare. Judas had his reward, for the country was at last granted religious freedom. He himself became King and under him and his successors the bounds of Palestine were extended until they enclosed nearly as much territory as is covered by that name today.

Finally, when Pompey had succeeded the Maccabees and Antipater, after him, had been given Roman citizenship in recognition of some service to the Empire, came the Herods. The first of them, having fled to Rome when the Parthians were running wild in Palestine, got himself proclaimed " King of the Jews," and on his death his three sons divided the country between them, each with the title of King. Staunch Jews in their own country, they had the reputation of being equally staunch Hellenists abroad and of currying favour all the time with Rome—near forerunners of the modern Quislings, in fact. This state of affairs lasted throughout the time of Our Lord, but the country was far from happy. Its relationship to Rome has been compared with that of Ireland to Britain at the worst period of the " Troubles " there, and in A.D. 70 the Romans decided that the time for drastic action had come. Troops were sent in strength and destroyed the Temple and all but a part of the Great Wall of Jerusalem. Once again the Jews were dispersed over the face of the earth and ceased to be an effective race. Towards those that remained, it seems that the Romans were at first prepared to be tolerant, but Roman deasi of law and discipline did not please the local inhabitants and eventually

Hadrian felt obliged to suppress the Jewish law, religion and language and all their traditional customs. He tried, without success, to make Jerusalem a Roman colony, and thereby provoked a rising which was temporarily successful and called forth more drastic retribution in the shape of a punitive expedition which tracked down the rebels and slaughtered them. Such Jews as now remained were outcasts in their own land, forbidden to appear within sight of their own Holy City, where a temple of Jupiter had been built within the walls of their own Holy Temple and a shrine to Venus on the place called Golgotha. Jewish hopes of national independence had suffered a grievous blow, but their spirit was not destroyed. Their schools went on and they continued to study and teach the ancient traditions of their race and so kept alight the flame of national feeling and hope that burns so fiercely today.

The partition of the Roman Empire, under which Palestine went to the eastern half, led to comparative quiet in the land for more than a century. Then the Persians returned and invaded Syria. The Jews joined them and helped to recapture their own Holy City of Jerusalem. Though it could not have been foreseen at the time, domination from the west was at an end.

In the meantime an event had occurred which was to have more influence in Palestine and many other parts of the world than anything which had happened before or since. Mohamed, the Prophet, had risen and, by his great understanding of the Arabs and their needs and passions, had welded into a powerful force the Arab tribes which had until then been continuously at war with each other. In addition he had evolved and given to his followers a system of religion which appealed to their imaginations and so gripped their emotions that it spurred them on to achievements hitherto beyond their comprehension. Omar, successor to Mohamed, captured Damascus, Jaffa and other cities, finally and decisively defeated Heraclius and established the rule of Islam over the whole of Syria and Palestine. Jerusalem fell to his arms and he is for ever remembered there by the Mosque which bears his name. Christians and Jews alike were now inferior beings, fit only to be persecuted and treated as the infidels they were in the eyes of the faithful followers of Islam and Mohamed.

Although Mohamed founded a system of religion and life which has survived without substantial modification until the present time, his influence and memory were not strong enough to hold the Arabs in peaceful unity after his death. For the next 400 years the rulers of Palestine were harassed by internal strife and the way lay open once more to the foreign invader. The Turkomans came from Khorosan and were routed by the Egyptians. Then came the romantic but disappointing era of the Crusades. Inspired by the sufferings of the Christians and angered by the desecration of the Holy Places, the misguided and ill-organized armies of the Cross took ship for Palestine. Indiscipline, famine, battles and disease took their toll and of 600,000 who started on the first Crusade but 40,000 reached Jerusalem. Nevertheless, in 1099, they captured the Holy City and ruled it for eighty-eight years. It was a rule of malice, hatred and envy, petty jealousies and conflicts being continuous and active, and all in the name of the Christian religion. The later Crusades achieved little or nothing and were no credit to those who inspired them, particularly the ghastly tragedy of the Children's Crusade, by far the happiest members of which were drowned in the sea. The Crusader regime disappeared as quickly as it had come, leaving ruins, a few place names and an undying hatred of Christianity as its only legacy to Palestine.

Meanwhile Saladin (Saleh-ed-Din) had seized the kingship of Syria and occupied Egypt. Finally disposing of the Crusaders he restored Palestine to

the Moslems, who were never again to be dislodged. The Mamelukes of Egypt eventually gave way to the Turks, but this change of sovereignty made little difference to the peoples of Palestine, whose local headmen and sheikhs quarrelled among themselves and oppressed the peasants to their hearts' content. Suleiman the Magnificent rebuilt the walls of Jerusalem and the country went on its troubled, corrupt and usually unhappy way.

At the end of the eighteenth century European interest in Palestine revived for a moment when Napoleon, flushed with his victories, besieged Acre and was driven off by the British fleet. Then Egypt again came into prominence, for Mohamed Ali, the Albanian ruler of that province of the Turkish Empire, ever seeking advancement for himself and jealous of his overlords, seized the excuse of trouble to invade Palestine with his armies. The people at first welcomed him as a change from the Turk, but the harshness of his rule roused them to revolt in 1834, to be ruthlessly crushed once more. Six years later the presence of the British, Austrian and Russian fleets off Beirut, combined with the advance of a Turkish army from the north to provoke a general rising, and the Egyptians withdrew to their own country. The Turks strengthened their control of the country, restricted the powers of the local sheikhs and encouraged other nations to send their consuls and representatives to Palestine, where trade was now beginning to warrant their presence. And all this time religious rivalry and bickering over the custody of the Holy Places went on unabated.

Although the country was naturally poor, the interest of other nations led to some sort of prosperity. Germans, Americans, French and Russians all had representatives there on religious or commercial business, and the trade that they brought increased the national consciousness and desire for power of both the Arabs and the Jews. In 1896, Dr. Herzl put forward what was really a suggestion for the establishment of a National Home for the Jews. Almost simultaneously the world was made conscious of the growth of Pan-Islamic ambitions. The Young Turk revolution of 1908 was accepted quietly in Palestine, the prosperity of the country led to greater interest on the part of Europeans, and the Arabs, both nationalists and Pan-Islamists, watched suspiciously the growth of the Zionist movement among the Jews.

For two years of the First World War, Palestine was a base for Turkish troops. The Turkish ruler in Syria, under whom Palestine came, was ruthless and stern and persecuted Zionists and Arab Nationalists alike. When the British Forces advanced and finally occupied Jerusalem, they were welcomed by the inhabitants, but they found the country poor and thinly peopled as the result of the previous years. The Zionists had established agricultural colonies in a number of places and had sown the seeds of urban settlement and development in the new town of Tel Aviv. When post-war settlements were being discussed the Zionists pinned their faith to the Balfour Declaration, which undertook that there should be founded a National Home for the Jews in Palestine. Unfortunately the difference between this and the conversion of the whole of Palestine into a National Home, which was what the Zionists wanted, was apparent from the start, and has been at the root of much of the trouble ever since.

On the Arab side, much was made of promises given, or alleged to have been given, to them by Lawrence and others in their efforts to secure their co-operation in the all-important job of winning the war. Arab feelings generally and their national aspirations in particular had by now become more active, more clearly expressed and therefore a more easily realizable target. Anything to do with a National Home for the Jews naturally filled them with alarm, for their long standing fear of Jewish expansion and infiltration was as

acute as ever. It was hardly surprising, therefore, that when the mandate for Palestine was formally granted to Great Britain in 1923 the Arabs announced that as long as the Balfour Declaration formed a fundamental part of British policy they would be unable to co-operate. Such a policy, they maintained, though it might only entail the establishment of a National Home in a selected part of Palestine, must inevitably lead to the gradual but inexorable overwhelming of the Arabs by the Jews. Apart from this refusal to co-operate in what they regarded as a policy leading to their own extinction, the Arab attitude was not unreasonable. They pointed out that the enormous majority of the people in Palestine was Arab, but that Jews and Arabs were in fact closely related in blood and had no fundamental quarrel. Since they had lived in the disputed country for twelve centuries and had, at that time, 80 per cent of the population, it was hard to criticize their attitude, and their objection to the provisions of the Balfour Declaration were scarcely more than what was to be expected and should not have constituted a permanent bar to a settlement.

Unfortunately both Arabs and Jews were unhappy about the future and discontented with the present. From then onward they took it in turns to frustrate all British efforts to find a constructive solution to the problem of the future organization and administration of the country. The Arabs rioted in 1920 and 1921 and boycotted a constitution put forward in 1922. More serious riots occurred in 1928 and 1929 when they demanded that, after ten years of absolute Colonial rule, the mandated territory should be granted a democratic system of government in accordance with the Covenant of the League of Nations and with the pledges given to the Arabs by the Allies. In fact it was already clear to them, though it has only recently been admitted by the British Government in its report on its trusteeship to the United Nations, that the mandate was unsound in its terms and unfair to the Arab race.

The riots of 1929 had come to a head over the question of the famous Wailing Wall—in itself a small matter but a striking illustration of the complexity of almost every problem in that country. On one side of the wall the Jews prayed because it was part of the western wall of the Temple of King Solomon. On the other side of the same piece of wall the ground was sacred to the Moslems, because on the night before Mohamed departed on his final journey his magic horse had been tethered there. This particular difficulty provided little more than the spark which set light to the tinder of fear on the part of the Arabs, fear of Jewish immigration, money and craft. The riots were suppressed and a commission sent out to investigate the causes of the unrest which were these same fears, coupled particularly with resentment at the purchase of land by the Jews. Inasmuch as many Arabs sold their land to Jews and received good prices for it they had only themselves to thank, for they had by their own actions increased the Jewish stake in the country, but the enthusiastic Nationalists among the Arabs managed to forget this fact when necessary.

In the meantime the Jewish National Home had taken shape, in fact if not in name. Immigration had increased in 1925 to nearly 40,000, then fallen away in the years that followed. They were years of great economic difficulties and it seems that even the Jewish devotion to their land was not strong enough to tempt them to go there when it was poor. Hebrew had been recognized as a third official language, in addition to English and Arabic, though many new settlers had to go to school after they arrived and learn their own tongue. Education flourished among the Jewish communities, and in 1925 they established their own Jewish University. The Jewish Agency,

to further the development of the National Home and encourage interest in it throughout the world, was founded in 1929, and a suggestion that the Arabs should set up a similar organization came to nothing.

It was about this time that the effect of Hitler's anti-Semitic policy in Europe began to be felt in Palestine. Immigration figures soared, until the Jews numbered one-third of the total population, and the newcomers now included men of wealth and initiative with the means and the ability to develop their new home to the utmost. The new town of Tel Aviv, which in 1931 had had a population of 46,000, soon numbered 140,000 and became a potent factor in the affairs of the country. At the same time the Arab desire for independence and a country of their own was strengthened by events in Transjordan, Iraq, Syria and Egypt, all of which had achieved some measure of freedom from foreign rule.

In 1934 the British Government made a move designed to please both Jews and Arabs in their desire for a degree of self-government. A Legislative Council was to be formed on which both races were to be represented—a step in accordance with the normal development of colonial government. The Arabs appreciated the spirit of the proposal and, though they were not happy with the extent of their representation, would have accepted the scheme for lack of anything better, but the Jews rejected it out of hand.

From that time onward trouble of one kind or another and of varying degrees of seriousness was virtually continuous in Palestine. The Arab rebellion of 1936 was the biggest thing they or the Jews had then attempted. A general strike was called, committees formed at the centre and in the villages to run organized rebellion and armed bands engaged the luckless British troops who tried miserably to maintain peace and order. Arabs from Syria and Iraq joined in, and only the restraining influence of the Arab leaders in other Moslem countries prevented the rebellion from spreading far wider. The Peel commission, sent from England to examine the problem on the spot, reported that Arab and Jewish claims were irreconcilable and that partition was the only solution. This time the rejection came from the other side. The Zionists might have accepted a plan for two separate autonomous states, one Jewish and one Arab, but the Arabs would not have it. Again a deadlock was the result.

Only two years later trouble broke out again and stricter military control was necessary, as well as large scale operations against the Arabs, whose High Committee was outlawed. Another commission proceeded from England and reversed the recommendation of the last one, for the Woodhead Partition Commission reported that, whatever solution was finally found, partition was quite impracticable. Rebel leaders who had been arrested were released and invited to London to a conference at which it was hoped that direct negotiation with the Jews might achieve more than any proposal from the trustee power, whom both the aggrieved parties disliked and distrusted. Illegal immigration went on, the Conference in fact achieved nothing, and the position looked no better or more likely to resolve itself than it had done ten years earlier.

Then came the Second World War. Britain and other countries were faced with problems far bigger and more world important than that of Palestine, though scarcely more intricate. Arabs and Jews, to their credit be it stated, declared an internal truce in Palestine and, still more to their credit, resisted to a great extent the efforts of the enemy to seduce them from it. Both peoples shared the losses caused by the decline in the citrus trade when there were no ships to carry away the fruit. Both served on village committees to deal with such subjects as production, agriculture and health;

and both contributed to the development of some 400 new undertakings which had the effect of transforming Palestine from an agricultural to a largely industrial country. Members of both races joined the forces and the Jews went a step further and introduced their own national service.

In 1944 talk of a Pan-Arab Federation added fire to the already burning desire of the Palestine Arabs for independence and self-government, while at the same time hardening the fierce determination of the Jews to rule the whole state of Palestine as a Jewish National Home. The aim of those who favoured the Federation was to link together all Arab countries—and they included Palestine—while not destroying their individuality and to help those still under foreign domination to gain their independence. They recognized the sorry lot of the Jews in many parts of the world, but maintained, not without reason, that this would not be improved by denying to the Arabs their age-old rights in Palestine. The more moderate and intelligent Arabs still maintained that they, as a race, had no quarrel with the Jewish race. They did not like Zionism, the aims of which they would always resist, but the two nations had always been neighbours and the Arabs, at least, had never persecuted the Jews, which was more than could be said of many other peoples of the world. When it was pointed out that the Arabs in Palestine had benefited from many improvements made by the Jews and from the Jewish money which had been spent in the country, their reply was one with which most Englishmen would sympathize. " You say that we are better off," they said, " you say that my house has been enriched by the strangers who have entered it. But it is *my* house and I did not invite the strangers in nor ask them to it. I do not care how poor and bare it is if only I am master of it."

Such an attitude was calculated to enlist considerable sympathy, which was increased as the Jewish terrorists replaced the Arab rebels as the chief purveyors of trouble in Palestine. The Hagana, or Jewish Defence Force and the Irgun, or Fighters of Freedom for Israel, were both semi-military organizations and were declared illegal. The Stern Group, less numerous but far more vicious, tried gangster methods with no good results for themselves or the Jewish cause. Their attempt on the life of Sir Harold MacMichael when he was attending a farewell function prior to handing over the High Commissionership to Lord Gort and later the murder of Lord Moyne in Cairo shocked the world, and were more effective blows against the cause of Zionism than in its defence, for they alienated the sympathies of all decent people including many Jews. Dr. Weizmann, then President of World Zionists, wrote to Mr. Churchill " I can assure you that Palestine Jewry will go to the utmost limit of its power to cut out, root and branch, this evil from its midst." But while kidnappings, shootings and violent lawlessness continue with alarming frequency the British Government refuses, as it must, to be browbeaten into giving way and allowing terrorist methods to win for the Jews the ascendancy they seek over the Arabs in Palestine.

The Anglo-American Committee, set up as a result of increased interest in America in the future of Palestine, recognized that that country alone could not meet the needs of the thousands of Jews who could not or would not live in the countries that had hitherto given them homes, and that a permanent solution was only to be found by all nations of the world accepting Jews as citizens. Until this could be arranged, the Committee recommended the admission of 100,000 more Jews into Palestine. The impracticability of partition and the undesirability of making Palestine a wholly Jewish or a wholly Arab state were equally accepted—as they had been by the British Government some time earlier. The claim of the Arabs to at least equal consideration with the Jews, especially in matters of culture and education,

was stressed by this Committee, but as the desire to be fair to both sides had been the cause of much of the trouble which had faced the British administrators, there was nothing new in this. In fact, the recommendations of the Committee were generally accepted in Britain in August, 1946, and another conference called to examine the details and endeavour to work out a practical proposition. The Jews refused to attend the conference and the Arabs maintained that the future of Palestine could only be decided by them, without either British or Jewish interference. Yet another deadlock was added to the long list of them in the recent history of Palestine.

It is more than doubtful whether Palestine, only a little larger than Wales, is strong enough economically, militarily or financially, to be divided into two separate states, as is now recommended in UNO. On the other hand, the alternative decision, whether the undivided territory should be a Jewish or an Arab state, seems impossible to take. The Arabs, for the most part, realize that the Jews cannot be absorbed, expelled or exterminated and that, therefore, even in an Arab state, some degree of autonomy for Jewish communities is essential. The geographical distribution of the population makes this feasible without putting Jew under Arab or Arab under Jew for local administration, except for very small and unlucky minorities, and the Religious Communities Ordinance of 1926 provides very much the type of freedom that is required. By an extension of the principle underlying this Ordinance it should be possible for all local and day-to-day matters to be decided by local authorities which would be either Arab or Jewish but not mixed. Certain matters affecting the country as a whole would require the attention of a central authority on which both Arabs and Jews were represented, such as trade, communications and foreign relations. But if the people generally could be persuaded to realize that this central authority would confine itself to these nation-wide matters and would not interfere in local or partisan affairs, there would seem to be no good reason why it should not work. There would be certain other subjects, of which guardianship of the Holy Places and control of immigration are the most obvious, which would be beyond the scope of any combined Arab/Jewish authority, for the two races can never now be expected to agree about them or to give way one to the other. It has been suggested that these might be the responsibility of a High Commissioner, appointed, perhaps, by the United Nations and advised, not by representatives of any particular race, profession or interest, but by individuals selected *ad hoc* for the value of the advice they were in a position to give.

There is no blinking the fact that on certain matters the two protagonists in Palestine are adamant and will never give way. It must also be realized that in most of the arguments reported in the Press and elsewhere, as well as in many actions taken by either side on the spot, the moderates are invariably swamped by the extremists, whose theories and actions alike make no contribution to the peaceful solution of the main problem. To the defeatists who would advocate evacuation of Palestine and leaving the Jews and Arabs to shoot it out on their own, it should be pointed out that, when France fell in 1940, we might well have lost the Middle East as well had it not been for the use that could be made of the port of Haifa and the availability of oil there from the fields of Iraq, and that the possession of Palestine and its coast and harbours by an enemy, actual or potential, might seriously embarrass any power as dependant as we are on the Suez Canal.

British administrators nowadays are an easy target for the critics and often suffer most from those who know least of their subject. It would be idle to deny that either they or the soldiers with whom they have worked in the difficult parts of the world have made mistakes, for they are but human. To

their credit be it said that they have not allowed terrorism or force to persuade them to agree to a solution which would be fundamentally unjust to the Arabs who have lived in Palestine for a thousand years and more. Equally the British Government has not wavered in its declared intention to give the Jews a National Home in Palestine. It will be interesting to see whether the United Nations are any more successful in achieving these two ideals simultaneously than the British trustees have been and whether proposals emanating from that august body will be any more acceptable to the peace-loving but determined Arabs or to the powerful and unscrupulous Jews, and any more susceptible to peaceful and effective implementation.

ENGINEER TRAINING ESTABLISHMENT C.M.F., NOVEMBER, 1943, TO JUNE, 1946

By LIEUT.-COL. E. H. T. GAYER, C.B.E., R.E.

GENERAL

"AND when you get to Italy have a look at the Volturno and see if a suitable place can be found for the S.M.E." Thus spoke A.F.H.Q., Algiers, October, 1943. The suitable site had already been found by C.E. 10 Corps and Major W. F. Jackson in Capua. The detailed reconnaissance started in mid-November, 1943, soon showing that Capua was even better than had first been supposed. Superficially it was depressing in the extreme; incessant rain, a town, not naturally over-clean, reduced in parts to a shambles from bombing and shelling, and reinforced by the demoralized remnants of Italian soldiery—not well versed in hygiene even in their heyday.

The S.M.E. was to be based on the old Italian Bridging School, and the R.E. Training Depot, due to arrive later, in a former British P.O.W. Camp, No. 66, some half-mile away. (See map on p. 343 for the detail of layout.) The S.M.E., derived from a small R.E. Wing of the North African 1st Army School, originally started on its own at Bone, Algeria, in September, 1943. The R.E.T.D. in North Africa formed one of the Battalions of the G.R.T.D. The aim of the organization in Italy was to centralize under one controlling authority, the Commandant, Engineer Training Establishment, C.M.F., all engineer training activities. To these were added later Div. Engineers Bridging Camp (February, 1944), Polish S.M.E. (June, 1944) and Indian Engineers Training Depot (August, 1944). The last addition was 3 Experimental Section and R.E. Liaison Team (September to December, 1944).

The facilities for training which exist, placed with the utmost convenience, might well turn Chatham or Ripon green with envy. A river 100 yds. wide with a fast current, rapid seasonal rise and fall, and constantly shifting sandbanks; mountains, woods, and large stretches of flat, almost uninhabited country, all within a mile or two. The City of Capua has a military history as old as Rome. Astride the Appian Way, on the main river barrier, the Volturno, between Rome and Naples, where the country opens from the mountains to the plains, Capua has always held a dominating position. The first historical incident of importance took place in 215 B.C. when Hannibal put his army into winter quarters in Capua, or more strictly speaking, old Capua (Santa Maria Capua Vetere) 3 miles away. His camp was actually sited on the lower slopes of Mount Tifata, near where S.M.E. Field Engineering Courses constructed mountain roads. That winter is referred to at some length and in various languages as " The Orgies of Capua." Whether legend or fact, Hannibal's Army crossed the Volturno, in the spring, three miles upstream of Capua and was soundly beaten. The Ponte Annibale was for several months the site of a 400 ft. Bailey Suspension Bridge, erected by 2 G.H.Q. Troops Engineers and just upstream, where American Engineers made an assault crossing in October, 1943, was the Bridging Camp for a complete Divisional Engineers.

Throughout the centuries Capua was always a town of great military and ecclesiastical importance. In 1943 it was an important garrison town with an Arsenal, small arms factory and various other satellites. It boasts an Archbishop and some twenty-five churches, which should be adequate for a town of under 20,000 inhabitants. It also had a very interesting museum, which unfortunately received a direct hit from a bomb. However, a large number of pre-Christian statues of the local goddess of fertility survived. This lady was evidently the prototype for Epstein. After more than 2,000 years her influence remains undiminished, if the number of bambini who squeal and play in the maze of labyrinthine alleys is a fair criterion. The S.M.E. buildings were a monastery before they became the Italian Bridging School. The most recent event of note in military history was the building in October, 1943, at Capua by 46 and 56 Divs. of the first operational Bailey Pontoon Bridge.

Inauguration and Construction

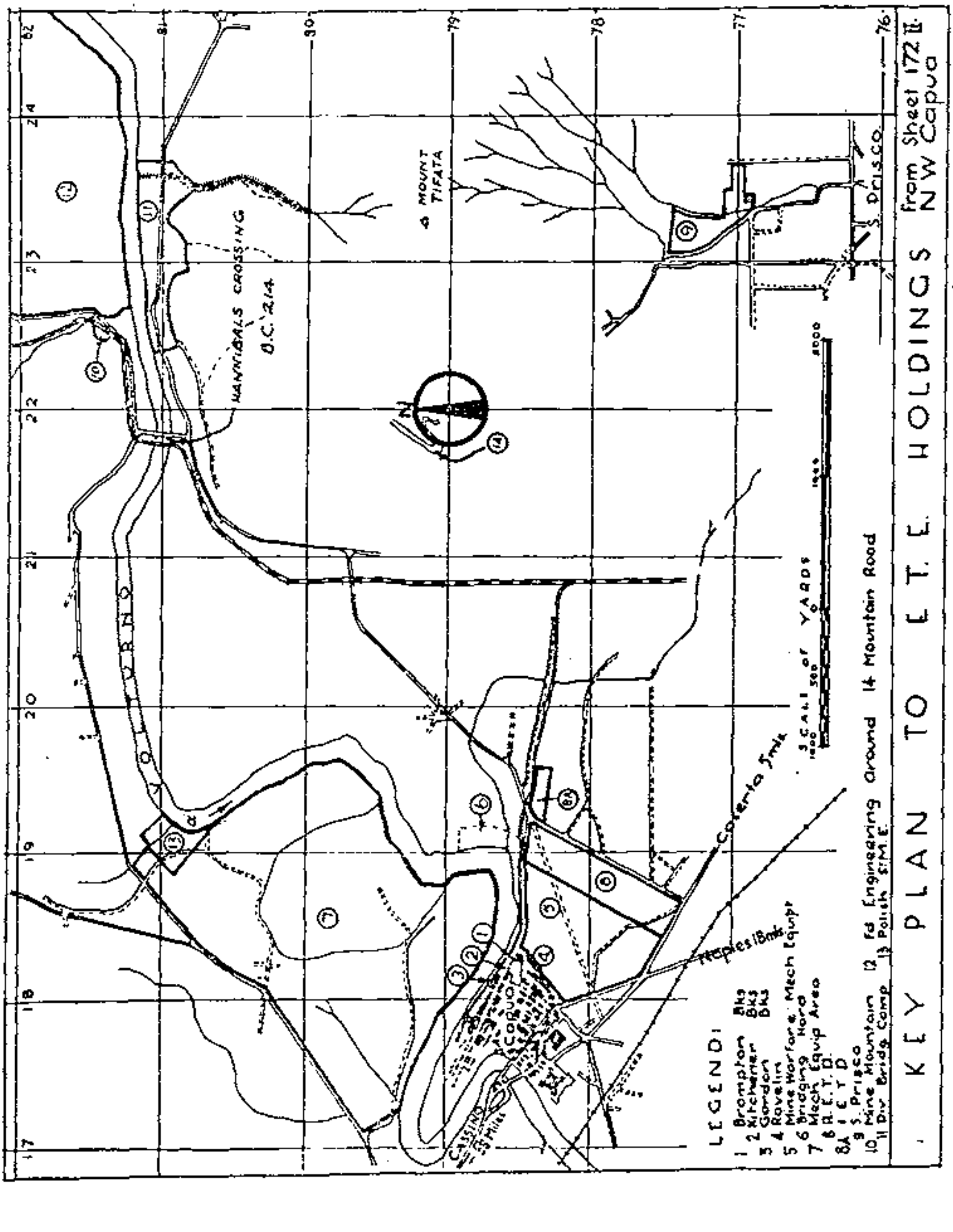
Work started on the S.M.E. on 20th November, 1943, with a C.R.E's. H.Q. and forty local Italian civilians. An interpreter was essential; though French, German and Urdu were in the H.Q. repertoire, Italian was missing. The first hopeful applicant was an ex-professor of mathematics from the University of Naples. He had three obvious drawbacks: poor English, halitosis, and a fervent aversion to working in Capua. The Field Security Personnel solved this problem quickly. His references were such that " on no account was he to be employed in any capacity." Obviously a Capuan was a more suitable choice and Signor Scialo, an ex-stationer was chosen and not found wanting. In many ways a pearl of great price, his talents included the ability to organize work and dismiss his own countrymen with energy, supplemented by Engineer training in his youth under the Local Borough Surveyor. By early December, local labour had risen to 400, by January, to well over 1,000, and by February to over 2,000. Authority to issue rations, received in December, created unprecedented scenes in the Labour Office, where applicants had to be forcibly removed. Application (to higher authority) for sapper units could not be met at once, but a Field Park Company arrived at the end of November, a Field Company on Christmas Eve and a second one on 1st February.

As usual the key to the whole situation was transport. The local labour had to be taken to and from its various villages, for each of which was a queueing-up place for the evening bus service. One hundred is reputed to be the record number taken by a long-suffering three-tonner. Tippers and road machinery were also in urgent demand for construction of the Bridging Hards and the approach road. Bridging instruction was to start in winter, when the Volturno banks were normally 2 ft. deep in thick cloying mud. Altogether some 12,000–13,000 tons of stone were quarried nearby and put into this work.

The general plan of work was to enable the Bridging Wing of the S.M.E. to function by mid-January, the whole S.M.E. by early February, and the R.E. Training Depot somewhat later. In fact the Bridging Wing did not arrive from North Africa until 20th January, and started its first course on the 28th ; the main body of the S.M.E. after many false alarms, arrived on 20th February and was in full swing by mid-March. The R.E.T.D., owing to disputes on a very high level concerning the ownership of the P.O.W. Camp, did not move in until 8th May, 1944.

The S.M.E. layout (see Map) consisted of three main buildings, 1, 2 and 3 Building No. 1 (Brompton Bks.) and Headquarters of the S.M.E. contained all messing and other administrative arrangements and accommodation for all O.Rs. Building No. 2 (Kitchener Bks.) housed all the student officers and their batmen, the H.Q., E.T.E.* and the Mines Museum ; Building No. 3 (Gordon Bks.) was overflow accommodation with a lecture hall sufficient to seat several hundred. This hall, and the floor that went with it, were later (May) opened by General Coxwell-Rogers as a N.A.A.F.I. Area 4 contained the Ravelin, with numerous dry gaps from 100–300 ft. ; also classrooms for mechanical equipment, camouflage, workshops, M.T. garage and the Italian colony of 200 ex-P.O.W. on the War Establishment. The latter were housed in the reconstructed civil jail. Later the Italian Co-operator Coy. was moved into the Arsenal and the jail became the carpenters workshops. Area No. 5 was mine warfare and mechanical equipment playground. No. 7 was held for future developments of the latter and was in fact extensively used, as the S.M.E. at its peak was training eighty operator-excavators at once, and held more than one hundred pieces of mechanical equipment. No. 6 were Bridging Hards with nine slipways. Three of these were concrete and purely artificial, the other two on the southern and four more on the northern bank merely angledozed. Area No. 8 was the R.E.T.D., with No. 8a, the I.E.T.D. Wing, and No. 9 the detached Coy. Camp of the R.E.T.D., used for weapon training, battle drill and mountain warfare. Area No. 10 was a further mine warfare area with the "Teufelsgarten" or mined mountain-side. No. 11 was the Div. Engineers Bridging Camp with its own equipment sufficient to train a complete Divisional Engineers as each came out of the line for training and rest. A large Romney run by the Y.M.C.A. as a canteen and a swimming bath 120 ft. × 40 ft., made from an old hemp-steeping pond, helped towards the lighter side of life. No. 12 Area was used extensively when the Assault Engineer Regiment was carrying out its initial training, as it was fully equipped with suitable hazards. On the west of Capua (not shown on Map) was the old airfield used for many forms of trials, and an assault demolitions area where derelict tanks, scorpions, etc., could be destroyed by budding saboteurs.

* The E.T.E. offices later moved to more palatial premises in a suite of ornate reception rooms. Entrance was made through a door bearing a huge coat of arms on frosted glass. The main heraldic feature being a coronet, a bar sinister and three pint pots. The true significance of this ensemble was unfortunately never discovered.


KEY PLAN TO E.T.E. HOLDINGS
from Sheet 172 II NW Capua
LEGEND:
1 Brompton Bks
2 Kitchener Bks
3 Gordon Bks
4 Ravelin
5 Mine Warfare, Mech Equipt
6 Bridging Hard
7 Mech. Equip Area
8 R.E.T.D.
8A I.E.T.D.
9 S. Prisco
10 Mine Mountain
11 Div. Bridg. Camp
12 Fd Engineering Ground
13 Polish S.M.E.
14 Mountain Road
SCALE of YARDS
MOUNT TIFATA
HANNIBALS CROSSING
Caserta 5mls
Naples 18mls
S. Prisco
CAPUA

In the S.M.E. areas No. 1 to 7, the work required fell roughly into the following categories :—

(*a*) Clearing debris from bombing and shell fire. Roofs had suffered most, many had gaping holes or were non-existent, none were weather proof. In addition the clutter of ages seemed to have accumulated in the buildings ; old records, weapons and ammunition, mostly unserviceable, wings and spares for aeroplanes. Building No. 2 (Kitchener Barracks), had twenty-five gallons of disinfectant poured through it. A Herbert Bridge was found, together with a beautifully made model and the Italian W.O. who made it. With his assistance the Bridge was launched on Bailey rollers to span a creek on the road leading into the Hards. The Italian W.O.—"The Marshal," as he was called locally, firmly disapproved of this method of erection, claiming that a five-ton crane was essential. He stated that he had built the Bridge seventy times and was definitely hurt professionally when the Inglesi insisted on their own methods, and with success.

(*b*) Repairs to buildings necessitated considerable internal additions and some structural alterations. An enormous much-battered room which had been a stable was converted into the dining-room of the Sergeants' Mess, with room to feed 400. Numerous bricked-up passages and staircases were opened up, which may have served clandestine purposes in the days of the monks.

(*c*) The water supply, electrical and sewage systems of the city were all smashed. Time for repair of these was most uncertain, so a separate system for each of these services was installed. By March the original systems had also been repaired.

The whole of the electrical installation, about 450 points, was carried out by American engineer electricians of 344 Engineer Bn., lent by the Engineer, 5th Army. Other men of this unit also helped with roof repairs. Throughout the work 5th Army were most helpful with stores. When excavating for the large battery of some 120 latrines in a nearby garden, a number of skeletons were found. Local gossip attributed these to gentlemen Garibaldi put "on the spot" in 1861.

(*d*) The painting and re-decorating of several hundred rooms and innumerable passages was no mean item. Italian painters were particularly good at this, and succeeded in keeping the original character of the buildings unspoiled.

(*e*) The Bridging Hards, etc., owing to the nature of the ground, needed extensive drainage and very large quantities of stone—12,000 to 13,000 tons. Fortunately, the river had only two bad floods during the winter, one just before serious work started on the hards and the other just after they were finished. On each occasion it covered the hards, having risen 20 to 25 ft. in as many hours.

(*f*) The work on the R.E.T.D. Area (Gibraltar Barracks) for 1,500 to 2,000 men, due to disputed ownership, did not really get going until 1st March. It had been a hutted camp with normal services for British P.O.Ws., and in October, it had been severely bombed and shelled. The exceptionally wet winter and the occupation of the site by tanks and many other heavy vehicles had reduced the site to a quagmire. Every building was re-roofed and redecorated, many walls were repaired and all the services reinstated. An Artisan Works Coy. arrived during March to speed on this work. Work on the Indian Engineer Training Depot was finished in August, complete with a small swimming pool, also converted from other uses, and a cruciform canteen made from five Flambo huts.

(*g*) The Bridging Camp at Ponte Annibale, which was semi-hutted, was started on 1st February, 1944, first occupied on 21st February, and finally finished about the middle of May when the Swimming Bath was opened.

In broad outline a summary of the work involved was :

(i) S.M.E. and associated areas—1,000 men for three months.
(ii) R.E.T.D. and I.E.T.D.—1,000 men for 3½ months.
(iii) Div. Engineer Br. Camp—300 men for three months.

There were never more than fifteen tippers and thirty three-tonners available. All stores had to be fetched from E.S.D. at Cancello (twenty miles) and sometimes from Bari. Much use was made of local resources, including a lime kiln and several quarries.

Direction and notice boards, which might normally be considered a rather minor item, had to be provided on an exceptional scale. Due to the old world construction of Kitchener and Brompton Barracks, it was considered that the normal intelligent man would take two months to learn his way round the various passages and corridors. As the S.M.E. student stayed about two weeks, sign-posting needed to be on a lavish scale. "Forgotten" rooms were rediscovered from time to time.

Training

The training at the S.M.E. was based on a more limited and definite syllabus than that at home or in the Middle East. It was objective rather than subjective, being designed to meet the needs of the Armies in Italy for the next few months. Bailey Bridging wet and dry, rafts of all standard types, and mine warfare were considered the predominant requirements. Later, large scale training of tractor and excavator operators became of major importance. Rafting, mine warfare and camouflage included all arms. Students varied from Majors to Corporals on most courses, though several Lieut.-Colonels also attended.

A number of additional short courses were also run—air photo interpretation, bomb disposal, motor boat maintenance and helmsmanship, and bridging equipment recognition for personnel of units working in docks, depots, etc. Field engineering courses started in October, 1944.

The equivalent of eighteen formation engineers (about seventy Coys.) trained for two to three weeks in the Bridging Camp, and a large number of units received a few days' training in certain subjects at the S.M.E., including Indian S. & M., American, French, Canadian, South African and Polish Engineers.

Practically all courses were international with considerable numbers of Americans and Poles, and rather fewer French. All ranks and nationalities worked with the utmost goodwill together, language differences presenting few difficulties, even when a Polish Corporal dropped a heavy weight on to an American's foot, or vice versa. There were two officer and three N.C.O. Instructors from the American Army and one officer from the Polish Corps instructing at the S.M.E. A small Polish S.M.E. established itself a mile and a half away and was affiliated. Training of Italian engineers started in August.

In March, 1945, special Rafting Training was carried out for six or seven weeks on a large scale, in preparation for the crossing of the Po and Adige. One hundred specially picked teams from British units and seventy Italian partisans carried out intensive training on various parts of the Volturno and Garigliano rivers. The Italians, though at first ignorant of British equipment, were very skilled natural watermen, many of them from the Po valley. They

were extraordinarily keen and became very expert. The speed of Eighth Army's advance across the rivers in the final stages of the Italian campaign, prevented their use except on a small scale. When the Commandant E.T.E. met the Partisan Leader, Imolese, near Venice, shortly after the battle, he said that though the results were good, we had not conducted the river crossings in the right way.

The last courses run at the S.M.E. were for Greek engineer officers.

Since the S.M.E. opened, 3,000 officers and nearly 6,000 O.Rs. had completed courses up to June, 1945.

As the S.M.E. was situated only about thirty-five miles from Cassino, and was at one point under twenty-five miles from the front, it was originally possible for its staff to visit units in forward areas to discuss difficulties on the spot.

Instructors were able to see bridges erected and collect mines, etc., " hot " from the field, where they were laid. Conversely, as the majority of students came on courses from battle areas it was not necessary to simulate realism by artificial din of battle. After the front moved north of Florence, a liaison team of three R.E. officers was formed to keep up-to-date with Fifth and Eighth Armies, U.K. and 21 Army Group.

Over sixty trials and experiments were carried out at the S.M.E. and by 3 Experimental Section. One of the more interesting was the design of a new type Bailey Mobile Bridge. This consisted of 110 ft. span carried on an ARK and pushed from behind by an AVRE. Its trials were highly successful and two bridges had just been manufactured at the end of the campaign.

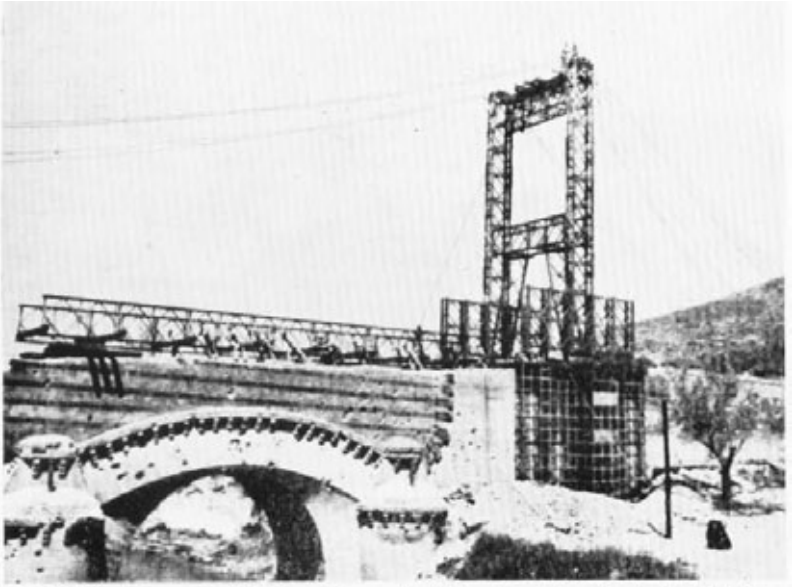
The Volturno is a river where watermanship is very well tested. At Capua it averages a width of about 100 yds. between banks varying from 10 ft. to 40 ft. high, though there are spits of land which make good rafting sites. In the winter it has a current of 3 to 5 knots and is subject to a rapid rise and fall, with a maximum velocity in full flood of 10 to 12 knots. In summer it falls considerably, though still with about 1½ to 2 knots' current. Sandbanks form for no particular rhyme or reason, and only certain channels remain constantly deep enough for bridging. In July the river was dammed, which gave a good job to the many earth-moving machines employed instructionally. The dam achieved its object for a short period by raising the water level of the bridging area 2 to 3 ft., but a severe storm later swept about 15 yds. of it away. Embryo operator excavators under training also made a landing ground 800 yds. × 300 yds. which was used by several aircraft.

A secondary, but most important function of the School was to provide facilities for interest, comfort and amusement as soon as working hours for the day were over. A theatre, cinema and the large N.A.A.F.I. existed for this and were well patronized. The two former were entirely run by sapper personnel. Leslie Henson, Florence Desmond and Emlyn Williams were among our entertainers, though possibly the performance that will remain most vividly in the minds of soldiers and civilians was that of Beniamino Gigli in *La Bohème*, shortly after VE day. Portions of an old palace, dating from 1450, were modernized and converted by R.E. enterprise into an attractive officers' club. Many people will probably remember the primrose ballroom with gold brocade curtains in after years.

The R.E. Training Depot aimed at giving all R.E. reinforcements adequate basic or refresher training and dealt with all branches of the Corps. Training was based on a five weeks' course. Battle drill, mountain warfare, elementary Bailey and mine warfare were the main subjects, included with a leaven of drill and physical training. The main object was to give the men sound

Via Appia Capua seen from the S.M.E. Technical Wing.

Engineer Training Establishment CMF
Nov 1943 - June 1946



400 ft. Bailey Suspension Bridge at Ponte Annibale. Launching North half of Bridge.

R.E. Memorial Chapel at Capua.

up-to-date training in reasonable surroundings with plenty of interests in their spare time ; to make a R.E. home and not a transit camp.

Certain courses were also run by the R.E.T.D., for driver operators, R/T for officers, D. & D. for N.C.Os., and D. & M. courses for both British and Indian drivers. Shortly before the invasion of Southern France, as a special " private " request, 250 Special Service American Troops were given a week's mine warfare.

The number of reinforcements trained at the R.E.T.D. and I.E.T.D. during a year were :—

British Officers	350 (including thirty Gunners).
Other Ranks	7,000 (including 2,800 Gunners).
Indian All Ranks	1,200.

This latter included men from all three Corps of Sappers and Miners and the various other Indian Engineer Groups.

The Gunners were mainly from disbanded Anti-Aircraft Regiments. The men received seven weeks' basic training instead of the normal five, the officers and N.C.Os. attending several courses at the S.M.E. in addition. This conversion was a great success, and the keenness displayed by the Gunners was most remarkable.

The R.E.T.D. Camp had its own Y.M.C.A. Canteen, a large Romney with stage, as well as the amenities of Capua mentioned above.

In the main R.E.T.D. Camp there was accommodation for 1,500, with room for expansion for at least another 500. This does not include the I.E.T.D. alongside or the detached Coy. Camp at San Prisco, 2½ miles away. Four hundred men could use the latter, and parties spent a week to ten days there, in country well suited to cross-country gymnastics, mountain climbing, with a 300 yds. reconditioned Italian rifle range thrown in. Situated in delightful surroundings the training in this camp was so popular that many asked for more. Four riding horses and twenty pack mules were included in the mountain curriculum.

Capua gradually developed into a large centre of sapper activities. In addition to the S.M.E., R.E.T.D., and I.E.T.D. and Divisional Engineers Bridging Camp, there were, for long periods, three or four Army Fd. Coys., a Fd. Pk. Coy., Artisan Works Coy., a Workshop and Park Coy. and very often a detached Fd. Sqn., all within about a mile or so of each other ; if the Polish S.M.E., a Polish Fd. Coy. and one or two Coys. of American Engineers are included, a total of 4,000 to 5,000 sappers.

Trade Training—1945–6

After VE Day, the Engineer Training Establishment started to disband. Between June and August, 1945, the H.Q., E.T.E., the R.E.T.D., and the I.E.T.D. disappeared ; the Polish S.M.E. expanded and cast itself off, finally only the S.M.E. was left as a pre-release Trade Training School.

During April, 1945, a start was made towards implementing the agreed post-hostilities role of the S.M.E. In effect, we were to be an extra-mural branch of the Formation College in Italy, with the task of running Trade Training Courses in the Building and allied trades. These courses were limited in the first place to refresher courses for men who had a sound pre-war knowledge of their trade or had reached Class II standard in an appropriate trade learnt in the Army. This standard was subsequently lowered to Class III. In addition the School was to continue running courses for Garrison Engineers and Foremen of Works, probably on an increased scale.

Having settled the type of student to be taken on the trade courses, it was decided to base them on a scheme which had been discussed in outline in

1944. Under this arrangement work done by the students was to contribute to the erection of a housing estate, giving them an atmosphere they had been accustomed to in their civil jobs and the satisfaction of seeing something grow as a result of their efforts.

By the middle of May planning to put this scheme into effect was in full swing—a general layout of a housing estate on the old mine warfare training ground was being prepared and draughtsmen were hard at work on detailed designs of a four-bedroomed house and a block of two three-bedroomed flats. These buildings were to be the basis of the estate, the designs being sufficiently flexible to cater for variations in the tradesmen arriving for the courses.

Estimates for the material required to implement the scheme for the first three months were accepted by A.F.H.Q. and the arrangements for general organization went ahead. It was important to ensure that the quality of instruction given to the students should not suffer from attempts by the instructors to make rapid progress with the estate and, with this aspect in view, a small staff which was solely concerned with progress was set up independently of the instructional staff. This enabled the instructors to concentrate on the quality of the instruction.

Meanwhile, the layout of workshops was being decided. The cellulose factory occupied by 3 Experimental Section was converted into a shop for carpenters, joiners and wood machinists; the large shed, hitherto used for M.T., became the bricklayers' and plasterers' shop and the old Italian magazine, till now used for its legitimate purpose, accommodated the painters. A Romney hut which had housed mechanical equipment courses became a workshop for blacksmiths and steelbenders—removal of the centre part of the roof and white paint inside making the temperature reasonably bearable during the hot weather of August and September.

The Capua Gaol, which had been used for many different purposes, now became an excellent plumbers' shop—and a full-scale roof, which was built on the floor of one of the rooms in the gaol, provided an excellent training ground for slaters and tilers as well as plumbers.

Electricians—wiremen only were being taken—were allotted the old camouflage workshop, and also had Booby Trap House—famous in mine warfare training days—as an additional training area in which all types of wiring could be practised.

The instructor situation was found to be reasonably satisfactory—three additional officers were found from outside units, while nearly 70 per cent of the W.O. and N.C.O. instructors needed were available in S.M.E., R.E.T.D. and 3 Experimental Section. Probably the most sensational discovery in the S.M.E. was a master plumber, with the army trade of engine fitter, who was hiding his light under a bushel as a junior field plant instructor in the Technical Wing. We felt that the instructor problem would solve itself as soon as the courses started and this proved to be the case, many students remained at the School as instructors for the rest of their service and we were greatly indebted to units of all arms of the service for their co-operation in agreeing to the posting of these men at a time of manpower shortage.

Inevitably, instructors were of a type peculiarly susceptible to Class "B" release and most of the trades had several generations of instructors during the ten months the courses lasted.

Towards the end of May we agreed that the first course could start at the beginning of July—fortunately this date was too soon for A.F.H.Q. and we were grateful for the extra three weeks of preparation before the first students —bricklayers only—arrived on 22nd July.

Assembly and dispersal of courses had been staggered by dividing the tradesmen into four groups and bringing them in roughly in the order in which they would be required on the estate; each course ran for six weeks, followed by a week's rest and there was either one or two weeks' interval between the assembly of the various groups.

Students were given an initial test, mainly practical, during their first week, mainly to ensure that they had known enough about their trade in the past to get real benefit from the course.

As the courses got under way, two features became immediately apparent. The first, which was always the subject of comment by visitors to the School, was the absorption and concentration with which the men went to work at their old trade. The second was the mixing of students who had learnt their trades in different parts of the British Isles—the resultant discussions, though interminable and frequently inconclusive, were a valuable and, perhaps, somewhat unexpected feature of the courses.

An early visitor to the School after the courses started was Andy Gray of the *Union Jack*—his article on our activities which appeared in August, 1945, gave the School a publicity not always achieved by the announcement of courses in G.R.Os. We also had a visit from the City Engineer of Plymouth, who came to give students a talk on re-housing at home generally and its application to Plymouth in particular.

At the end of August, when all courses had assembled, we had an official visit from Major-General M. A. W. Macleod (D.A.G., A.F.H.Q.) and Major-General N. A. Coxwell-Rogers (M.G.R.E., A.F.H.Q.). By this time the estate was already showing signs of the industry of many tradesmen, mainly bricklayers, whose backs, after six weeks of summer sun in Capua, were generally agreed to be more thoroughly burnt than most of the Italian bricks from Benevento and Salerno with which they were working.

This visit was followed, less than a week later, by one from Field-Marshal Alexander, the Supreme Allied Commander, who spent two hours going round the workshops and the estate.

By this time the courses were getting well into their stride—each trade held fortnightly discussions at which suggestions for improvement of the courses were received and put into effect where possible. Attendances at the early courses were a little disappointing as they seldom exceeded 50 per cent of capacity, contributory factors probably being the wide area from which students were drawn, with the consequent difficulty in re-allotting surrendered vacancies at short notice, and the "LIAP" scheme, which was first priority for men who had spent two to three years in the Mediterranean without home leave and was operating at full pressure during the first few months of the courses.

In November we were asked to consider the possibility of running Vocational Courses in the same trades, with the object of giving novices an introduction to the building trades. We put forward a scheme to A.F.H.Q. (now renamed G.H.Q., C.M.F.) in which we agreed to take up to 500 students in all, divided between higher and vocational training, with limitations on the maximum numbers to be taken in each trade. The scheme was accepted in principle, but it was not until February, 1946, that this new series of courses actually started.

Programmes were prepared for them during the winter. They were designed to lead up to the Ministry of Labour post-release vocational courses, for which our students would be prospective candidates. The Ministry of Labour syllabi, which were very complete and practical, were of great assistance.

Visitors appeared at regular intervals throughout the winter, one being the Director of Army Education, who was accompanied by a number of civil education experts from the War Office and the Ministry of Education. There were also two separate teams of H.M's. Inspectors of Education during December and January. From all these visits we gained the impression that the quality of the training we were providing compared favourably with that in a Technical College at home.

In December we sent an officer on a resettlement course run by the Ministry of Labour in London ; when he returned, he set up a Resettlement Advice Bureau in the School. This proved to be of the greatest value, not only to the students but also to the staff of the School and to neighbouring units to whom the service was made available. A number of individual problems were referred to the Ministry of Labour, from whom we usually got prompt and helpful advice. Resettlement problems were the main theme of the educational periods and fitted well into the general structure of the courses.

At the end of January final arrangements were made for the vocational courses to start on 24th February, allotting two six-week courses before the School started to close down in May, 1946.

This type of training required a higher proportion of instructors than had been necessary for the higher courses and this problem was eventually solved by inviting volunteers from the higher courses to act as assistant instructors as part of their training. This system worked well in practice, many of the students being prepared to accept the proposition that one of the best ways of improving their own knowledge was to teach someone else.

In fact, the progress made by some of the vocational students in six weeks was astonishing ; their enthusiasm to learn was tremendous and we were able to recommend about 90 per cent of them as suitable for Ministry of Labour courses after release.

The last three months of the courses were thus one of the busiest times and there were about 400 students in the School for the whole of this final phase. All together 1,643 students passed through the School between July, 1945 and May, 1946.

The letter quoted below was from a Gunner. If this was the feeling of the majority of the students, the courses achieved something that will endure.

"To : The Commandant,
School of Military Engineering. 24.4.46.

SIR,

On my departure from this school, I wish to thank you and all the staff in my small way for the pleasant and very interesting time I have spent here.

During the few short weeks I have been here much has been done by the instructors to help me regain my former occupational skill and every assistance has been given me.

I am now going back to civilian life after 6½ years and thanks to the school and everyone concerned I am going back with a definite job in my mind, instead of the hazy idea I had before coming here owing to almost forgetting my former trade during the war years.

In closing I wish to thank you and the staff once again and I hope you will find satisfaction in this. I remain, sir,

Yours truly, (Signed)———Gnr."

Dedication of R.E. Memorial Chapel

The Army leaves behind it certain " Fixed Assets," some of which contrast pleasantly with the wholesale destruction generally associated with modern war. The R.E. Memorial Chapel at Capua is a good instance of something permanent and constructive which the Sappers have left to the Italians.

The Chapel, which stands in the old R.E.T.D. enclosure, was started during the war and completed at the end of 1944, when it was dedicated by the Bishop of Maidstone. It was designed and built entirely by Sappers. The charming simplicity of the interior was largely the work of the Rev. Gray, Chaplain of the R.E.T.D., and lady helpers of the Y.M.C.A. The building is constructed in stone and is partly Chapel and partly recreation room, the latter being usable as an extension to the Chapel itself. The whole structure, including a small outbuilding which will be used as living quarters by the caretaker, is surrounded by a wire fence. The formal handing-over ceremony and the signature of the legal documents by which the whole property was conveyed to His Excellency The Archbishop of Capua took place on 2nd February, 1947. This formal ceremony was arranged to meet the wishes of the Italians.

The Guard of Honour was found from 267 Works Section, R.E., and from Italian troops in Capua. The Italian officials included the Commander Presidio Militare of Capua and Dr. Aria, Prefect of Caserta. On the British side the officiating Chief Engineer, G.H.Q., and the C.R.E. of the South Italy area formed the official party.

After being introduced to the waiting officials, the Archbishop proceeded straight through the recreation room and up the aisle of the Church to the altar, the congregation filing in after him, to the accompaniment of music by an Italian orchestra. After assuming his Episcopal Vestments he proceeded to bless the Church.

Holy Mass was celebrated in memory of the Royal Engineers who died in Italy during the war by a priest from the Archbishop's personal staff, after which the deeds of gift engrossed on vellum were signed and witnessed by the Archbishop and the Officiating Chief Engineer. These deeds are now kept in the R.E. Museum at Chatham.

The Archbishop then made a short speech in Italian thanking the Royal Engineers for their gift and assuring them that prayers would be said for them in perpetuity. He said that the Italian people had never wished to fight against the British, but that as soldiers, having once been committed to the battle, they were forced to fight. He hoped that the ancient friendship between the British and Italian peoples might be revived and grow stronger in the years to come.

The Officiating Chief Engineer made a brief reply which was translated by Captain Fielding, of G.H.Q., who had kindly consented to act as interpreter.

Two wreaths were laid by the Italian Troops on either side of the Memorial Plaque and a wreath from the Royal Engineers was placed between them.

Note by C.E., C.M.F.

Colonel Gayer was Commandant of the Engineer Training Establishment, Capua, from 12th April, 1944 to 1st August, 1945, having been posted to the S.M.E. and R.E.T.D. (as it was then designated) in January, 1944. It was very largely due to his efforts that so much order was produced out of the ruins of the City of Capua.

In April, 1944, the freedom of the City of Capua was bestowed on him in the following terms :—

> " The City of Capua wishes to confer on Colonel E. H. T. Gayer, Commandant of the School of Military Engineering (E.T.E.), the '*Freedom of the City*' as a permanent token of their appreciation of the sympathy and understanding he has shown to a City which has suffered so great a loss to its sacred monuments through war damage."

ECONOMICAL LARGE SPAN TIMBER CONSTRUCTION IN INDIA

By LIEUT.-COL. R. H. MATTHEWS, R.I.E.

OWING to a shortage of prefabricated hangars, unfabricated steel and timber in long lengths, the need for a design of a large span hangar that could be built with short lengths of timber became apparent in India towards the end of 1943.

The Research and Development Section of the Engineer-in-Chief's Branch were instructed to carry out experiments with a view to obtaining a suitable design. The limiting factors were that the design was to allow the use of poor grade unseasoned timber in lengths not greater than 10 ft. and the smallest possible quantity of steelwork, specially nuts and bolts. In addition, only the minimum of timber was to be catered for, the use of bricks was to be entirely eliminated and the design was to be one that could be erected easily and quickly.

It was learnt that the Royal Australian Engineers had done some experimental work in Australia in this connexion and an experimental design of a 177 ft. span timber blister hangar was obtained from them. It was found, however, that the type, grade and lengths of timber specified were unobtainable in India and therefore alterations in sections and lengths had to be made to suit Indian materials and conditions.

Within four months, using the Australian design as a basis, designs and prototypes of four types had been completed and working drawings issued for general use. These four types can be put into two classes, large spans and small spans, subdivided as follows :—

CLASS I—LARGE SPANS

(*a*) *Kashmir Hangar.* 177 ft. clear span, suitable for the housing of large aircraft.

(*b*) *Sonai G.P. Shed.* 104 ft. clear span, suitable as a general purpose shed for stores, workshop or small hangar.

CLASS II—SMALL SPANS

(*a*) *Lahore Shed.* 40 ft. clear span, suitable for use as a store shed and, with adaption, as a Recreation Room, Institute and Personnel Accommodation.

(*b*) *Mayo Hut.* 30 ft. clear span, suitable for Personnel Accommodation, Hospital Ward or Office.

2. These four types will be sufficiently detailed to show the general principles of the designs.

KASHMIR HANGAR

The Kashmir Hangar is of the blister type, has a span of 177 ft. and is segmental in section, having a radius of 110 ft. The trusses are fabricated in two portions in a jig on the ground. The truss consists of four 5 in. by $2\frac{1}{2}$ in. chord members, each in lengths of timber spliced together with timber splice plates and wire nails. These lengths are 7 ft. 10 in. and 8 ft. 2 in. in length.

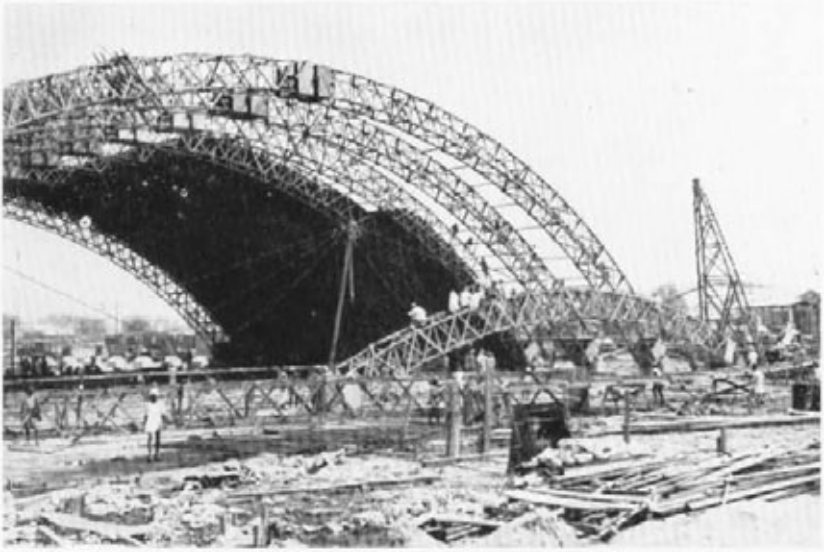


Photo. 1.—Kashmir Hangar. General view during construction. Cradle is being fixed to one half truss prior to erection.

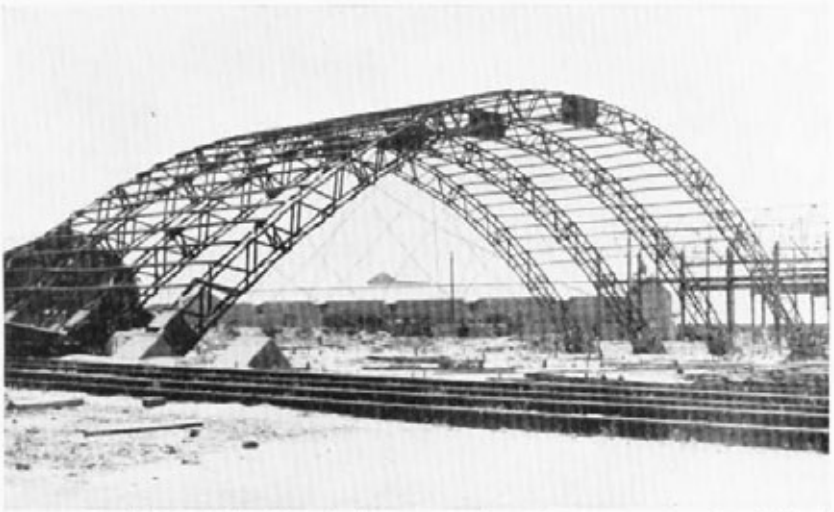
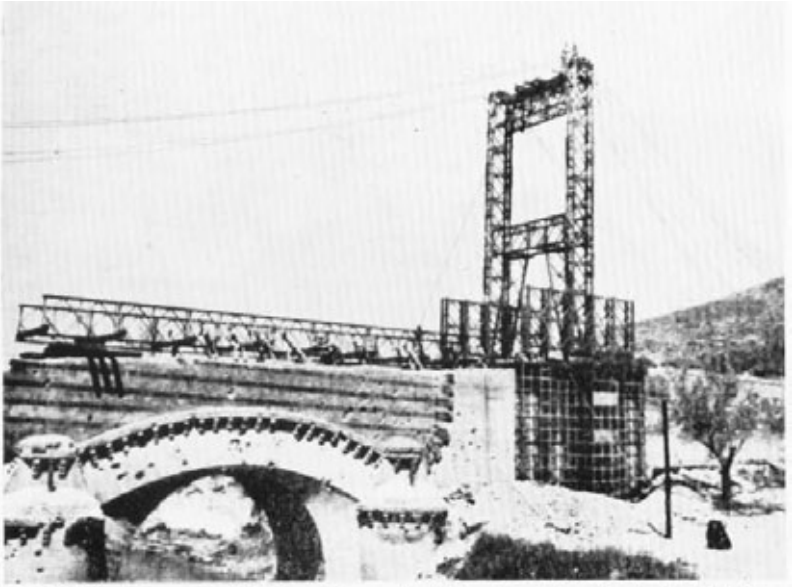


Photo. 2.—Sonai G.P. Shed. View during construction. Four trusses erected, windbracing not yet fixed.

Economical large span timber shed in India



400 ft. Bailey Suspension Bridge at Ponte Annibale. Launching North half of Bridge.

R.E. Memorial Chapel at Capua.

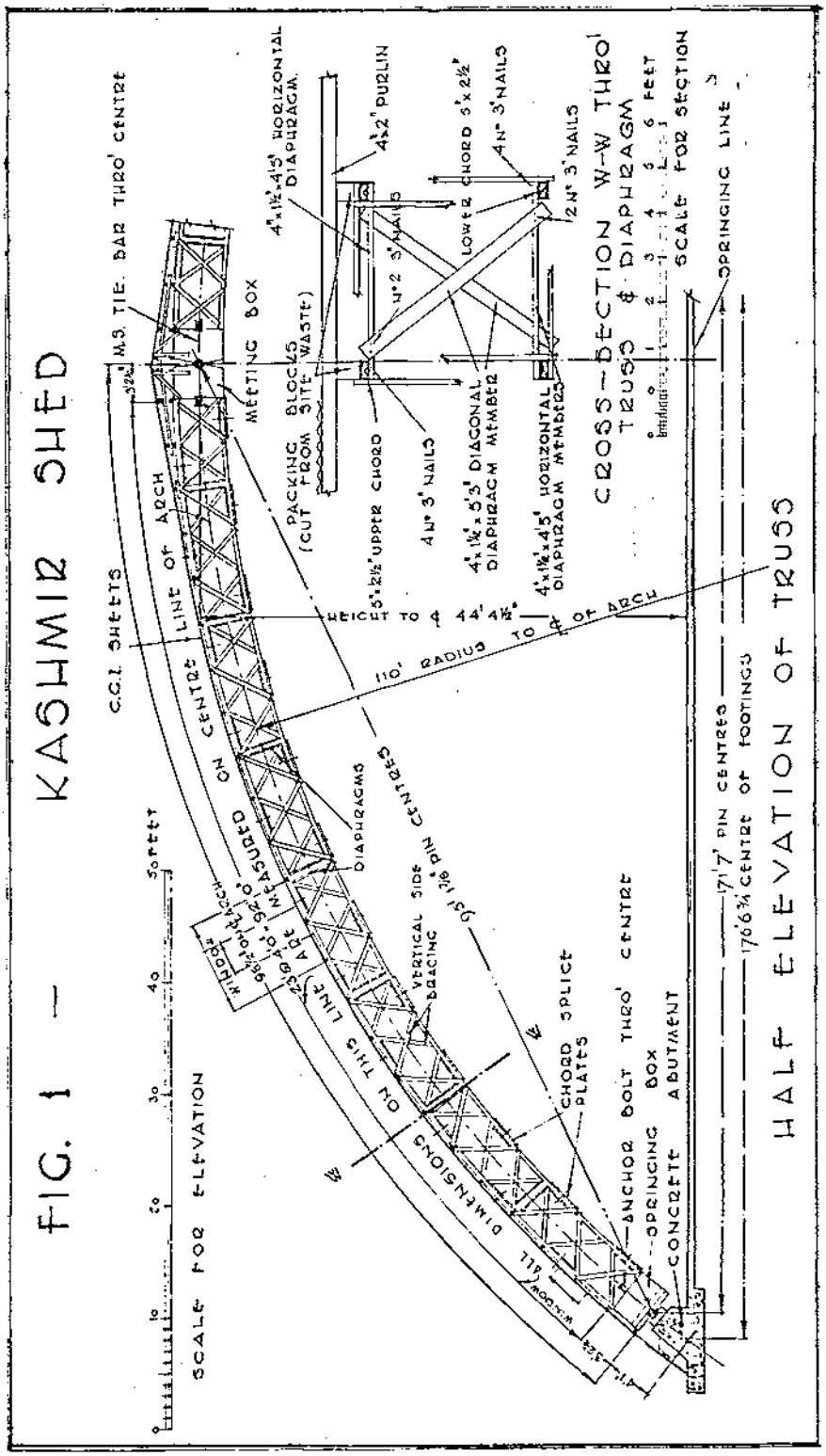


FIG. 1 — KASHMIR SHED
HALF ELEVATION OF TRUSS
SCALE FOR ELEVATION
SCALE FOR SECTION
CROSS-SECTION W-W THRO' TRUSS & DIAPHRAGM
C.C.I. SHEETS
LINE OF ARCH
ON CENTRES
MEASURED
ON THIS LINE
110' RADIUS TO ℄ OF ARCH
DIAPHRAGMS
VERTICAL SIDE BRACING
CHORD SPLICE PLATES
ANCHOR BOLT THRO' CENTRE
SPRINGING BOX
CONCRETE ABUTMENT
METTING BOX
PACKING BLOCKS (CUT FROM SITE WASTE)
4"x1½"x4'5" HORIZONTAL DIAPHRAGM
4"x2" PURLIN
LOWER CHORD 5"x2½"
4 nr 3" NAILS
2 nr 3" NAILS
4"x1½"x5'3" DIAGONAL DIAPHRAGM MEMBER
4"x1½"x4'5" HORIZONTAL DIAPHRAGM MEMBERS
SPRINGING LINE
171'7" PIN CENTRES
176'6¾" CENTRE OF FOOTINGS

The chord members are spliced and pre-stressed in the jig and braced together to form a 4 ft. square "box." Fig. 1 shows elevation and section respectively of half a truss and Photo 1 shows appearance during construction.

Sal timber was used throughout. Sal has a weight of 51 lb. per cu. ft., bending extreme fibre stress 2,400 ft., and modulus of elasticity 1,802,000 lb. per sq. in.

The trusses are spaced at 15 ft. centres. Purlins and windbracing are spliced so as to avoid long lengths of timber.

If a floor area of 45,843 sq. ft. (177 ft. × 259 ft.) is assumed, the total amount of sawn Sal required, including ends, is 6440·70 cu. ft., which at 51 lb. per cu. ft. is a total weight of 146·60 tons. The weight of timber per sq. ft. of floor area is 7·1 lb.

In addition to timber the following are the main material requirements :—

Sheets, M.S. corrugated, 22 G.	35 tons
Bars, round, M.S. for reinforced tie bar. (This can be eliminated if larger concrete foundations are adopted)	12·34 tons
Tie and holding-down bars	2·5 tons
Drive screws	8 cwts.
Nails, wire	3·7 tons

The total weight of material, excluding concrete and plant, required for one hangar of the size given is 200 tons or 9·89 lb. per sq. ft. of floor area.

This hangar can be erected and completed by Indian labour in twenty-eight days, or a total of 136,120 man hours.

At rates prevailing in Northern India during 1944–5, the cost of supply of materials and erection by contract is approximately Rs. 3/10/- per sq. ft. of floor area.

Sonai G.P. Shed

The Sonai G.P. Shed is merely a lighter and smaller edition of the Kashmir Hangar, and is consequently considerably easier and quicker to erect. The method of construction and erection is very similar to the Kashmir Hangar. The main difference is that as the chord members have to be pre-stressed to a radius of 65 ft., it was found necessary to use chord members of 3 in. × 1¼ in. in section and nail laminate to a section of 3 in. × 2½ in. The chord members are in lengths of 7 ft.

For the construction of the prototype, Sal timber was used throughout. It is practically certain that this structure could be built of Deodar or some other good conifer, but no designs have been started yet. If this is possible the weight would naturally be considerably reduced.

Fig. 2 shows elevation and section of half a truss. The trusses are erected at 14 ft. centres.

Photo 2 is a photographic view during construction of the prototype.

The total amount of sal required is 2,375 cu. ft., having a weight of 50·4 tons. With a floor area of 19,740 sq. ft. the weight of timber per sq. ft. of floor area is 6·10 lb.

In addition, the following are the main material requirements :—

Sheets, M.G. corrugated, 24 G.	21·30 tons
Tie and holding-down bars	9 cwts.
Drive screws	3·75 cwts.
Nails, wire	17 cwts.

The total weight of materials required, excluding concrete and plant, is 73 tons, or 8·8 lb. per sq. ft. of floor area.

Time of erection by Indian labour is twenty-three days or 44,020 man hours.

At rates prevailing in Northern India during 1944–5, the cost of supply of materials and erection by contract is Rs. 3/8/- per sq. ft. of floor area.

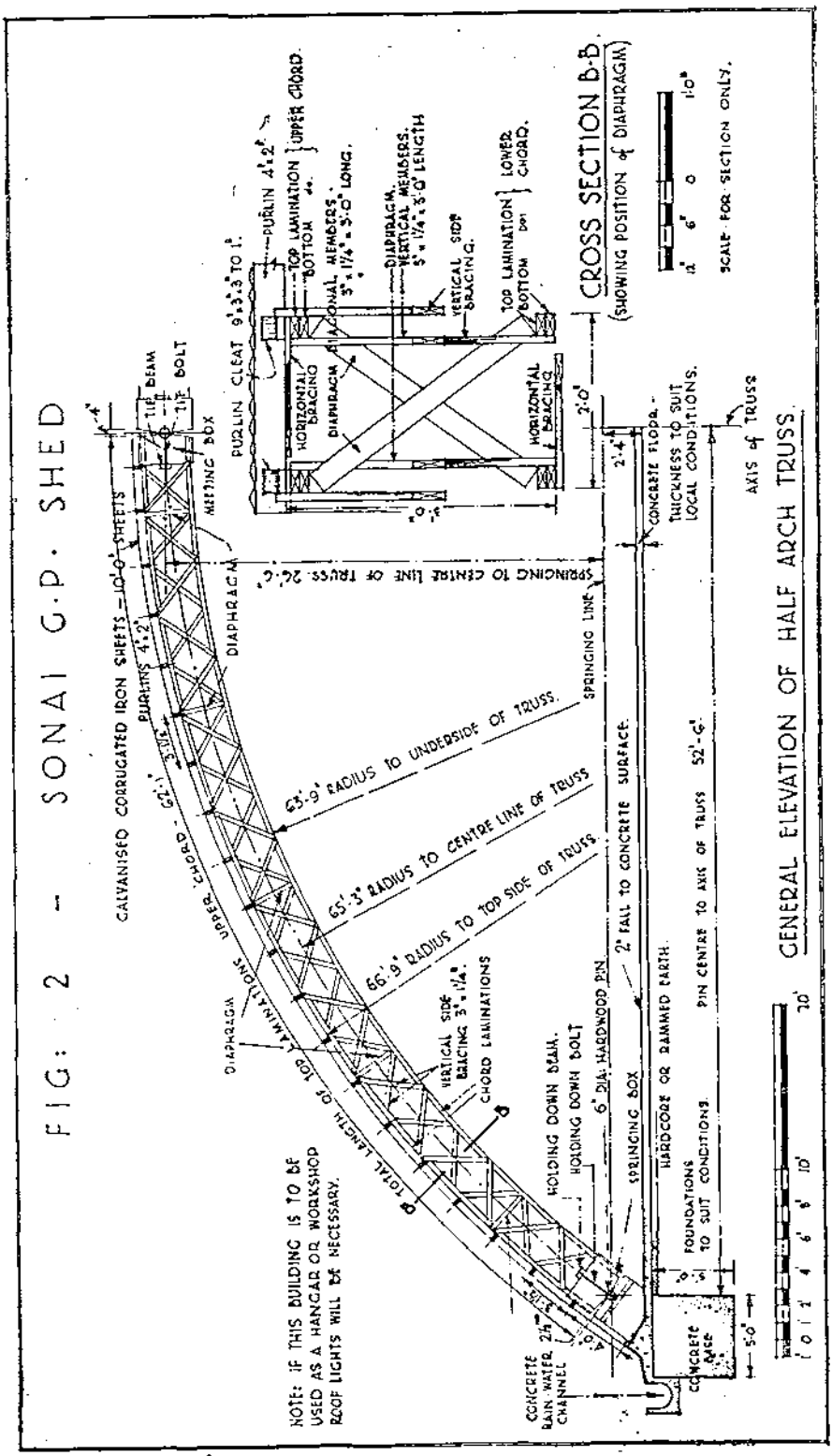


FIG: 2 - SONAI G.P. SHED
GENERAL ELEVATION OF HALF ARCH TRUSS
CROSS SECTION B-B
(SHOWING POSITION of DIAPHRAGM)
SCALE FOR SECTION ONLY.
CALVANISED CORRUGATED IRON SHEETS
PURLINS
DIAPHRAGM
SPRINGING LINE
SPRINGING TO CENTRE LINE OF TRUSS 26'-0"
65'-9" RADIUS TO UNDERSIDE OF TRUSS.
65'-3" RADIUS TO CENTRE LINE OF TRUSS
66'-9" RADIUS TO TOP SIDE OF TRUSS
TOTAL LENGTH OF TOP LAMINATION
VERTICAL SIDE BRACING
CHORD LAMINATIONS
HOLDING DOWN BEAM.
HOLDING DOWN BOLT
6" DIA HARDWOOD PIN
SPRINGING BOX
2" FALL TO CONCRETE SURFACE.
HARDCORE OR RAMMED EARTH.
PIN CENTRE TO AXIS OF TRUSS 52'-6"
FOUNDATIONS TO SUIT CONDITIONS
CONCRETE RAIN WATER CHANNEL
CONCRETE FLOOR
THICKNESS TO SUIT LOCAL CONDITIONS.
AXIS of TRUSS
TIE BEAM
TIE BOLT
MEETING BOX
PURLIN CLEAT 9"x3"x3/8" TO I.
PURLIN 4"x2"
TOP LAMINATION BOTTOM
UPPER CHORD
DIAGONAL MEMBERS. 3"x1¼"x5'-0" LONG.
DIAPHRAGM VERTICAL MEMBERS. 5"x1¼"x3'-0" LENGTH
VERTICAL STOP BRACING.
LOWER CHORD.
HORIZONTAL BRACING
NOTE: IF THIS BUILDING IS TO BE USED AS A HANGAR OR WORKSHOP ROOF LIGHTS WILL BE NECESSARY.

Lahore Shed

The Lahore Shed has a span of 40 ft. The design of the truss is in " box " form, as the Kashmir Hangar and the Sonai G.P. Shed, with the exception that the cross section through the building is semi-circular instead of segmental. The trusses are built up in two parts in a jig on the ground in the same manner as the Kashmir and Sonai. Difficulty was experienced at first in pre-stressing the chord members sufficiently in the jig owing to the poor type of timber available. This was overcome by soaking the members in water for twenty-four hours prior to fabrication.

There are four chord members in the truss, each consisting of two 3 in. × 1 in. nail laminated members in spliced lengths of 9 ft. 3 in. Since the first experiments were completed other tests have been carried out and the length of chord members has been reduced from 9 ft. 3 in. to 7 ft. This was done owing to a difficulty that was experienced in obtaining suitable timber in lengths of 9 ft. 3 in. The trusses are erected at 10 ft. centres.

Fig. 3 shows elevation and section of truss.

Photo 3 is a photographic view of the experimental structures.

Deodar timber was used throughout. Deodar has a weight of 35 lb. per cu. ft., bending extreme fibre stress 1,450 ft. and modulus of elasticity of 1,340,000 lb. per sq. in.

471·7 cu. ft. of Deodar is required, which is a total weight of 7·37 tons. The floor area is 3,907 sq. ft. Therefore the weight of timber per sq. ft. of floor area is 4·20 lb.

The following is the weight of the main materials :—

Sheets, M.S. corrugated, 22 G.	7·2 tons
Tie and holding-down bars	2·5 cwts.
Drive screws	1·2 cwts.
Nails, wire	6·2 cwts.

The total weight of materials, excluding concrete and plant, for one shed is 15·16 tons or 8·6 lb. per sq. ft. of floor area.

Indian labour can assemble this shed in eleven days or 5,192 man hours.

The cost, including cost of labour, at prevailing rates is Rs. 1·36 per sq. ft. of floor area.

Up to the end of 1945, 4,000 of these sheds had been manufactured at a central sawmill and distributed throughout India Command and S.E.A.C. for erection.

Mayo Hut

The Mayo Hut is a smaller edition of the Lahore Shed and has a span of 30 ft. The method of fabrication, erection and design remains practically the same as the Lahore. The main difference in design is that the truss has only two, instead of three, hinges. The whole truss is fabricated in one piece in the jig at the same time. Trusses are erected at 10 ft. centres.

The chord members are 3 in. × $\frac{3}{4}$ in. in section, nail laminated to a section of 3 in. × $1\frac{1}{2}$ in. The chord members are in 8 ft. lengths.

The experimental structure was built entirely of Deodar.

Fig. 4 shows the elevation and section of truss. Photo 4 is a photographic view of the structure. The interior was lined with white-washed hessian.

All timber construction is of Deodar. In all 418 cu. ft. of timber is required, which is a total weight of 6·5 tons. The floor area, including two verandahs, is 2,400 sq. ft. Therefore 6·10 lb. is the weight of timber per sq. ft. of floor area.

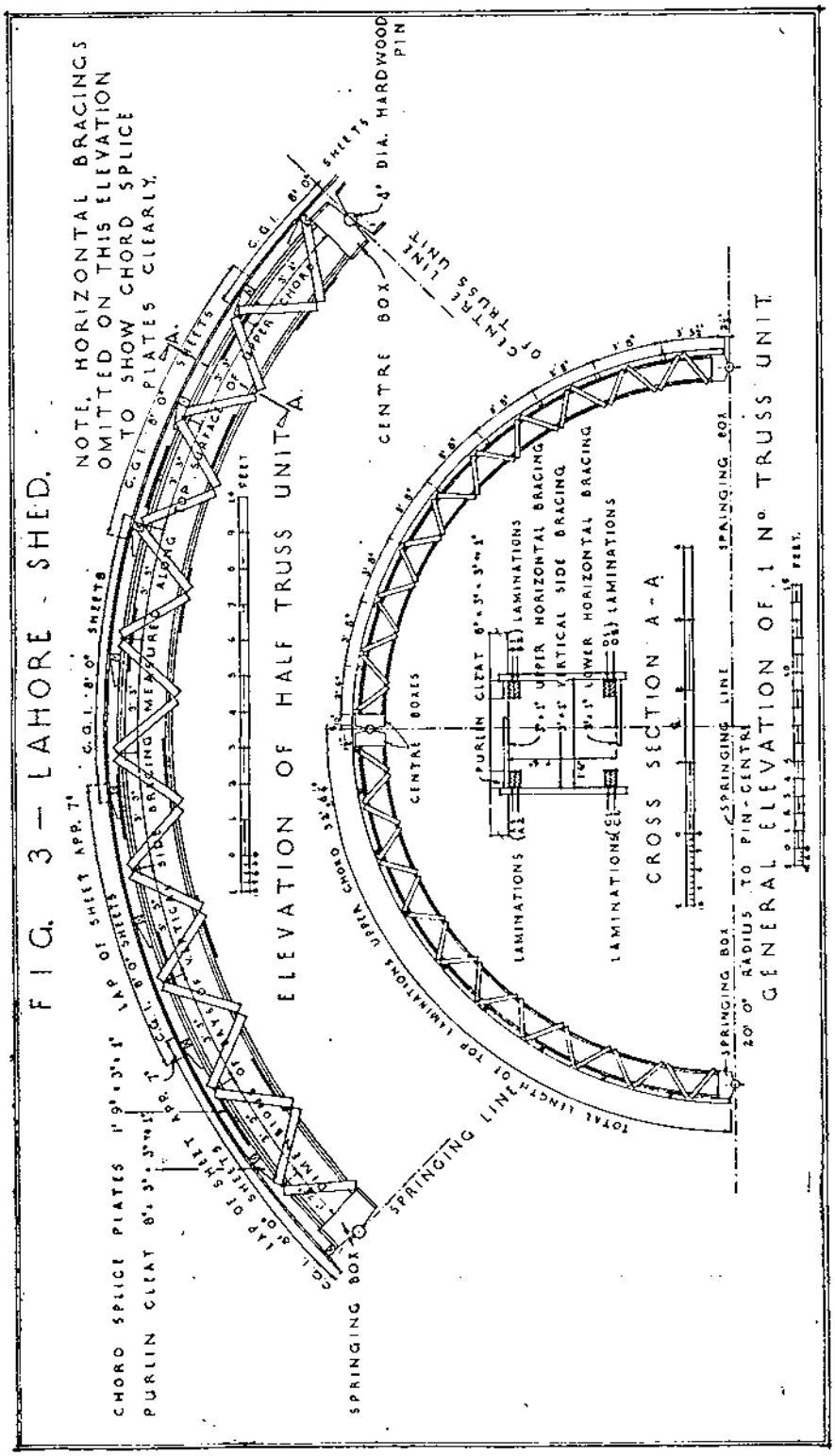


FIG. 3 — LAHORE - SHED.
NOTE, HORIZONTAL BRACINGS OMITTED ON THIS ELEVATION TO SHOW CHORD SPLICE PLATES CLEARLY.
ELEVATION OF HALF TRUSS UNIT A.
CENTRE BOX
OF TRUSS UNIT
3" DIA. HARDWOOD PIN
CHORD SPLICE PLATES
PURLIN CLEAT
SPRINGING BOX
SPRINGING LINE
TOTAL LENGTH OF TOP LAMINATIONS
CENTRE BOXES
LAMINATIONS
CROSS SECTION A-A
GENERAL ELEVATION OF 1 No. TRUSS UNIT
SPRINGING BOX
SPRINGING LINE
SPRINGING BOX
20'0" RADIUS TO PIN-CENTRE
FEET

In addition, the following are the chief materials required :—

Sheets, M.S. corrugated, 22 G.	3·2 tons
Holding-down bars	29 lb.
Drive screws	83 lb.
Nails, wire	4½ cwts.

The total weight of materials for one hut, exclusive of concrete and plant, is 10·1 tons or 9·04 lb. per sq. ft. of floor area.

Time of erection and costs are not known by the author.

Tests

The completed experimental structures were subjected to a wind load test based on the Air Ministry test requirements for blister type hangars, which is 15 lb. load per sup. ft. horizontal, averaging 7½ lb. per sup. ft. normal to the curve of the roof. Load to be applied eccentrically (i.e., on one half of the arch only). The prescribed total load of 11,083 lb. was applied to the Kashmir Hangar and no deviation from the normal occurred. The load was increased to 10·15 lb. per sup. ft. normal to the curve, or a total load of 15,000 lb. Under this latter load the maximum downward deflection was 1¾ in. on the loaded half and a maximum upward movement of $1\frac{7}{16}$ in. on the unloaded half.

In the test of the Sonai G.P. Shed, the total load applied was 6562·5 lb. Only very slight deviation from the normal occurred under this load, so the test was increased to 7·94 lb. per sup. ft. normal to the curve of the roof, or a total load of 6,930 lb. Under this load the maximum downward deflection was 1⅜ in. on the loaded half and a maximum upward movement of 1 in. on the unloaded half.

The Lahore Shed and Mayo Hut were subjected to the same test of 7½ lb. per sup. ft. normal to the curve of the roof and the deviation from the normal was negligible.

Comparison

Particulars	Kashmir Hangar	Sonai G.P. Shed	Lahore Shed	Mayo Hut
Floor Area in sq. ft. ..	45,843	19,740	3,907	2,400
Total weight of materials, excluding concrete, in tons ..	200·00	73·00	15·16	10·10
Total weight of material per sq. ft. of floor area, in lb. ..	9·89	8·80	8·60	9·04
Cu. ft. of timber	6,440·70	2,375·00	471·70	418·00
Type of timber	Sal	Sal	Deodar	Deodar
No. of cu. ft. of timber per sq. ft. of floor area	0·14	0·12	0·12	0·17
Total weight of timber in tons	146·60	50·40	7·37	6·50
Weight of timber per sq. ft. of floor area, in lb.	7·10	6·10	4·20	6·10
Approximate cost per sq. ft. of floor area	Rs. 3/10/- or 5/5¼	Rs. 3/8/- or 5/3	Rs. 1/6/- or 2/0¾	Not known

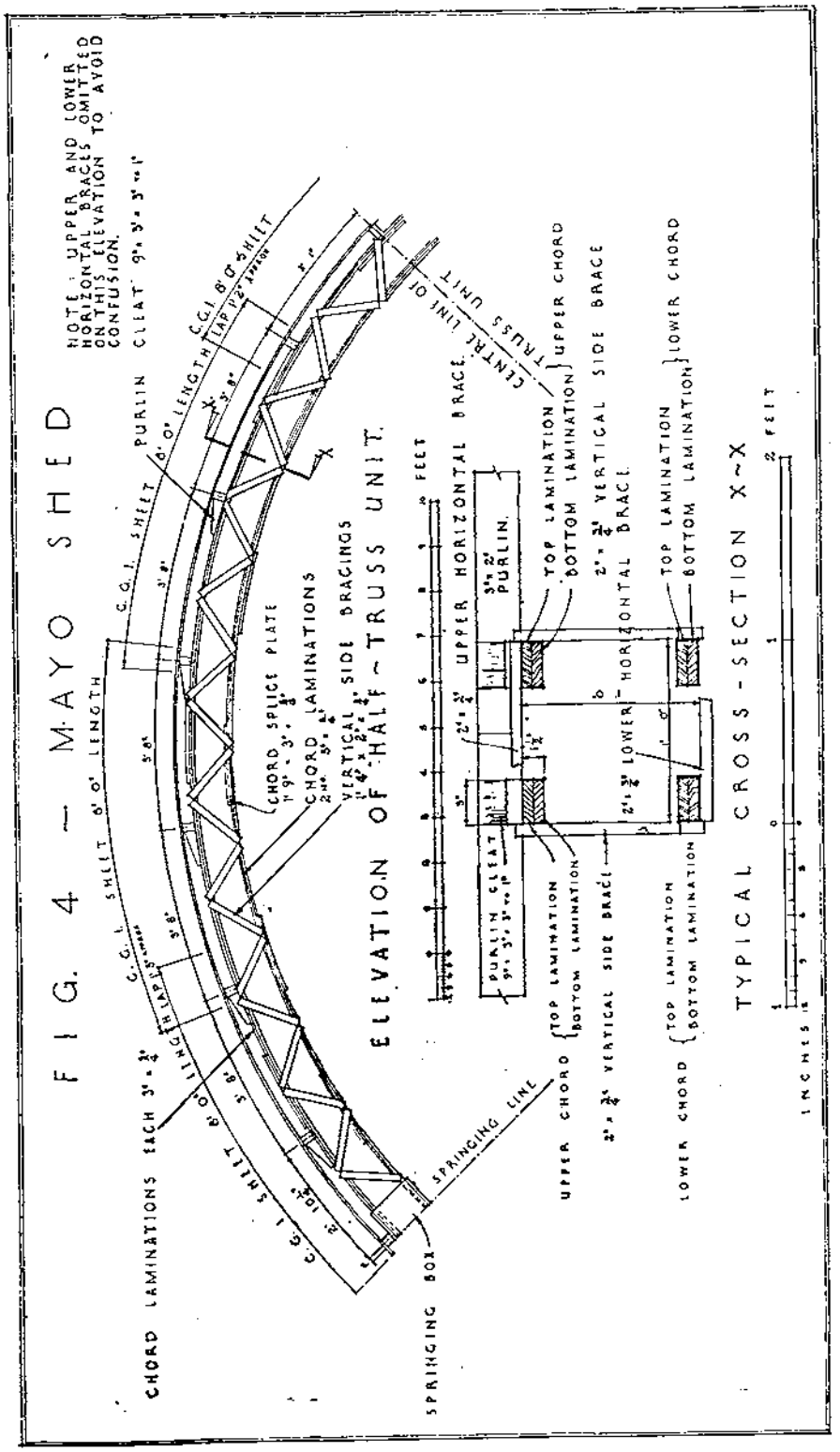


FIG. 4 — MAYO SHED
NOTE: UPPER AND LOWER HORIZONTAL BRACES OMITTED ON THIS ELEVATION TO AVOID CONFUSION.
CHORD LAMINATIONS EACH 3" × ¾"
SPRINGING BOX
SPRINGING LINE
ELEVATION OF HALF-TRUSS UNIT
CENTRE LINE OF TRUSS UNIT
PURLIN CLEAT
UPPER HORIZONTAL BRACE
TOP LAMINATION
BOTTOM LAMINATION
UPPER CHORD
2" × ¾" VERTICAL SIDE BRACE
LOWER HORIZONTAL BRACE
LOWER CHORD
TYPICAL CROSS-SECTION X~X
FEET
INCHES

INTELLIGENCE AND THE ARMY BOOT

By " SENTRY "

THE ARMY BOOT emerges from the Quartermaster's Store as a sinister and rather antagonistic article. It weighs about two and a half pounds; it is heavily armoured with steel plates and studs; its bodywork cannot accurately be described as streamlined; its general appearance is utilitarian rather than aesthetic.

With the introduction of the human foot to the army boot, there arises at once a serious difference of opinion. The boot, having been scientifically prepared for this moment, bears the assaults of the foot with hardly a squeak. The foot, on the other hand, has not been prepared adequately for the contest, and immediately despatches signals to all parts of the human body. The adjectival content of successive bulletins issued from Headquarters is undoubtedly affected. But as time passes, a certain comradeship is established between foot and boot. It is not quite certain which side may be said to have won the initial contest, but it is probable that there is some give and take. The foot reluctantly agrees to part with a cherished old bunion, or to grow new ones, while the boot billows and wrinkles in sympathy. However this may be, anyone who has looked carefully into the face of a matured army boot can have no doubt that it has a highly developed sense of humour.

This fact leads to a consideration of the spiritual properties of the boot, and there is some controversy as to whether these are benign or malevolent. The army boot has undoubtedly been responsible for the downfall of more quartermaster-sergeants than any other single item of military equipment. Does the blackness of the army boot penetrate into the souls of those with which it comes into contact, or does this blackness merely protect a heart of gold? One thing we know; psychologically, the boot makes a powerful effort to master the man. The novice is dismayed by the advertisement that his footwear gives to his movements. His morale is affected when he first measures his length on a stretch of pavement. Not only his feet, but his hands also seem to be abnormally large when he takes tea with a duchess. After a few weeks contact between boot and man, one of two things happen: there are no half measures. Either the boot has become part of the man, or the man has become part of his boots.

Even the strong-minded soldier, however, is influenced by his boots. As he stamps along the road, his tread is not only noisier; it is more assured. The face of the good soldier, like his boots, shines with an added lustre. He requires more *lebensraum*, and if this is not afforded him, he takes toll of the walls that surround his dwelling. He can take rougher treatment than before. He can fling himself or his boots at a snoring comrade with more confidence. He has been led by his boots into a more robust attitude to life.

For all this, it must be reluctantly admitted that the limitations of the human faculty prevent the overwhelming majority of us from following up these initial advantages, and from being led by our army boots into a more adventurous and fuller intellectual life. There are few who can extract lessons from those telling wrinkles and subtle creases that show so clearly the wisdom of even the average army boot. Indeed, it must be confessed that the majority of us soon find our personalities mastered by those of our army boots. It is therefore agreed by most of those who have given thought to the problem that the further apart the wearer of the army boot can be kept from the realms of Military Intelligence, the better.

It may still be remembered that in 1940 the Battle of Britain was fought and won. At that time, there were some millions of army boots at work in this country. Most of their tenants had learnt much from their boots, but few had learnt enough to acquire that degree of finesse which is required for delicate work connected with Intelligence. Sapper Jones cannot reasonably be considered to be among the few.

At this time, in an important headquarters not far from London, there was a small panel of officers whose duty it was to penetrate the future designs of the enemy. During the Battle of Britain, these devoted men had made two important discoveries. To begin with, the enemy seemed prepared, particularly at night, to run the gauntlet of our fighters and our anti-aircraft artillery. It was also noticed that many Germans had saved their lives by descending from their burning planes by parachute. For many days, these officers pondered over these two facts, and like all good intelligence officers, sought to draw deductions which might be of importance to their Country. At last one morning, probably as the result of unconscious cerebration, one of them had an idea. Might not the enemy now drop parachutists on purpose, and so establish intelligence centres in our midst?

A new file was quickly opened, and after a not unreasonably protracted discussion with "finance," it was decided to place the army on its guard. Such is the efficiency of army methods, that within a comparatively short time, orders of varying intensity had broken upon the consciousness of every soldier in our Islands.

A little later, two Canadian warriors, who must surely have taken counsel with their boots, were walking along a lane not far from the city of Oxbridge. They heard a rustle in a thicket, and, so they said later, were immediately reminded of the recent order about parachutists. This may seem surprising, but what is really astonishing is that they found in that thicket an individual in battledress, whose language was foreign to them, and who carried no identity papers.

They proudly escorted their prisoner to their headquarters. Unfortunately, we get only one glimpse more of these two brave men. Brave they certainly were, for interrogation called forth a confession from the captive that he had been dropped recently from a German aeroplane, with instructions to make his way to the farm of a Mr. Montague Bloggins.

This information was flashed from headquarters to headquarters, and in due course impinged on an officer so highly placed that he could not evade the duty of making a decision. The utmost secrecy regarding the whole affair was to be maintained; this order, of course, went out too late, but, as will be seen, this did not matter. In addition, a carefully organized and skilfully devised trap was to be set, so that other spies should approach the farm of Mr. Bloggins without warning or hindrance; and so that, once within the net, they should never escape. Soon after the issue of this order, the influence of the army boot began to make itself felt.

At about this time, a senior and distinguished member of a great university was considering the right course of action to take about a troublesome little affair. His proctorial duties had taken him that evening along the streets of Oxbridge, and he had been much astonished when the door of a drinking house suddenly opened, and a well-known and troublesome undergraduate landed on the pavement at his feet. The expression on the face of this wretched youth was a blend of annoyance, fear, pain and guilt; but apart from this, the learned Don was aware of an undiagnosed abnormality. He therefore decided to probe the matter. It appeared that the boy had found that his favourite inn had been invaded by a number of soldiers who were celebrating the capture of a dangerous spy. He had expressed his disapproval of the intruders, and the soldiers had at once secured him. Fortunately one of these men had on his person a pair of clippers, so he had at once removed a very exuberant growth of curls, and left nothing but brown stubble. The soldiers had then ejected the lad without even a word of advice. The Proctor had no doubts as to the penalty to be imposed on an undergraduate found in a public bar, but he was puzzled to determine what additional punishment was necessary to check a tendency among the young for mixing with the rough soldiers. Though he did not then know it, the curtain had already been rung up for a drama in which he was to play his part.

His thoughts turned to another problem. The university was engaged on a scheme to increase the supplies of home-grown food. But tools were lacking. This energetic and high-minded pedagogue had undertaken to make a round of the nearby farms to borrow such wheelbarrows, spades, shovels, hoes, rakes and other resources as could be spared. He studied the list of amenable farmers that lay before him, and, with the help of a map, he traced out his route for the expedition he would take next day. After a few minutes planning, he folded up the map, selected from his book shelves a volume of the *Satires of Juvenal* as light reading, and proceeded to bed.

The following afternoon, having borrowed a hay fork, and a lethal-looking tool for trimming hedges, from a very pleasant farmer called Abner Stone, he directed his steps towards the residence of a certain Mr. Montague Bloggins. From a slight rise, as he looked ahead, he saw some signs of unusual activity. Adjusting his long distance glasses, he saw that the army was carrying out some form of activity. He could distinguish a number of groups of soldiers forming a rough circle round the farm he was approaching. He attached little significance to what he saw, and in due course found himself in conversation with a Corporal, who was supported by half a dozen hungry looking men.

"Where d'you think you're goin' to?"

"I am visiting the farm of Mr. Bloggins."

"Oh! Are yer? Ye're tellin' me."

The professor was about to protest at what he interpreted as interference with the rights of the citizen, when an intelligent looking Lance-Corporal started a whispered conversation with his superior officer. The latter listened, and nodded his head.

"O.K. mate. You can go on there."

As he reached the door, the Don could hear from inside a considerable clatter of hobnailed boots, and the sound of many voices. It was not surprising that his knock was not heard. He therefore opened the door, and walked in. The kitchen was full of soldiers, and as soon as they saw him, three men rushed across, seized him, removed his farm tools, and searched his pockets.

"Nah then, no nonsense. We got yer."

" Sure he ain't got no something pistol, Alf ? "

" Okay, Corp. Funny little basket, ain't 'e ? "

It is not often that a proctor of a great university is frog-marched by two muscular privates into the presence of a Second-Lieutenant.

While signing to the soldiers not to relax their hold, the officer was courteous. He appeared to accept the Don's explanation of his visit, and said that all his papers seemed to be in order. But there was no question of release. No. The gentleman would have to wait until a senior officer came out from Oxbridge. Protests, and suggestions that witnesses to identity should be obtained were of no use. Finally the officer made a sign to the Corporal, saying,

" My men will see to it that you are comfortable."

It was not until nine o'clock that the promised senior officer arrived. The soldiers knew enough of the story to feel convinced that the good Mr. Bloggins would not be needing the contents of his larder for some time, and made sure that nothing should be wasted. The party was on the whole very cordial, except when, at about 5 p.m. a commercial traveller arrived. Not being a professor of Philosophy, this man did not take his arrest kindly. He was led to the officer protesting loudly, and even threatening reprisals, and a little later reappeared extremely flushed in the arms of his escort. He then kicked one of them on the shin. This brought in two more soldiers, who good-humouredly stood on his toes, while his boots were removed. He was then locked up in a cellar.

The professor, on the other hand, was admitted on nearly equal terms to the company. Later on, in telling his experiences in the Senior Common Room, he said,

" You know it astonished me how acute those fellows were. Their conversation is really most interesting. The only trouble is that they seem to know only one adjective, and they use it so often that it interferes with the rhythm and tempo of their talk."

Throughout the same day, the parachutist had had a lot of attention. He made few replies to any questions, and when he did speak, it was with a pronounced accent. Two officers were discussing him, in his presence.

" Pretty stout effort keeping quiet like this. I suppose he realises he'll be shot anyway."

" What iss thatt you say ? "

" Hullo ! You listening ? Well you heard what I said. As a matter of fact, they might possibly take a lenient view of your case if you tell us all about yourself."

The prisoner thought for a moment. Then he told quite a new story. When this was checked up, the man was found to be none other than 5466773 Sapper Jones, an innocent absentee.

" Why on earth did you spin all that yarn about Bloggins ? "

" Indeed, he iss a bad man. Before the war, I was on his farm. He sent me off without my pay, whateffer."

THE PROBLEM OF THE ITALIAN COLONIES

By BRIGADIER A. J. KNOTT, O.B.E.

WHEN Germany was defeated in 1918 it was accepted as right and inevitable that she should lose her Colonies. Since the victorious allies had all denied their desire for territorial gains some future for those Colonies had to be designed other than their appropriation by any of the victors, and the Colonies were placed under mandates, the administering powers in each case being responsible for their stewardship to the League of Nations. Between the wars there were periodical suggestions that one or other of her Colonies might be returned to Germany but, fortunately for the world, nothing came of them.

The case of Italy is somewhat different. Although she was defeated in the field and surrendered unconditionally in 1943, she did then render some aid to the allied cause, even to the extent of fighting against her own former allies. Moreover the ideas of the world at large about the future of native peoples and their countries have changed since 1918. The Charter of the United Nations makes it clear that the aim of all nations and peoples, regardless of colour or race, must be eventually to achieve self-determination and the kind of self-government they themselves wish, provided that this accords with the general principle of democracy as understood by the more experienced and enlightened peoples of the world. With such a background to discussions and negotiations any form of permanent or unlimited mandate for the ex-Italian Colonies would not be acceptable in the eyes of the world nor would it meet the legitimate aims of the colonial populations, and some other solution has to be found which will be at once more restrictive of the administering powers and more promising of progress for the native peoples. At the same time, few if any of these peoples are yet ready for self-government and it is clear that some form of trusteeship over them must be arranged now, to provide adequate administration for the immediate future and the help which they need in their progress towards independence.

It has been argued that the only sound basis on which to determine the ultimate ownership of any portion of the earth's surface is that of length of occupation and it is certainly true that in a majority of cases in which such problems arise a solution based on this theory will satisfy more of the modern conceptions of justice and equity than any other. But in the case of the Italian Colonies there is, at any rate for the present, no dispute as to ultimate ownership—that belongs to the native peoples of the territories and to nobody else and is to be fully recognized as soon as they are culturally, politically and financially fit to shoulder the responsibilities of self-government. The problem of today thus becomes one of providing an interim control over the territories and their peoples and of ensuring that they shall be governed on democratic and progressive principles until such time as they can be left to look after themselves.

The Italian African Empire at the beginning of the war comprised two main groups—Libya, including Tripolitania and Cyrenaica in the north and Italian East Africa, consisting of Eritrea, Somalia and Ethiopia. Of the latter group Ethiopia was returned to the Emperor Haile Selassie, for good or ill, in 1941 and is therefore outside the scope of this article except in so far as the development of Italian East Africa as a whole, while it was administered as one entity in the Italian Empire, included improvements in Ethiopia which still affect the condition of her neighbours. The present problem directly concerns the older Colonies of Eritrea and Somalia and the later but by no means recent acquisitions of Libya, Tripolitania and Cyrenaica.

Eritrea covers less than 50,000 square miles of the east central portion of Africa. The country is largely barren, the coastal strip hot and sticky and the inhabitants for the most part unenterprising and often lazy. The population totals rather more than half a million souls and never included more than about 73,000 Italians and foreigners, the remainder being natives. Nearly half of these are Coptic Christians, many of them Ethiopians, who live in the higher parts of the plateau, while the others, living in the lower parts, are almost entirely Moslem. A dozen or more languages are in daily use, many of them little more than dialects and unintelligible to any but those whose mother tongue they are, while the habits and way of life of the tribes vary from the purely nomadic to settled agriculture. Tribes overlap the borders of the Sudan as well as those of Ethiopia, and in fact the Colony of Eritrea has but few signs of unity of race, culture, language or religion.

Somalia is four times the size of Eritrea and has double the population, but the Italian and foreign element is even smaller than in the older Colony. Before the war the non-natives totalled only some 20,000 out of a population of over 1,000,000 and European settlement is virtually impossible except in isolated coastal districts and along the lower Juba river. The tribesmen are some of the most difficult in the world to know or to govern, as officers and others discovered to their cost during the war, when they fought on both sides and gave trouble wherever they were. Somali units under British command showed an inclination to mutiny on the slightest or no provocation and the Italian officers of at least one native unit were known to have slept in a zariba, away from the main unit lines, under loyal guards, to protect them from their own Somali troops. One of the main causes underlying this reputation for unreliability and trickiness is the Somali language, which is primitive and complicated in the extreme and bears but little relation to any other known tongue. It has been mastered by but few Europeans, even among those who have served among Somalis as officers or administrators, and government through interpreters is notoriously uncertain and risky. The population of Italian Somalia is scattered and disunited and there is no trace of a natural or hereditary ruling class or family which might take control of the whole country and command the respect or loyalty of the mass of the Somali peoples.

These two Colonies were incorporated, with Ethiopia, in Italian East Africa and there is no denying the improvements, at least on the surface, which the Italians made in many directions. A system of communications, essential to peaceful living and to economic progress, was designed and completed between 1937 and 1939 and included more than 2,000 miles of first-class new main roads, bringing Ethiopia into touch with Eritrea and linking Massawa with Addis Ababa, Harrar with Mogadiscio and Asmara with Gondar. In Somalia alone another thousand miles of roads opened up the country while great improvements were made to the harbours and ports. Massawa and Assab, ports of Eritrea, were given improved equipment and

facilities and trade with Ethiopia brought commercial and industrial activity to that formerly inert country. All these works entailed the importation into Africa of large numbers of Italian artisans and craftsmen, constituting a large-scale experiment in the use of European labour in Africa which was interesting but is unlikely to be imitated by other nations.

When, after a period of much strife and persecution, the Duke of Aosta became Viceroy in 1937 he embarked on a policy of co-operation with the natives throughout his dominion, very different from the brutal and repressive administration of his immediate predecessors. Under his guidance agriculture received help and encouragement and the natives benefited accordingly. In Somalia methods of growing bananas and cotton were improved, sugar and maize crops increased and the output of ground-nuts and castor oil seed was raised. Land reclamation schemes in the Tessenei district of Eritrea, worked in conjunction with the use of the Gash waters under the Anglo-Italian agreement of 1927, enabled the natives to produce more wheat and cotton and promised to lead to greater prosperity in the future.

The Duke was neither afraid nor ashamed to consult with and learn from more experienced administrators in the British Colonies and in the Sudan where he was welcomed as an honoured guest, an enlightened proconsul and a charming visitor. By his death as a prisoner of war in Nairobi, in March, 1942, the natives lost a true friend, the Italians a valuable statesman and the world a progressive colonial administrator.

But the territory that was Italian East Africa contains a high proportion of desert or semi-desert and is economically unattractive. It is more than doubtful whether the naturally indolent natives, even with the help and support of the sprinkling of Italians and other foreigners, would ever have returned a really satisfactory dividend on the vast sums of money which were poured into the territories from the Italian Treasury.

The position in the northern colonies was rather different. Here Arab blood, language, religion and especially culture and ways of life, brought in by the Islamic flood which had surged over Africa in the seventh century and the westward surge of Arabs in the eleventh century, had so permeated the people that, in spite of the Mediterranean, Berber or Caucasian background which belonged to many of them, they had, by 1939, become essentially Arab in their outlook. Tripolitania had, it is true, remained largely outside the machinery and aspirations of the Arab League, and along the coasts there were Greeks and other southern Europeans engaged in the sponge trade or other more or less lucrative occupations. There were also some 30,000 Arabic speaking Jews who had been in that part of the world since pre-Christian days. But Arabs or people of Arab ways of life were in an overwhelming majority and entitled to primary consideration in the future.

In 1939, following the policy which had been formulated in Italy in 1934, Tripoli, Misurata, Benghazi and Derna had all been raised, by royal decree, to the status of provinces and integral parts of the Kingdom of Italy and thus ceased, strictly speaking, to be Colonies. The decree provided that the natives should enjoy a special form of Italian citizenship and should retain all their rights under Mohammedan law where this might conflict with Italian law. In the event, the implementation of this scheme was interrupted by the outbreak of the war, and it had no real or lasting effect. The outside world was thus prevented from learning the reactions of the natives to the honour thus conferred upon them or of studying the effect of this attempt to turn Africans into Europeans. Nevertheless it must be admitted that this step

on the part of the Italian government showed its willingness to recognize the rights of the native to consideration and to promote his constitutional advancement.

In the Italian plans for the development of North Africa roads and agriculture took first place, as in the case of the other colonies. Over 1,000 miles of good new road were built to link Tripoli with Benghazi and Tobruk—a road which served both sides during the war as a main artery of supply both in advance and retreat. To meet the need for agricultural development the government planned to send some 30,000 workers from Italy in 1938 and 1939, hoping by this means also to ease the problem of over-population at home. In fact over 3,500 rural families arrived in Libya and were settled on farms totalling nearly 200,000 acres. This was no attempt on the part of the Italians to convert Libya into a wholly or even a mainly European settlement, and equal attention was given to the native population. In the same two years, vast plans were prepared for their settlement and progress and a start was made with putting these plans into operation. The number of native farmhouses built by the government rose from thirty-two in 1938 to 262 in 1939 and altogether, in the two years preceding the war, the area under government-sponsored cultivation was more than doubled. Olives, vines and cereals were the main crops, their production being aided by the sinking of artesian wells and by re-wooding the cliffs to prevent the encroachment of the sand on the cultivated areas.

But all these plans seem to have taken little account of the basic potentialities of the territories for which they were made. Economically they could never be more than a poor imitation of southern Europe. Given modern methods of cultivation and a great deal of patience in persuading the natives to make the best of them, it is probable that eventually the people would have become self-supporting on a higher standard of living than they had previously enjoyed. There might even have been some surplus for export of hides and skins, wheat, olive oil or sponges. But the conversion of that part of Africa into an area suitable for large-scale white colonization would have required a major revolution in the science of desert agriculture.

The war came at a bad time for the Italian African Empire. Many of the Italians who had emigrated were still trying to find their feet and to learn how to be useful citizens in a new land, the natives themselves, slow to learn the advantages of new methods of cultivation, were barely beginning to make good use of them or to appreciate and turn to advantage the improved communications which their masters had provided, and vast sums of money had been invested in the territories which were as yet showing no dividend at all. Much had been done, something achieved, but still more remained to be done and the countries needed above all a long period of peace in which to settle down and develop their strength and resources on the new basis. Instead of this the whole process of readjustment and progress was interrupted. With the outbreak of war all major works were suspended, men of all colours joined the fighting forces either locally or in Italy and communications with the homeland were either seriously hampered or completely cut off.

The course of the campaigns in Africa against the Italians is too well known to need re-telling here. The brilliant operations of Sir William Platt from Khartoum, and the complementary offensive by Sir Alan Cunningham from Kenya, led to the restoration of the Negus to the throne of Ethiopia in May, 1941, and in the following November Italian military power in East Africa came to an end in complete surrender. In the north things moved more slowly. More difficult conditions and the intervention of the Germans caused

the operations to drag on for two more years until the final occupation of Tripoli in January, 1943, set the seal on the defeat of Italy in Africa. British Military Administrations took over the running of the territories leaving their future to be decided when the stress of war should permit.

The problem was considered by the Foreign Ministers when they met in September, 1945, and May, 1946. It was agreed that any proposal put forward for the ex-Italian colonies must, first and foremost, fulfil the conditions laid down in the Charter of the United Nations and provide the means whereby the native populations should be led to eventual self-determination and, if they wished, to independence. Four such schemes were put forward. The American plan entailed collective United Nations trusteeship for all the Colonies while guaranteeing the complete independence of Libya within the next ten years. No such provision was made by Russia, who wanted the territories to be under a Soviet administration with Italian deputies. Certain other complications in their scheme tended to confuse rather than to simplify the issue. The Italian claim to return to their former position in the colonies was pressed by the French representative, while Britain proposed that Libya, Cyrenaica and Tripolitania should have immediate independence and that Italian Somalia should be incorporated in a Greater Somaliland, for which Britain herself would be the trustee. In putting forward this scheme Mr. Bevin stressed the special interest which Britain felt in all the colonies, having played the major part in their liberation and reconquest, but against this must be set the unimpressive record of the administration in British Somaliland which had twice in a generation abandoned the natives to their fate in the face of opposition which, though determined, should not have been such as to daunt a Great Power. In the course of negotiations various other claims or suggestions emerged. Egypt wanted rights over certain oases and over the Sollum plateau and quoted an Egypto-Ethiopian agreement of 1884 in support of her claim for Massawa. In her role as a great Arab power she also pressed for the independence of Libya under the aegis of the League. Ethiopia claimed unrestricted control over or ownership of the whole of Eritrea and was supported in this by powers as wide apart as Canada and China. South Africa put forward the essentially reasonable plea that, in view of her position in Africa and of the part she played in both the East and North African campaigns, she might be specially consulted before any final decision was made, and it was agreed that this should be done.

The Foreign Ministers came to no conclusion. The past achievements of the Italians in their Colonies and the part which she played in the later stages of the war were both given due recognition, but no guarantee was given or implied that she must have any part in either the interim or the ultimate control of the colonies. Realizing the detrimental effect on the territories and their peoples which must come from undue delay, the Ministers agreed that the final decision should be made within one year of the ratification of the peace treaties with Italy. If, then, they have still been unable to reach agreement, the whole matter is to be referred to the General Assembly of the United Nations. Meanwhile the British Military Administration carries on.

When Italy signed the Peace Treaty in 1947 she added to her signature official protests on many points, among them the disposal of her former Colonies. In confidence (or optimism) that these will have effect, her Ministry of the Colonies was never disbanded but still sits in Rome hoping and waiting for something to administer. The two main grounds on which Italy bases her claim to resume control, either absolutely or under the supervision of the United Nations, of her Colonies are those of historical fact and of past achievement. Both of these merit serious consideration if not actual sympathy,

and the return of Italy to Africa should not be ruled out merely because she started the war on the side that eventually lost, for in the interests both of justice and expediency her claim can be well defended. Under her regime, she claims, the agricultural possibilities of Somalia were improved and thereby the natives were given a better chance of earning a reasonable living. The development of native settlement in Eritrea can also be quoted, and the way in which the Italians concentrated there on trade rather than agriculture, leaving the latter to the natives, who also benefited from the industrial and commercial enterprise of their masters. In the north she calls attention to the extension and improvement of agricultural methods and scope and to the constitutional advancement of the native which was planned and executed, only to be interrupted in its effect by the war. Above all she reminds the world that all the colonies now under consideration belonged to her for many years before she embraced the Fascist faith which, she alleges, had no part in their development except in so far as this was accelerated by the influx of Italians, who might never have emigrated had it not been for the effects of Fascism at home. While all these arguments and claims are being digested and discussed the countries concerned suffer, for already, through inertia and uncertainty as to the future, the Green Mountains of Cyrenaica are reverting to desert while the magnificent mountain roads of Eritrea and the east degenerate into the goat tracks which were all those countries knew of communications until the Italians brought the enterprise, money and labour which led to the amenities which they enjoyed before the war.

Unlike many similar issues which arose at the end of the previous war this, though complicated enough, is at least not prejudiced or vitiated by undertakings given secretly or openly while the fighting was still in progress—with one small exception. Speaking in the House of Commons in January, 1942, Mr. Eden, on behalf of Great Britain, stated that in no circumstances would H.M. Government permit the return of "the Senussi of Cyrenaica" to Italian rule. Since these Senussi comprise some 85 per cent of the total population of Cyrenaica, this promise must be taken to rule out the resumption of Italian control over the whole of that colony. What are the possibilities for the remainder?

Tripolitania, though not as backward as many native countries, will need at least guidance and probably active help from outside for some years to come; but there is little there to encourage the outsider to spend money or man-power. Of possible trustees for that part of Africa, Turkey might have an historical claim but little else; France has already a large share of interest in North Africa and would not be prepared to honour any undertaking to grant independence within a fixed or limited time, for she fears the effect which this might have on the peoples of her own Tunisia; Great Britain, though closely interested, has responsibilities enough without adding to them, even if the other great powers were willing to allow her to take on more. There remains Italy herself—virtually the only power able and willing to carry on the development and administration of this area. If the British promise to the Senussi is to be kept some other solution for their part of the country must be found, but for the remainder of ex-Italian North Africa it should not be impossible to provide adequate safeguards against exploitation, against vindictiveness towards those natives who helped the allies and against persecution of the inhabitants. Under their former regime there were, if reports are to be believed, many cases of brutality and unscrupulous oppression of the local population, though it seems likely that many stories were exaggerated. In any case, it will be for the United Nations Organization to organize and provide supervision, whatever power becomes the trustee,

and to prevent the recurrence of abuses. Under such control and with provisions to limit the garrison and to throw open sea- and air-ports to the use of all nations, there is much to be said for allowing Italy to become the trustee of at least part of her former northern colonies, the responsibility for which nobody else really wants, until such time as the natives there have progressed far enough to warrant the grant of self-government.

Somalia must have outside control or revert to chaos. In such a desolate, unattractive country, where European settlement holds few advantages and is impossible except in a few restricted areas, there must be considerable temptation to leave the people to themselves, to sort out their own troubles and fight their own battles. The alternative, as suggested by Britain at the original conferences, is to create a larger state, call it Greater Somalia or what you will, which might be large enough and have adequate resources to become less of a liability economically and even, perhaps, a sound proposition. This would entail adding to Italian Somalia parts of Kenya and Abyssinia together with British and French Somaliland, and might therefore provoke much opposition. If this could be overcome—and there is no reason why it should not—the question would arise who was to run the new country. To give Italy control over *more* territory than she had before the war would be out of the question, and, again, no other European country would be sufficiently interested or rich in man-power or resources. If America could be prevailed upon to undertake the task it would give her the chance to gain practical experience of African administration on which to base the criticism which now, though not infrequent, has little practical background.

The problem of Eritrea is made the more difficult by the absence of any uniformity of history, geography, race or language, and in consequence partition at once suggests itself as the practical solution. Certain parts of the country would fall naturally and easily into the structures of the Sudan and of Abyssinia and the latter would gain a much-needed outlet to the sea.

In the absence of any agreement by the Powers the British Military Administration, which took over from the fighting troops as the territories were conquered, is to carry on until, within one year from the ratification of the peace treaties, a decision is reached either by the Foreign Ministers or by the General Assembly of the United Nations. In the meantime a four-power fact-finding mission is to visit the territories themselves and report back to the Foreign Ministers. All the powers that have existing interests in Africa, particularly those bordering on the disputed colonies, are concerned in the result. Ethiopia and Egypt have made concrete claims; the Arab League is interested in the ethnological (and perhaps in the ideological) aspects of the problem and Britain, with the most experience of Colonial and African administration, will not willingly agree to any solution which, like the American and Russian plans, involves the division of responsibility between many nations, for responsibility shared is too often responsibility shelved.

The complexity of the problem of these colonies of the minor Axis partner is sufficient to make statesmen the world over rejoice that the major partner, at any rate, had no Colonies left to present an even more intricate conundrum, but while nobody with the interests of the people at heart would wish for a hurried or ill-considered decision, there is no denying the harm which prolonged delay is doing to the peoples of those large slices of Africa who might otherwise be learning to make a greater contribution of food and general production to the world shortage of today. It is to be hoped that the decision to decide within the year will be upheld, no matter what new factors the fact-finding mission produce nor what obstructions are put in the way by countries not directly concerned.

ROYAL ENGINEERS' GIFT TO SAPPERS OF INDIA AND PAKISTAN

By Lieut.-Col. M. C. A. Henniker, D.S.O., O.B.E., M.C., R.E.

(Reprinted from *The Sunday Statesman* (Calcutta) of 7th September, 1947.)

THE officers of the Royal Engineers are now completing a transaction in India, the like of which can seldom have been seen before. They are presenting their officers' messes, lock, stock and barrel, to the officers of their Indian counterpart—the Royal Indian Engineers.

There are five principal R.E. officers' messes in India: at Roorkee, Bangalore, Kirkee, Quetta and Rawalpindi. The mess at Roorkee is the oldest. It was built in 1855 by a handful of British officers serving with the Bengal Sappers and Miners. It is a magnificent building, and must have cost its founders much. Since then it has been enlarged by generations of Sappers, and panelled with teak. On each piece of panelling is engraved, on a silver plate, the name of the officer who presented it.

The Bangalore mess was established in 1865. It rivals (some say it excels) the Roorkee mess in comfort and prosperity. It is approached by a long drive through an unique avenue of Java fig trees. Next, comes the Kirkee mess, built in 1907. This was built partly from the subscriptions of the officers serving with the (then) 3rd Sappers and Miners, and partly from a Government loan. By good economy the officers paid back the loan and by 1921 it became their "absolute and unembarrassed property."

The messes at Quetta and Rawalpindi are by comparison new, having been established in 1927 and 1933 respectively. But they are good.

The messes are "going concerns" with furniture, stocks of wine, bank balances, countless silver plate and trophies of all kinds. All this has been contributed by R.E. officers; and in one mess alone the assets exceed Rs. 200,000.

A list of all the pieces of plate would fill a collector's catalogue. Space will only permit a description of two trophies of extraordinary interest. At Roorkee there is a silver vase in the form of a winged figure of Victory. It was made in Italy, after World War I, by order of the Italian Government as a tribute to President Wilson. But his later attitude over Adriatic questions annoyed the Italians and the vase was never presented. The British military attaché at Rome brought it to the notice of a Roorkee Sapper officer, and it was presented to the mess by the officers who had served in the war.

Of a different kind of interest is the Magdala Vase at Bangalore. It was made from a silver Abyssinian drum presented to the commander of the Madras Sappers by Lord Napier in commemoration of their services in the campaign of 1867.

While the plate represents human endeavour in the field of battle, the heads on the walls represent it in the field of sport. Not everyone likes this form of ornament. But those who understand big game hunting will agree that quite phenomenal endurance, ingenuity and skill are required to make such collections, including, as they do, specimens that would find a place in the best collections in the world.

Home of Tradition

All these things together make a home; a home not only of men, but a home of tradition. It is a tradition of service. As one sits in any of these messes, with the polished tables, the spotless linen, the pictures, the trophies and the plate, or perhaps as one sits in the cool shade of the garden, the ghosts of those famous Sappers, who sat there long ago, pass across the mind.

Lord Kitchener, Lord Napier of Magdala, Sir Bindon Blood and Sir Henry Prendagast, V.C., are known to all. Less known, but equally remarkable, were three Sappers who turned their hands to the art of Government. Sir Archibald Campbell was the first. He started in Madras the Board of Works, a Hospital Board, a Revenue Board, a Board of Trade and established a bank and an exchange in the early nineteenth century. Later came Sir William Denison and Sir George Sydenham (afterwards Lord Sydenham) to whose encouragement India is indebted for the Tata Hydro-Electric scheme.

In a humbler sphere, Colonel John Colvin was the pioneer of the Jumna Canal Systems and the Ganges Canal Systems that now make fertile vast tracts of otherwise waterless waste. Colonel Pennycuick will be remembered in connexion with the Periyar Irrigation System of Madras. The tunnel, a mile long, through the ghats at Travancore to convey water to Eastern Madras is a memorial to his vision, technical skill and persistence. In the hydro-electric scheme at Mandi the Punjab owes a debt to Colonel Battye, its engineer.

To Thomson, Napier, Taylor and General "Buster" Browne and to scores of unrecorded Sapper officers India owes the present Grand Trunk Road from Calcutta to Peshawar, many of the roads of Baluchistan and the NWFP, the Hindustan Tibet Road and mountain roads to Murree, Dalhousie, Chakrata, Almora and Naini Tal. All these brought peace and prosperity besides their strategic value.

The great railway network of India owes much to R.E. officers. They have advised the government in railway policy. They have been general managers and chief commissioners of the Indian railways.

The docks and lighthouses round the coasts of India are intimately linked with the names of Sapper officers. Over all the land there spreads the system of the Survey Department. It was built by a long line of Sappers who toiled, in heat and cold, in the plains and in the high Himalayas, to make the maps of India equal to those of any other country in the world.

No student of India's history needs reminding of the Sappers' share in her defence. It is too well known to bear repetition here. Many an unknown warrior wore a Sapper badge. The spirit that animated these men was one of service and adventure. It is enshrined in their Indian homes—the officers' messes. The tradition is carried on by Indian Engineers and the gift to the Royal Indian Engineers of these officers' messes by the Royal Engineers is a token of goodwill in the passing of a tradition from British to Indian hands.

The allocation of this mess property to the Engineer officers of India and Pakistan is now being decided by the donors through a sub-committee of R.E. officers.

The final division is still under consideration, but it is quite certain that the Engineer officers of both Dominions will take over their messes fully furnished, equipped and endowed with funds on a generous scale amply sufficient to ensure that they will start off free of encumbrances, and in a sound position to continue to uphold the time-honoured Engineer traditions of mess life and hospitality.

BAILEY BRIDGING FOR REPAIR OF FLOOD DAMAGE

By MAJOR R. G. BISHOP, R.E.

INTRODUCTION

THE CAVENDISH BRIDGE at Shardlow, Derbyshire, was partially demolished by flood waters on 21st March this year. It was built in 1758 and carried the A.6 road between Loughborough and Derby across the Trent, which forms the boundary of Leicestershire and Derbyshire at this point, the former county being responsible for its maintenance. Traffic diversion was fifteen miles long. The A.6 was a main trunk route. The Ministry of Transport required its immediate replacement. As this was beyond the resources of the Civil authorities, Military Engineers were consulted.

After a recce had been made, the Chief Engineer, Northern Command, ordered the R.E., O.C.T.U., at Newark, Notts to build a 150 ft. triple triple, Class, 70, Bailey Bridge. It was understood that the bridge might be required for a period of five years.

ORGANIZATION

The task was given to the O.C.T.U. Field Engineering Wing, with orders to commence work on 31st March. To simplify control of the job, the working party was organized as a Field Squadron, with a H.Q. Troop responsible for administration and three troops of officer cadets for building. The Squadron Officers were all instructors in the Wing, the Senior Instructor acting as Squadron Commander. A Q.M.S.I. acted as S.S.M., and another as N.C.O. i/c stores. Sergeant Instructors became Troop Sergeants. Cadet Seniors were given N.C.O. appointments on the scale of one lance-sergeant and four corporals in each troop with the normal responsibilities of these ranks. One Cadet officer was appointed to Squadron H.Q. to assist the two in charge. Transport was allotted to the Squadron by the O.C.T.U. for general use, special transport for the bridging equipment being provided by Northern Command.

Sufficient accommodation was found in 634 (P.W.) Royal Pioneer Corps Camp at Alvaston, about four miles from Shardlow. Nearer accommodation was not available.

The R.E. Squadron consisted of five officers, fifteen O.Rs. and 120 officer cadets.

The following additional troops were under command :—

1 Tp. (2 lights) 230 Bty., 84 (S.L.) Regt., R.A.
1 Sec. (6 × 3 tonners) 28 Coy., R.A.S.C.
20 Pioneers.

STORES AND PLANT

The Ministry of Transport supplied and delivered to the site all timber. Bridging equipment was provided by C.E., Northern Command, from the E.S.D. at Hessay, near York. To help the E.S.D. and to ensure stores arrived in the correct order, a Q.M.S.I. was sent to supervise loading. One convoy of fifteen three-tonners arrived on the site at 1700 hrs., 31st March, the second of twenty-one three-tonners at 1200 hrs. on 1st April.

A Class 1 Bulldozer and operator were sent from the S.M.E., and a Coles crane from the E.S.D.

Construction

The Ministry of Transport would not agree to the demolition of the remaining arch, so it was not possible to make the new bridge decking level with the existing approaches. It was designed to clear the top of the arch by 3 in., resulting in the deck being 11 in. above the approach on the Derby side, and 1 ft. 3 in. on the Leicester side. The civil authorities undertook the removal of the road and fill on top of the remaining arch, and the excavations for baseplates. They were also responsible for re-making the approaches and putting on the skin decking.

The Derby side was used as a building site. It was not ideal because of an upward slope of about 1 in 16 towards the gap, resulting in the tail of the bridge being 3 ft. 5 in. above road level, 100 ft. back from the rocking rollers. To overcome this discrepancy in levels, building platforms were constructed by placing normal decking on top of transoms which were laid transversely across the road. Due to the restricted width of the site, the Coles crane could not be used for double storeying. A limited amount of equipment was dumped on the site on both sides of the centre line, the rest was dumped on the road behind and brought forward by hand.

Because of the gradient and sharp bend in the approaches on the Leicester side, it was ruled out as a building site.

The design of the bridge was standard. Baseplates were positioned 8 ft. back from the abutment on a suitable grillage. To avoid overloading what remained of the arch on the Derby side, rocking rollers were placed behind the baseplates. An extra bay of double single was added to the tail to permit jacking down. It was launched as a triple double structure (the triple storey added in bridge with the Coles crane), being pulled into position by the bulldozer on the far side. Launching links were not required in the nose.

A time-table is shown separately. (Appendix A.)

Liaison

All liaison with the civil authorities on the job was carried out by the Squadron Commander with the Engineering Assistant of Leicestershire County Council, who was responsible for bridges in that county, and represented the County Surveyor. He was referred to in the matter of levels, excavations, approaches, etc. No difficulty was experienced and this system worked to the satisfaction of both parties.

The following were suggested as useful additions to aid traffic and protect the bridge :—

A loading gauge.
End post protectors.
Traffic lights.
Clear sign posting of load classification, etc., most of which have been incorporated now.

The responsibility for maintaining the bridge was handed over to Leicestershire County Council directly it was finished. Their maintenance gang was briefed by the Squadron Commander, and full written instructions sent to the County Surveyor. Some Bailey tools were handed over for this purpose.

General

It was necessary, on account of numerous sight-seers (building took place during the Easter holidays), to erect a barrier on each approach and call in the County Police to control traffic.

DINING-ROOM, R.E. MESS, ROORKEE.

The Headquarters Mess of the K.G.V's O. Bengal Sappers and Miners.

Reproduced from *The Indian Sappers and Miners* by Lieut.-Colonel E. W. C. Sandes, D.S.O., M.C., R.E. (retd.).

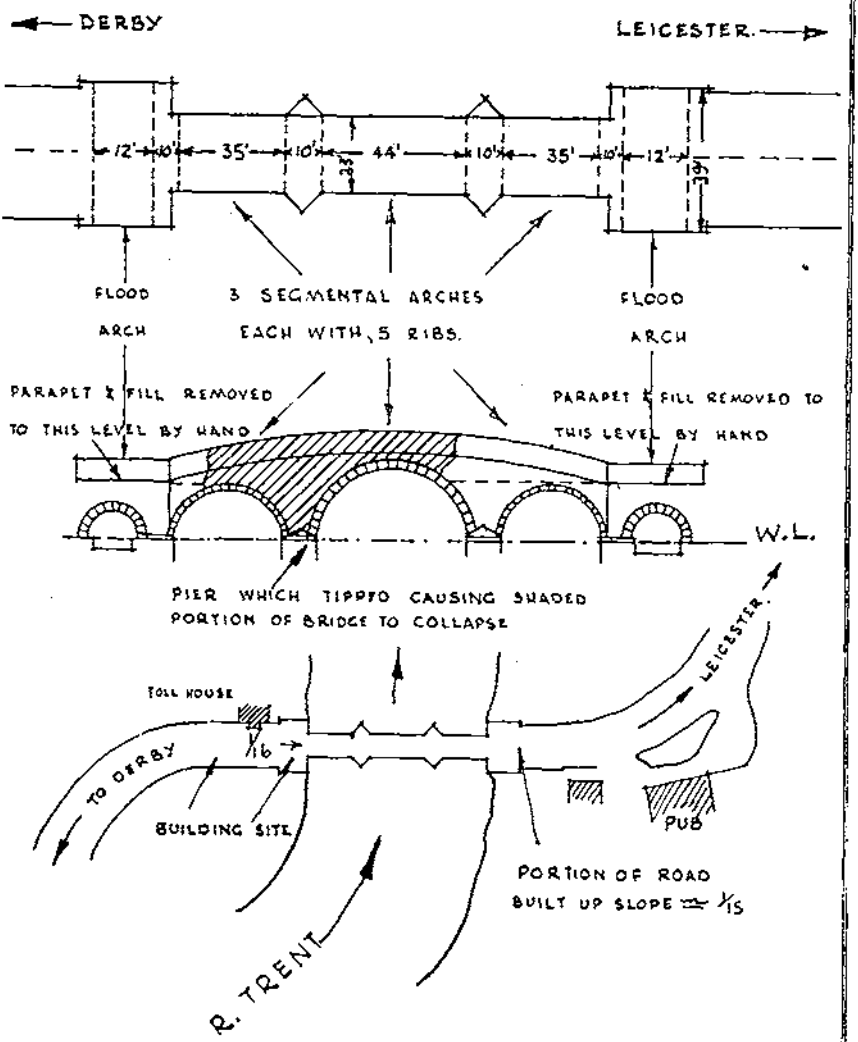
Dining room, RE Mess, Roorkee

Cavendish Bridge after the pier had toppled over.

The new Cavendish Bridge open to traffic.

Bailey Bridging for repair of flood damage

CAVENDISH BRIDGE



The site was constantly besieged by reporters and photographers from local newspapers, who demanded interviews with Squadron Officers as to how long the bridge would take to complete, and details of its construction, etc. Failing to get these interviews, cadets were sought out who gave them the "dope," which invariably was by way of a leg-pull. Articles appeared in the papers to the effect that Sappers were "throwing" the bridge across, and comparing it with crossing the Rhine! An amusing cartoon in one paper, depicting bridge construction, *à la* Heath Robinson, caused much general merriment. These articles amused all concerned and were carefully saved, together with a group photograph taken on the bridge, as souvenirs of an unusual O.C.T.U. course.

Conclusion

(*a*) It was excellent training.

(*b*) Troops who are relatively untrained in Bailey Bridging can erect a bridge of this type very quickly, provided the key personnel in charge know the construction drill thoroughly. In this case cadets had received very little previous training.

(*c*) The Coles crane was first-class value for triple storey work and, lifting five panels at a time, did the job in about half the time it would have taken to do by hand, but it must have an experienced operator in control.

(*d*) Night work was made easy by the indirect light from the two search-lights which were situated about a mile from the site. Indirect light from low cloud is better value than direct light, and very little shadow is cast by this method.

Appendix A

Time-table for the job including Recce and Liaison before building commenced.

Diary of Recce Phase

21st March	Large crack across centre of road reported by lorry driver, and Cavendish Bridge closed to traffic.
1500 hrs.	C.E. Northern Command orders R.E., O.C.T.U. to recce bridge with a view to constructing a temporary bridge over the top of damage.
2000 hrs.	Pier topples over carrying away the spans on each side of it.
22nd March 1130 hrs.	Conference held on site to discuss construction of a temporary bridge. Attended by representatives from Leicester and Derby County Councils, and the Ministry of Transport. R.E., O.C.T.U. representative present on behalf of C.E. Civil Authorities ask for a Bailey Bridge.
23rd March	R.E., O.C.T.U. prepares project for Bailey Bridge.
24th March	Project taken to C.E. Northern Command for approval. Civil Authorities commenced excavations for bankseats.
25th March	Further conference held on site. Ministry of Transport make formal application to C.E. Northern Command for military to construct a temporary bridge.
27th March	C.E. orders R.E., O.C.T.U. to build a Class 70 Bailey Bridge, commencing 31st March. C.E. undertook to supply transport and equipment. Ministry of Transport to supply all timber and to be responsible for transporting it to site. Civil Authorities to excavate for bankseats and remove road and fill on top of remaining pier.

Diary of Construction

Notes 1. Hours of work on site 0830–1230 and 1330–1700.
2. Search-lights were not available for night work until 3rd April.
3. Total working time: fifty-four hours.

31st March	
1700 hrs.	Fd. Sqn. arrives at Alvaston Camp.
1830 hrs.	15 × 3 ton loads of Br. stores arrive and are unloaded on site by No. 3 Tp. and 20 pioneers. Civil Authority complete excavation for Derby side bankseats.
1st April	No. 1 Tp. sets out launching rollers and rocking rollers. No. 2 Tp. operates Folding Boat Ferry and assist with carriage of stores. No. 3 Tp. and Pioneers unload 21 × 3 ton loads of equip., this completing requirements for bridge.
2nd April	No. 1 Tp. commences building, completing nose and three bays. No. 2 Tp. works from 1700 hrs. until dark at 2030 hrs. and completes further three bays of D.S. No. 3 Tp. operates ferry and lays grillages and rocking rollers on Leicester bank. Pioneers remove parapet walls on remaining arch. Civil Authorities finish excavations on Leicester side.
3rd April	Construction, less five bays, D.S., completed by 1700 hrs. Work from 2000 hrs. until 2200 hrs. with indirect lighting from two search-lights and completed construction.
4th April	Bridge launched by 1200 hrs. using bulldozer to pull it across. One end post broke and held up jacking-down. Pioneers returned to unit.
5th April	Bridge jacked down by 1200 hrs.
1430 hrs.	Commenced triple storeying with Coles crane, five panels each lift. Strong wind slowed up work. Complete outer trusses less four bays by 1700 hrs.
6th April	(Easter Sunday). 1 Tp. only employed on shifts. Troops attend church. Continue triple storeying. Coles crane jammed, took two hours to free. Completed two outer trusses. Gale force wind slowed up work.
7th April	All troops employed. Completed triple storeying by 1100 hrs. and overhead bracing by 1500 hrs. Coles crane in use throughout. Civil authorities commence making up approaches.
8th April	Clean up accommodation and back load surplus stores.
9th April	Fd. Squadron returned to R.E., O.C.T.U.
12th April	Civil Authorities completed approaches and skin decking. Bridge open to traffic.

MEMOIRS

BRIGADIER J. S. PAYNE

JOHN STANLEY PAYNE was born at Lewisham on 14th August, 1899, and educated at Whitgift. He was commissioned in the Corps on 23rd January, 1919, and after a short period with 233 Fd. Coy., R.E., in the Rhine Army, attended No. 1 J.O. Course at Chatham. On completion of this course, he was posted to the R.E. Depot at Chatham, where he remained until joining the Rly. T.C., R.E., for a railway course in 1923. After his course at Longmoor and on the Southern Railway, he was posted to 10 Rly. Coy., R.E.

In 1928 he was appointed Adjutant of the 53 (Welsh) Div. Engrs. T.A., at Cardiff. He then had a tour of foreign service as G.E. Tientsin, returning to the Railway Training Centre at Longmoor in 1936. For most of the war, he was employed as a Movements Staff officer. After spending the early years of the war in Movements at the War Office he was appointed Deputy-Director of Movements, British Army Staff, Washington, in January, 1942. His next appointment was as Deputy-Director of Movements, South Coast Ports, in September, 1942, and as such he was later responsible for many of the detailed arrangements for the mounting of Operation "OVERLORD," particularly the co-ordination of the moves forward to the ports with the availability of craft. In January, 1945, he was appointed Deputy-Director of Movements, G.H.Q., M.E.F.; in March of the same year he was promoted substantive Lt.-Colonel, and in July he became D. Movements, G.H.Q., M.E.F., with the acting rank of Brigadier.

Shortly afterwards, he left Movements and became D.Tn., still in the rank of Brigadier, his last major task in Movements being to set up the organization at Suez for disembarking and re-embarking the released prisoners of war and internees from the Far East. The writer took over from him just as this move was starting and found that it had been laid on in Jack's normal quiet and thoroughly efficient manner, everything going according to plan. Jack Payne was still D.Tn., in the Middle East when he died suddenly at Fayid in July, 1947, while en route for U.K. to attend an exercise.

As a young officer, Jack was a keen regimental soldier, and when he became more senior never forgot his interest in the efficiency and welfare of the men working under his control. As D.Tn., in the Middle East he was responsible for a large number of Transportation units, spread over a wide area, and his repeated tours, involving many long and fatiguing journeys, did much to maintain a high standard of morale in those units during the difficult period of the early post-war years. On the technical side of his work he tended on his railway course to specialize in railway operating and traffic, and the knowledge he gained in these subjects stood him in good stead when he was on the Movements staff during the war.

On 19th July, 1927, he married Kate Isobel, née Cousins, and his son and daughter were born in 1929 and 1931. Jack, with his unusually generous nature, was a good friend to a very large number of people. His death at an early age has been a loss not only to the Corps, but also to all those friends who share the sorrow of the widow and two children whom he has left.

R.E.B.-W.

BRIGADIER-GENERAL F. G. BOWLES

BORN in the last few days of the Crimean War and a year before the outbreak of the Indian Mutiny, Frederick Gilbert Bowles passed nearly one half of his life in the reign of Queen Victoria. He came of a well-known Berkshire family living at Mill Hill, Steventon, and was a grandson of Bishop Gilbert of Chichester. Passing into the " Shop " from Radley, he was one of a small batch commissioned in the Corps early in 1876.

After nearly three years at the S.M.E. he was posted to the Submarine Mining branch, in which he served for seven years, at home and abroad, and was then transferred to the Telegraph Battalion, with which he was associated during the greater part of his service in junior ranks. When Captain he was for four years A.D.C., in effect Staff Officer, to Sir Lothian Nicholson, I.G.F., an appointment for which he was well suited. He then joined the 2nd Division of the Telegraph Battalion, which he eventually commanded during a part of the South African War. As Lieut.-Colonel and Colonel, he was subsequently C.R.E. at Home and at Colonial stations, ending his active service in 1913, after four years in the appointment of Chief Engineer, Eastern Command, with the rank of Brigadier-General.

While stationed at Halifax, Nova Scotia, in 1906, he married Miss Grace Harvey, whose father was resident in that town. Not long afterwards both he and Mrs. Bowles were injured in a severe earthquake at Jamaica which destroyed their house.

During the 1914–18 War he was employed at the G.P.O. as Chief Censor of Trade Telegrams.

Bowles' career in the Corps was shaped by his long association with Branches whose functions have long passed to other organizations. When he joined the Submarine Miners in 1878, the practical use of electricity was in its infancy. Systems of telegraphy worked by private companies on a somewhat limited scale had existed for thirty years: these were nationalized in 1870. Telephony was practically unknown in England. The generation and transmission of electrical power were in the experimental stages.

The course of Submarine Mining instruction was almost the only specialized training in electrical work which was then available ; it afforded also practical experience to officers and men in the handling of plant, stores and equipment which proved invaluable to the Corps at large, not only in marine and submarine work, but at a later date in all forms of military engineering. Several officers thus trained, attained high distinction in the Army and in civil life.

But, so far as the individual officer was concerned, prolonged service in the Submarine Miners at that time carried the disadvantage of sedentary work, mostly in small isolated units, and the absence of any prospect of employment on field service. This fact was counterbalanced to some extent by priority for selection to the 1st Division of the Telegraph Battalion stationed at Aldershot, whose detachments formed part of every expeditionary force.

It was with one of these detachments that Bowles saw service in an operation at Suakim in 1885, directed by Sir Gerald Graham, also an R.E., which formed part of the campaign for the relief of Khartoum and the rescue of General Gordon. Later he was on Telegraph duty on the Upper Nile.

Subsequently he served for several years in the 2nd Division of the Telegraph Battalion with headquarters in London. This unit was charged with the administration and control of the telegraph system covering a large area in the south of England, and was an integral part of the G.P.O. organization. The personnel included civilians and enlisted Reservists liable for service overseas. There were also some regular R.E. other ranks, who had completed their Colour service. Many of the junior officers and reservists fought in the South African War.

Thus, although a large proportion of his service was passed at Home, and comparatively little abroad, Bowles gained a wide and varied experience, which fitted him for the important appointment which closed his career. In this post his ability, kindliness and consideration for his subordinates were most notable.

Bowles was devoted to cricket. He played for his School eleven and developed into a useful bat and wicket-keeper. On a few occasions he played for the Corps against the Gunners and for the M.C.C.; more frequently for the Band of Brothers and other teams, whose matches formed the nucleus of pleasant social gatherings in the Southern Counties before golf and lawn-tennis became generally popular. The contacts thus made and his character and disposition gained for him a wide circle of friends.

He was hampered in the latter part of his service by deafness, which increased as years went on, but retained most of his social interests throughout his life.

A contemporary says of him in the early '80's at Chatham " He was a very pleasant companion, with a most equable temper, never disturbed and always ready to do anything required of him." At the close of a long and very happy married life it is written " It was not until recently that he seemed old. He was always young in mind, and such a wonderful companion."

His was a very kindly personality.

He died on the 26th April, 1947, at Huntley Court, near Gloucester, at the age of 91.

W.A.L.

Brigadier - General Frederick G Bowles,

Colonel Henry M Fordham OBE MC

COLONEL H. M. FORDHAM, O.B.E., M.C.

HENRY MARSHALL FORDHAM was born in India, at Ajmere, on the 30th of January, 1889, the youngest of a family of four. His father, William Fordham, was then serving in the P.W.D. His mother, whose maiden name was Marshall, had been, as a child of three, with her parents through the siege of the Residency at Lucknow during the Mutiny.

After education at Bedford School, where he held a scholarship from an early age, and the R.M.A., he was commissioned in the Corps in 1909. He was posted to 39 Fortress Coy. at Sheerness in 1912, and in the following year to Hong Kong.

Returning home in 1916, he was posted to the 290 A.T. Coy. in the B.E.F., and thereafter served with the 150 and 466 Fd. Coys. He was awarded the Military Cross in the supplement to the London Gazette in January, 1918.

He was posted to the War Office as a staff captain in F.W. 9, in 1919, and on finishing his tour of duty he took an E. & M. course, and was then appointed an Inspector of R.E. Stores in 1925. He was appointed Chief Inspector of R.E. Stores in 1928. During this time he was largely responsible for the inspection of new coast defence engine-room equipment, the 105 ton railway crane, designed for the Singapore defences, the largest railway crane ever made, and for evolving tests for electric lamps, searchlight reflectors, batteries and field cable insulation.

The work he did on cable tests led to considerable research by cable makers and to corresponding improvement in the cables which they produced for the Army.

He then served at Aldershot as E. and M. Officer for two years, before returning to Hong Kong, as C.R.E. in 1934, and, on vacating that appointment in 1937, was awarded the O.B.E. for his services.

Promoted Colonel in 1938, with seniority 1st June, 1936, he was a member of the R.E. and Signals Board from October, 1937, to March 1940, when he was posted to the War Office, as an A.D.F.W., and where he was concerned in the strenuous task of expanding (L. of C.) R.E. units and the staff for engineer services. He was also in charge of all E. and M. work, which included much new work for camps, ordnance and supply depots, in addition to the requirements of overseas forces. In spite of not being really fit he thought he was not giving his best and he asked to be posted abroad.

On appointment as Chief Engineer in Gibraltar, in September, 1940, Fordham organized, with great energy and success, the building of the aerodrome, extension of the tunnelling, including Fortress H.Q. and hospitals underground. The enlarged garrison needed much expansion of accommodation and of the water supply. The latter was precarious owing to demands by the Navy and Merchant Navy, in addition to reserves required in case of siege, which necessitated the construction of an important distillation plant underground. The greater part of the work was executed with military labour and the strength of the R.E. exceeded 3,000. On his return home in January, 1942, he was appointed C.E. Central Midlands District.

He had been suffering from high blood pressure, and after a period of sick leave retired in July, 1943.

In August, 1943, Fordham undertook to carry out the duties of Secretary of the Institution of Royal Engineers as a temporary measure until Brig. C. C. Phipps, who had been elected as the permanent Secretary, could be released from active service. He held the post until January, 1945.

With his usual thoroughness he at once set to work to reorganize the office. The Staff had been employed for a great number of years and were getting decidedly old. Fordham introduced a new rule fixing a maximum age limit of seventy and at the same time started a Staff Benefit Fund. He also went very thoroughly into the cost of printing the Institution publications and made various economies in this connexion. He foresaw a general increase in all costs of production after the War and planned accordingly. His action in these respects was fully justified by actual events.

H.E.H., who was Chairman of the Publications Committee during most of the time Fordham was Secretary and Editor of the *R.E. Journal*, says :— "He was outstanding as an Editor. Copy was scarce (so was paper) the censor had to be satisfied, writers were short of time and many of them quite new to writing. Fordham rewrote many of the articles completely and kept going a flow of suitable copy so that each quarter's *Journal* was well worth reading."

During his time at Chatham he took a very active part in the Civil Defence Organization and was a Section Commander in the local Fire Guard, in which his wife also served besides doing much work with the W.V.S.

He married in Buxton in February, 1917, Elaine Violet Fisher Moore, widow of Captain Robert Chetwood Moore, Indian Army, and only daughter of Alweyne Turner, Barrister-at-Law. His wife and married daughter, Pamela, survive him.

In Henry Fordham a very quick and retentive brain was allied to a keen interest in people and a kindliness which showed themselves both in his care for troops under his command, and in the many thoughtful acts of kindness done to his friends. He had a strong sense of civic duty and, after retiring, was an active member of the British Legion and of the Officers' Association, of which he was the Eastbourne representative. He stood as a candidate in the municipal elections in Eastbourne in November, 1946.

Though he was an enthusiastic follower of many sports, he suffered under the disability of having a poor eye for ball games, and his activities were confined to beagling, and latterly, golf ; but he had a great appreciation for the exploits of others and his knowledge of sporting records and personalities was compendious.

Those who counted Henry Fordham as a friend will remember him as one who had the art both of doing and of accepting kindnesses.

His death occurred very suddenly on 19th July, 1947.

H.M.C.

BRIGADIER-GENERAL J. A. S. TULLOCH, C.B., C.M.G.

JOHN ARTHUR STAMFORD TULLOCH was born on 3rd December, 1865, and was the son of Maj.-Gen. A. Tulloch, Indian Army. He was educated at Reading School and the R.M.A., and received his first commission in the Corps, as a Lieutenant, on 8th December, 1884.

After completing the usual course at the S.M.E., he was posted to India in 1887, and joined the 2 Coy. of the Q.O. S. & M., in Burma, where operations were still in progress towards the end of the 3rd Burma War. He was orderly officer to Gen. Sir George Wolseley and was awarded the Burma Medal with two clasps. In 1889 he returned to the H.Qs. of the Q.O. S. & M., at Bangalore to command 'B' Coy. Four years later, in 1893, he returned to Burma to command the Burma Coy., at Mandalay. In 1897 he came home to the U.K. and did a Fieldworks Course at Chatham, returning to Bangalore in 1899. In 1900 he went to China with the Chinese Expeditionary Force in command of 3 Coy. Q.O. S. & M., and on the termination of these operations he was posted to England, having been nominated as a student at the Staff College at Camberley. On completion of this course, two years later, he was appointed C.R.E. at D.I.K., and in 1905 he was posted to the D.G.M.W. Office, at Simla, as an Asst.-Director.

Having completed 21 years service in India he returned to the U.K. in 1908 and was posted to command the 17 Fd. Coy. at the Curragh. In 1911 he was appointed C.R.E. 5 Division, also at the Curragh, and proceeded to France in this capacity in 1914, and was present at the battles of Le Cateau, Marne and Aisne. He was also responsible for the general arrangements for the big mining operations at Hill 60. In 1916 he was appointed Chief Engineer of X Corps, with the rank of Brigadier-General.

For his services during the 1914–18 War he was awarded the C.B. in 1915, the C.M.G., in 1917 and also the Legion of Honour, Officer 4th Class.

In 1918 he was appointed Chief Engineer, Western Command, and held this appointment until he retired in December, 1921.

In 1898 he was married to Mary, the daughter of Richard Marsden of Gravesend, and had one son and two daughters. He died on 22nd December 1946.

F.B.B. writes of him as follows :—

" There were three points which always impressed me very forcibly. His great calm and patience in adversity or if things went somewhat wrong. The thoroughness with which he went into anything that he took up. His versatility and skill at all games ; I don't think that there was anything (including polo and billiards) that he couldn't and didn't play and well above average at each of them.

" He was a very good and keen rider, especially in his time in India. But his most outstanding performance, which cannot have been equalled very often and might almost be unique, was to captain the Corps side at both Rugger and Soccer in the same season when he was at Chatham."

His brother, Lt.-Col. D. F. Tulloch, says :—

" My brother was the most versatile man I remember at the ' Shop,' in his day. Soccer Matches were played on Wednesday, and Rugger on Saturday ; he got his colours for both.

" When at Bangalore he won the Open Tennis Championship of the Madras Presidency.

" He was a keen rifle shot and competed at Bisley, where he won several minor competitions. He was a keen jockey and won a number of Races. He also played polo for the R.E. team at Bangalore.

" He played golf in India and at the Curragh and after he retired he won a number of handicap events at Dinard, where he went to live. He continued to play up until 1940."

C.C.P.

LIEUT.-COLONEL J. C. GARWOOD, D.S.O., R.E.

ON 3rd August, 1947, Lieut.-Col. John Corry Garwood, D.S.O., R.E., was drowned at Lagos in West Africa. His son David, aged seven, had got into difficulties bathing. John Garwood, his wife and another officer who was with them, perished in an attempt to save the boy. A second child, Prudence, still an infant, remains the sole survivor of the family.

It is hard to say when John first determined to be a Sapper. Certainly his mind was made up to be a soldier even in his first year at school. His father and grandfather were both Sappers and it was natural for John to follow in their steps.

At that time (he was at Marlborough from 1919 to 1923) John appeared, on the surface, an ordinary boy. He was not outstanding in scholarship, and at games he did not shine. It was only those who knew him well—and, because he was modest and retiring, they were few—who saw how much he had which others lacked.

First, he had an ingenious mind, kept only in check by good sense. This was the mainspring of his stupendous versatility. Next, he was both an artist and something of a musician. When others were engaged on half-holidays with schoolboy "ploys," John would be busy with pencil and brush. He took up etching and woodcuts; the processes of these particularly appealed to his ingenuity. His taste in musical instruments was catholic. The piano, the violin or the organ, which other musical boys sought to learn, were not for John. The ukelele, the banjo, the guitar and the penny whistle were more to his taste. These he had to teach himself. Playing his own accompaniment he would give rein to his retentive memory and pleasing voice. He charmed his friends with his music.

He had a facility for composing doggerel verses. The school frowned upon them, though some had considerable, if unorthodox, merit. In particular a doggerel connecting every famous English writer from Bede to Conan Doyle with his principal works was a master piece of mnemonics.

His fingers possessed all manner of skill. He could cook, darn socks, carve wood, make toys and repair watches. All these accomplishments were gradually developed as childhood ripened into manhood.

Last, he had a whimsical humour for which his artistic talents were the willing servants. In the "Snookers' Concert" at the Shop he all but made an immediate hit with a song he wrote. It told of King Arthur's Passing from the R.M.A. Set to the music of an old English folk song, it was a triumph of wit and erudition with just that spice of "slap-stick" required to give it an appeal to the not very highbrow audience. That it failed through being ill-sung was not his fault.

They were happy days at the Shop, but they did not leave much leisure for hobbies. None the less John found time to keep an illicit motor cycle, which was often in pieces in his room. Meanwhile his dexterity in the workshops, his draughtsmanship in the classroom and his general level of ability earned him a place amongst those cadets who could choose whether to be Sappers or Gunners. He chose to be a Sapper.

At the S.M.E. there was greater scope. He bought a motor car with solid tyres, which, as he said, "exactly fit the tramways of Chatham, so that motor drives inevitably end either in collision or the tram terminus." He had a half share of a sailing boat, in which he learnt to sail. The interest he took in the stars during survey enabled him to become a competent navigator as well as something of an astronomer.

He was a welcome addition to any syndicate for engineering projects. His was the task of doing the drawings and embellishing the cover sheet.

After leaving the S.M.E. and Cambridge, John went to India, embarking on the *S.S. City of Poona* in December, 1928. He was a tower of strength in the amateur theatricals on board. He painted scenery, wrote lyrics, did conjuring tricks and sang comic songs.

From then till 1935 he was with the Bombay Sappers and Miners. Besides gaining the best military experience available in peace-time, he found opportunity to learn to fly an aeroplane, to become a first-class jockey and to learn to ski.

In 1935 he married Miss Dorothea Leslie Smith, a lady of great charm and many attainments. She studied medicine during the war and became a fully qualified doctor last year.

After a period at Chatham, John went to war in 1939 with 9 Field Coy., R.E., later getting command of a company himself just before Dunkirk.

In 1941 he returned to India. In 1943 he became C.R.E. 2 British Division, with which he was awarded a D.S.O. for service in Burma. He was given command of an A.G.R.E. in 1944 and returned to England in March, 1945. Employment at the War Office and a course at the Staff College were followed by his posting to Lagos. Compared with his varied interests his military career sounds banal: much like any other regular officers of that time. But one event in it, at least, reveals the man as anything but commonplace. It was just before the Dunkirk evacuation. Brigade H.Q. was troubled by two German automatics. John offered to silence them. Sending a subaltern with a section of sappers to deal with one, he took a similar party to deal with the other. In the gathering dusk John crawled up to one M.G. post. There were three Germans there. Taking careful aim he shot one and the other two pounced upon him. He wounded one with his pistol, but the other knocked the weapon from his hand. A hand to hand fight ensured. The sappers were unable to take part. Alone he managed to deal with both the remaining Germans. His subaltern had had good hunting too, and John laconically remarked to the Brigadier: "I don't think you'll be troubled again with those M.Gs." He offered no further details of the exploit. John received no recognition, though he took pains to see that his subaltern did not go unrewarded. (He was mentioned in despatches for his other services in the campaign.)

This modesty was one of his most striking characteristics. He would have you believe that he was a very ordinary man. His virtues were taken for granted. Unless you knew him well you never suspected his greatness. Many readers of this notice will say affectionately "Well I never knew old John could do all that." The truth is he could do all that and more. By his death the Corps has lost a gallant, efficient and talented officer. Those who knew him have lost a staunch friend. M.C.A.H.

BOOK REVIEW

GERMAN RESEARCH IN WORLD WAR II

By Colonel Leslie E. Simon, U.S. Army

(Chapman & Hall—*Price* 24s. 0d.)

This book provides a most interesting study of the organization and achievements of German scientific research and development under the Third Reich and during the War.

The Author, who was Director of the U.S. Ballistic Research Laboratories, was one of the officers sent to Germany by the U.S. Government immediately after the Surrender to obtain information and material which would be of use in the war against Japan. By visiting numerous research institutions, and questioning large numbers of senior German scientists, he was able to build up a very complete picture of the German research organization, and the connection between research, development and the fighting services. Arising from these results, he has laid down, for the first time, a clear definition of the respective responsibilities of Basic Research, Technical Research, Design and Development.

The most interesting portion of the book is that dealing with the reasons for the comparative failure of the Army to produce anything really important in the way of new weapons, until late in the War, as compared with the high standard of progress in the Air Force. The latter, besides being the most popular Service, and the idol of the German people, had the inestimable advantage of having the all-powerful Goering at its head, and was thus able to obtain complete priority in the supply of money, equipment, and above all, scientists, including many who should rightly have been banned for lack of the correct Nazi qualifications.

On the other hand, the Munitions Industry in the country had achieved such eminence in the German mind that it was thought hardly necessary to provide the Army with research establishments of its own, at least until Speer took over. The bigger firms, Krupp, Mauser, Rheinmetall-Borsig and so on, had large research establishments of their own, but the Industry was Big Business, and Big Business was not inclined to be dictated to by mere soldiers as to the particular attributes of the weapons which they were to develop. Only after the disasters on the Russian front in the winter of 1941–42, and the consequent establishment of the Speer Ministry, was research for the Army really put on a proper footing and directed toward meeting the real requirements of the Army. The Author finishes this part of his book with the devastating conclusion, based on the nearly completed projects which he found, that had German weapon research been properly organized from the start, the War might have taken a different course.

The remainder of the book, which is excellently illustrated, is devoted to some of the more important results of German research, and in particular to the equipment and instruments developed for its prosecution. Though naturally somewhat inclined to concentrate on matters connected with ballistics research, the Author gives extremely interesting descriptions of some of the techniques developed by the Germans. His accounts of the wind-tunnels, some of which were capable of air speed up to four and a half times the speed of Sound, and of the methods of studying and photographing the behaviour of models of projectiles and rockets, including the V.2., in these tunnels, are of absorbing interest.

Altogether, a book which is well worth studying.

F.E.F.

TECHNICAL NOTES

THERMIC DRILLING OF CONCRETE AND STONE

By "MAURICE LEBRUN"

This paper published in the February issue of the *Structural Engineer Journal* outlines a novel adaptation of the slice bar cutting process (a method used for the clearance of draw holes by furnace operators) in the drilling of concrete preparatory to the placing of explosive charges for the demolition of the Atlantic Wall defences.

The method described consists simply of burning steel in association with oxygen and bringing it into contact with the concrete to be drilled thus effecting the removal of the melted concrete in combination with the iron oxide as a fluid slag.

The apparatus consists of a length of ordinary steel gas barrel tubing and a convenient type of holder to which the tubing is connected. The holder in turn is connected by flexible rubber tubing to one or more oxygen cylinders and is provided with a tap to enable the operator to regulate the flow of gas.

The oxygen gas is lighted at the open end of the steel tube which begins to burn away and is ready for boring operation.

The boring is free from vibration and comparatively silent in operation and is equally effective against mass concrete, reinforced concrete, and certain types of stone and, in addition, can be used for underwater drilling.

A $\frac{3}{8}$ in. bore tube has been shown to produce a $1\frac{3}{4}$ in. diameter hole and to penetrate at a rate of 4 in. per minute with the expenditure of 21 cu. ft. of oxygen and about 2 lb. of the steel tubing.

CEMENTS WITH CONTROLLED EXPANSION AND THEIR APPLICATIONS TO PRE-STRESSED CONCRETE

By HENRI LOSSIER, M.Soc.C.E. (France)

This paper, describing a cement mixture which produces a swelling of the concrete for use as an alternative to mechanical means in pre-stressing, was published in the *Journal of the Institution of Structural Engineers* in October of last year.

The composition of the cement includes an expanding agent and a stabilizing element in addition to the base of artificial Portland cement and by judicious choice of the proportions of these the expansion can be regulated as regards its intensity and duration. The duration of the expansion is usually regulated to take ten to fifteen days to allow the cement to acquire sufficient crushing strength before the expansive energy has developed.

The cement (neat) is claimed to give expansions of from 1.0 to 1.5 per cent and concrete made with it is reputed to be as strong if not stronger than concrete made with ordinary Portland cement.

Details of some civil engineering projects where the use of this cement has had special application are given. These include its use on damaged bridge structures in re-establishing the stress present in members before the damage occurred and in acting as a jack to load up new supporting members introduced into an existing structure. In addition, it can be used to compensate for normal shrinkage occurring in other parts of a concrete structure and for pre-stressing reinforcement.

THE HERMETICALLY SEALED DOMESTIC REFRIGERATOR UNIT

(Extract from a paper read before the Institute of Refrigeration).

The hermetically sealed compressor unit, although evolved twenty years ago, has only recently been generally adopted for refrigerators of the domestic size, i.e., up to 20 cu. ft.

The "open" type of unit had the great advantage of accessibility and maintenance consequently was easier. In the sealed type the compressor and motor are effectively enclosed in a welded-up container so that repair necessitates the return of the entire unit to the makers.

Advances in design and manufacturing technique have, however, rendered the sealed unit so reliable in service that it is ousting altogether the open unit for domestic refrigeration. Design has eliminated the need for belt-drives, shaft-seals, lubricating-points and breakable joints in the refrigerant lines. Meticulous accuracy in machining and scrupulous cleanliness are essential. Machining limits are normally within ·0003 inches while such parts as piston pins and valve plates are finished to 15 micro-inches. Final assembly, after each component is chemically cleaned of grease, dirt and moisture is carried out in an air-conditioned room. The unit is charged with oil and all lubrication is automatic. As the components are all initially perfectly clean and dry and the assembly is hermetically sealed, there is no atmospheric pollution and the unit, once charged and sealed, needs no further attention to the lubrication or refrigerant system.

In view of the proved reliability of the sealed unit, it has been adopted by all the Services for future use. It has the added advantage that a multiplicity of spares is avoided as complete units only need be carried which can be installed by personnel who are not necessarily skilled refrigerator mechanics.

IMPRESSIONS OF ROADS AND ROAD RESEARCH IN NORTH AMERICA

(Road Research Technical Paper No. 7.)

(Published by His Majesty's Stationery Office, price 1s. 6d. net.)

1. This publication from the Road Research Laboratory was published in May, 1947, and summarizes information and impressions obtained during a visit to the United States and Canada.

2. The main purpose of the tour was to ascertain the progress that had been made in the investigations and researches into road safety and concrete roads, these researches having been postponed in this country owing to the war.

3. Opportunities that occurred to study progress in other fields were not neglected. These included the organization and scope of road research, traffic schemes, highway economics, materials and methods of construction and the training of highway engineers.

4. It should be noted that all the ideas and practices described are not necessarily considered by the Road Research Laboratory to be suitable for British conditions nor, indeed, to imply that America has nothing to learn from British practice.

5. One especially interesting development noticed was the complete omission of expansion joints from Concrete Roads. Hundreds of miles of jointless concrete roads were driven over and although cracks had developed

at about 15 ft. spacing the riding generally was still good. In some cases "blow-ups" had occurred but the general opinion seemed to be that the repair of such "blow-ups" was a minor matter compared with the resulting improvement in construction methods resulting from the omission of expansion joints.

APPLICATION OF ELECTROSMOSIS TO SOIL MECHANICS

(Extract from *Engineering* of 7th February, 1947)

1. In excavating sandy and gravelly soils for foundations, etc., it may be necessary to lower the ground water level which is very often done by means of vertical tube wells and known as "ground water lowering by the well point system." It cannot, however, be used in the case of silts and clays owing to their low permeability.

2. The phenomenon of electrosmosis arises when an electric current is passed through wet soil, the soil being dried out at the positive electrode (anode) and water expelled from the soil at the negative electrode (cathode).

3. A recent paper by Messrs. A. H. D. Markwick and A. F. Dobson published in *Engineering* of 7th February, 1947, gives an interesting description of this method of soil drainage for silts and clays.

4. The process in its simplest form consists of inducing osmosis (tendency to percolation) in the soil by passing a direct electric current between two electrodes driven into the soil, thereby causing the water to move through the soil from the positive to the negative electrode.

5. If, therefore, the negative electrode is a well point (tube well) the application of current will feed it with water from the surrounding soil and, by having a series of such electrodes, any required area can be drained.

6. This method was used by the Germans during the last war in the case of a 20 ft. deep cutting for a double line railway track and also in the case of a U-boat pen which involved the excavation of an area of 550 ft. by 330 ft. to a depth of 40 ft.

7. Other possible applications have been suggested, for example, in tunnelling or shaft sinking, stabilization of soil beneath metal grid runways, hardening of ground under rail tracks or the sinking of steel piles and caissons.

L.M.S.R. TO EXPERIMENT WITH MAIN LINE DIESEL-ELECTRIC LOCOMOTIVES

(*Railway Gazette*, Issue 28th March, 1947.)

The L.M.S.R. has decided to introduce diesel-electric traction to its main line services. Experimental running will include amongst other main line passenger and freight services the express passenger trains on Anglo-Scottish services.

The first experimental design is for a diesel-electric locomotive of 3,200 h.p. composed of two 1,600 h.p. units coupled, capable of hauling the heaviest trains between London and Glasgow or alternatively fast light trains between these cities. It will be used in competition with the modern 4-6-2-type steam locomotive. The weight of the locomotive will be 220 tons and possible speed will be 100 m.p.h. The single units of 1,600 h.p. will be tried out on the suburban and semi-fast passenger services.

CONNAUGHT BRIDGE RECONSTRUCTION MALAYAN RAILWAY

(*Railway Gazette*, Issue 26th April, 1947.)

The original bridge over the Klang river was opened in 1890 by the Duke of Connaught. By 1925, increasing traffic and defects in the piers necessitated a new bridge which consisted of three spans, each 200 ft. long and which was completed in 1928.

This was blown by the retreating British forces in 1942. The centres of the eastern and the central span were severely damaged, as well as the eastern abutment and the pier supporting the two damaged spans.

It was first planned to use the Everall Truss bridge for replacement, but eventually it was decided to raise the damaged spans, cut and replace the damaged steelwork and repair the piers.

The work was carried out by the Transportation Directorate, A.L.F.S.E.A. Steelwork erectors, trained at the Tn.T.C.R.E., Longmoor, were flown from U.K. to assist in the reconstruction. Over 100 tons of new steelwork was fabricated and the falsework, supporting the raised bridge spans temporarily, consisted of 70 ft. long timber piles which were driven through the soft mud river bed to harder strata below in a 7 to 8 knot tide. The reconstruction took half a year and the bridge was tested on the 24th June, 1946.

SOMMERFELD JOISTS

(*The Architect and Building News*, 13th June, 1947.)

Various types of light, pressed steel floor joists, have been produced for housing in the interest of timber economy. Production of these joists in quantity has, of course, been affected by the current shortage of pressed steel.

A light joist has been designed by Messrs. Sommerfeld, Ltd., made from $\frac{3}{8}$ in. diameter transverse bars of the famous track of the same name. This has been tested and found suitable for housing. The joist consists of two No. $\frac{3}{8}$ in. bars for each of the flanges with a $\frac{3}{8}$ in. bar lattice web, the whole electrically spot-welded. Clipped to the flanges are two timber fillets for nailing.

With regard to economy in timber, the following figures may be of interest ; one hundred miles of Sommerfeld track, made into joists is the equivalent of 1,200,000 ft. run of 7 in. by 2 in. timber joists. The amount of timber saved would be 508 standards.

BUILDING PRICES, 1947

The *Journal of the Royal Institute of Chartered Surveyors* published in its edition for August, 1947, an article by H. J. Venning, Esq., A.R.I.B.A., F.R.I.C.S., on Building Prices in 1947.

Increase in labour costs over 1939 rates is given as 80 per cent, including elements for " holidays with pay," " Pay as you earn," etc.

Prices of materials are rounded off as showing an increase of 85 per cent, including, for example, softwood with a rise of 220 per cent, white lead 160 per cent, and Portland cement 43 per cent.

The overall average rise in price of building work, materials and labour, is taken as from 80 to 100 per cent, tending to rise still further.