# The Royal Engineers Journal



OL. LXIII

SEPTEMBER 1949

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#### "GO TO IT"

## THE STORY OF THE 3rd PARACHUTE SQUADRON, R.E. (continued)

#### By MAJOR J. S. R. SHAVE, M.C., R.E.

#### CHAPTER 4

#### WAR OF ATTRITION

#### (See folding map at end for place names and glossary of terms)

The critical battle of the Breville gap marked the close of the first phase of our adventures in Normandy. The battle was over by the time I rejoined the squadron with my section. We had supposed that at this point we should be withdrawn in order to prepare for further airborne operations, but apparently the general situation did not allow it. We therefore entered upon a phase of static defence which laid a great strain on all ranks.

From 14th June until 17th August, the division played a holding rôle on the left flank of the allied forces. Although one of the most important tasks in the beachhead, it was rather frustrating, and did not give us the scope for individuality which we had during the first days and for which we had trained so hard. For the airborne engineers the ensuing days were eventful and the tasks quite varied, but the P.B.I. had little to relieve the mental stress and physical discomfort. Theirs was a round of seemingly endless days and nights of peering through the leafy hedges, constantly prepared against attack. Although the weather, in general, remained so dry that forward units were extremely short of water, we had spells of torrential rain which made an infantryman's life absolute hell.

It is no easy thing to maintain the initiative in static warfare, but an aggressive policy was carried out during the whole of this period. Large raids were suicidal, but minor raids were successfully carried out and also vigorous patrolling and counter-sniping.

#### Ecarde

Our first action upon reaching our new location, was to dig in as deeply as we could and, as far as was possible, to make our holes waterproof and give them sufficient overhead cover to stop shrapnel and bomb splinters.

Although our home was now at Ecarde, the centre of our activities continued to be the Le Mesnil area. Whenever the 3rd Para. Brigade was at the crossroads, we had a troop there with them. Also, at the beginning of this phase, while 591 Squadron was still recovering from the ill luck it had on "D" day, one of our troops remained at Le Mesnil when the 5th Para. Brigade took over from the 3rd Brigade.

No. 3 Troop remained at Le Mesnil for the first three days, whilst we were given the task of digging shelters for divisional H.Q. at Ranville. The château occupied by Major-General Richard Gale and his staff was being continually shelled with great accuracy, and several casualties had been caused. We worked on some big dugouts for two days until, after a particu-. larly bad day, it was decided that the division should be moved to the quarry arca adjoining our Squadron location at Ecarde. The combined efforts of the divisional engineers were now put forth in order to provide divisional H.Q. with as safe and as comfortable a temporary home as possible. I remember spending a very unpleasant evening up on the big glider LZ, digging out the anti-landing poles in order to provide rafters for the shelters. It was raining in torrents that evening, and Tim and I, with two sections of the troop, felt miserable. We did have a fairly dry and comparatively safe hole to go back to that night though, which is more than the Para. Battalions had.

As soon as No. 3 Troop moved down to the Squadron, No. 2 Troop went up to replace them. We found Le Mesnil looking a little better than on previous occasions, numbers of dead had been buried and the M.D.S. had been moved to the village of Ranville. The well at the house there was by this time running very low, the first indication that the water situation was going to be difficult. We had no time to "stand around", in fact, standing around was not a healthy occupation. We were at once given the task of wiring in the Brigade perimeter in front of the forward positions. Alan Forster and I erected a portion of it with our sections. Most of this work had to be done after dark and nobody liked it very much. Alan, with No. 7 Section, started the job, whilst I and my section were given the task of removing some very prominent landmarks from the brickworks at the crossroads.

The landmarks consisted of two tall brick chimneys and one electricity pylon. I aged considerably during this demolition since one of the chimneys remained standing after the first attempt ; the other came down beautifully just where it was supposed to. On approaching the first chimney I found that the fuse was wet and had failed to initiate the charge. Having relaid the fuse we lit it again, and in due course there was a lovely bang, but again the stack only rocked and remained standing. Feeling the grey hairs forming, I entered the building out of which the chimney rose, and gingerly climbed the stairs to the first floor where we had set the explosive. To my disgust I found that although the charge had done all that had been asked of it, and had cut a beautiful "V" notch in the brickwork, it also disclosed a thick steel reinforcement underneath the exact spot where the charge had been laid. We now laid another charge on this steel, and after the next bang, down came the chimney-and the roof of the building. I am sure that M. Du Pont, the resident and cheerful owner of the brickworks, will remember me long after the German shells and mortar bombs are forgotten. I do hope that he has since received compensation for his chimney stacks.

The wiring went on apace for three days and then the whole troop was put on to the last stretch. The enemy were now seldom seen except by the foremost sections and the snipers, but while we were doing this work we had a taste of the awful tension that the foremost infantry lived in. We were twice forced to stop work during that day because the accuracy of the mortar fire was so uncanny. I am certain that we were watched the whole time we were on this job. We had to come back in the evening to finish it and did it at record speed. I remember working "flat out" beside Sergeant Docherty at the bottom of a small copse in which my section was working. Tim was with Sergeant Richardson and No. 8 Section at the other end of the copse. The whole clump of trees was only 40 yds. long and 5 yds. broad. In one "stonk" six mortar bombs were spaced evenly along the copse between the sections.

The site of the wiring task was on the flank of the 7th Para. Battalion. I had to visit the C.O., Lieut.-Colonel Pine-Coffin, D.S.O., and found him calmly typing out the battalion war diary at a time when it was all I could do to prevent myself from making a bee-line for the nearest ditch.

As divisional troops, I always felt how much better off we were than the infantry, who, gallant and uncomplaining, held the line for very long periods. Whether we had been out for a few hours or for days, we could always return to the comparative safety of our quarry. Not so the infantry, who, apart from short periods of rest back at the riverside some four miles from the Germans, spent the rest of their time living under the awful strain of life in the woods and fields around Le Mesnil. I suppose they did not envy us in our tasks, but I tremendously admired the manner in which they carried out their own tasks. After three days and nights at the crossroads, we were more than ready to be relieved by another troop. Working in the open there, one had to be super alert all the time, with the nearest cover always in the mind's eye. Watching and listening, day and night, doing the "Double Shuffle" for cover several times within the hour to avoid being punctured by a mortar fragment.

Ecarde lay on the main route into the divisional area from the remainder of the Normandy beachhead. Here we had a pretty good picture of what was going on. Two pairs of Bailey bridges, Tower I and Tower 2, York 1 and York 2, were constructed across the Orne and Caen Canal, by the engineers of 1st Corps. From time to time we would see new formations move in over these bridges as others moved out. All moves were carried out with as much secrecy as possible, sometimes all vehicles would have their signs covered over and we would be told not to even mention these moves in our normal conversation. Another pair of bridges, London 1 and London 2, were built by the Sappers of 3rd British Division alongside the Benouville bridges.

The division was not fighting hard during this period, but was engaged in a war of attrition in which each side did its best to exhaust the other. There was a steady drain of casualties, particularly from the Le Mesnil area, although everything was done to keep these at a minimum. All men were dug in deeply and in the forward areas there was a system of warning organized, whereby a sentry would blow a whistle whenever he heard the distant music of mortar bombs leaving their barrels. It was a strict order that every man's slit trench would have good overhead protection as a further precaution against flying "muck."

Sapper tasks there were in abundance, both forward and in the rear. Initially they were largely mine laying, wiring, and the laying of trip flares and booby traps. Later we had to do a lot of road building and repair and also some water supply. We became expert in the construction of deep shelters for various headquarters. Brigades were constantly on the move and after each move their H.Q. required new shelters.

One of the first tasks done by No. 2 Troop in this phase was the laying of a belt of anti-personnel mines at the village of Amfreville. Whilst on this job we lost a good friend and excellent N.C.O. in Corporal Tony Green, who was killed when arming mines. Tony Green was a quiet, efficient and most likeable fellow; he was seldom seen without a small pipe of uncertain origin in his mouth.

It is the personalities of the troop that still remain in one's mind, at a time when one can take a slightly more detached view of the horrible events of that lovely summer in Normandy. A good example was No. 2 Troop cook—Freddy Lune of the A.C.C. He and Sapper Lundy his mate, were both great characters, and formed the social centre around which the rest of the chaps would gather when the situation permitted. When at Le Mesnil, Lune and Lundy would quickly get organized with their petrol cooker and a few compo boxes. All their cooking had to be done in the open and no meal was ever prepared undisturbed. The sight of them diving for a slit, amidst a welter of flying utensils, was probably very funny. It is a pity that no one could stand around to watch. One day Lundy was unable to go to ground quick enough and stopped a chunk of metal with his leg; he returned to us later in the year, but the cookhouse team was temporarily broken up. We were very fortunate to get a second A.C.C. man in his place, his name was Scoltock, the best cook I have seen in the army, a veritable treasure who remained with the troop until the end of the war in Europe.

After a few days our duties at the crossroads were taken over by a troop of 591 Para. Squadron. We joined our unit at the quarry and from there commenced mending the roads which were already breaking up under the wear and tear of battle.

Between us and the Orne bridges at Benouville, lay our "D.M.A." (divisional maintenance area) in which were located our stocks of food, petrol and ammunition. These dumps were twice destroyed as the result of attentions of the Luftwaffe. The D.M.A. was situated in a quarry to the right of our main lateral road. One evening we were innocently travelling along this road in a 3-ton lorry, when we were almost lifted off it by a tremendous upheaval below us on our right. This was due to one of the numerous stacks of " ammo" which had chosen that moment to "go for a Burton." Fortunately we were saved by the sides of the quarry, but from then on no chances were taken, the trucks were made to do " everything but talk" when going down that stretch of road.

A great personality who was with us until "D plus one," was Lance-Sergeant "Taffy" Jones who trained with us and dropped as the commander of No. 8 Section in No. 2 Troop. On "D" day he landed in Ranville and was taken prisoner. He made good his escape, and while fighting his way out killed eight Germans, he then managed to join the troop at the crossroads. Within a few hours he was killed whilst on a sortie. His body was later recovered and laid in our temporary cemetery beside 3rd Brigade H.Q. Taffy was laid in what was the most mortared piece of ground in the sector. I am sure he would have wanted it that way; to him it was all part of the game and he would have wished to be as close to us as possible. He excelled in many ways, a warm-hearted and true friend to all. He was also a star rugby player and alongside Tim, held a regular place in the divisional side.

The 26th of the month found No. 2 Troop once again up at the crossroads. Our tasks on this tour were twofold—The laying of hundreds of trip flares in the forward positions, along likely paths of enemy approach, and the construction of strongpoints at the farm, some 400 yds. down the road to Bavent. Half the troop went to each task, Alan Forster was in charge of the flare laying, while I went to the farm. Tim, as usual, was everywhere, always at the spot where he was most needed.

The farm had frequently changed hands and had recently been retaken by the Canadian Para. Battalion. Our first task, as always, was to remove the dead who, under the hot sun, very soon made their presence unpleasantly obvious. While we disposed of cows and horses with the aid of an armoured bulldozer, the Canadians buried some dozen or so Germans who had been lying in and around the place for some time. The next job was the construction of five machine-gun posts in the ruins of the buildings. For this task we had the assistance of a small working party of Canadians. The farm was in a very exposed position, and from it we could observe the enemy working at his defences only some 300 or 400 yds. away. The policy was not to make ourselves offensive to him until our positions were completed and then to give him all we had. It was a most uncanny situation which nobody liked. For two days we worked with only occasional mortar fire against us, until on the second evening one of our Canadians was sniped whilst working in a very exposed place from which we had much difficulty in evacuating him. From that moment the place was most unpleasant and we were very thankful for the completion of our part of the task on the third day. It was fortunate for us that the heaps of rubble afforded good cover, since the mortaring was most accurate, slap on the farm every time. The courtyard of this burned-out place contained a small, richly stagnant pond. One bomb of a "stonk" registered a direct hit on this pool and the ensuing smell defeated even that of the charred remains of cattle in the farm buildings.

At this time the farm was being troubled by the close attention of an S.P. (self-propelled) gun, which would trundle up through the woods along the Bavent road to within a few hundred yards of us, and send all sorts of "muck" along at extremely high velocity. Brigadier Hill thought of a way in which to "sort out" this unwelcome visitor. The plot consisted of the mounting of a small captured anti-tank gun in the roof of the most solid outbuilding of the shattered farm. The sequel to this plan follows later.

On the 28th of the month we had more or less finished the sandbagging of the strongpoints in the farm when we were again visited by tragedy. On this day our Squadron suffered the most grievous blow of its life. The Canadian Battalion H.Q. was situated inside the brickworks during this period, and thence Tim went at about four in the afternoon to report progress to the Battalion C.O. Tim's jeep was drawing up in front of the barn which housed the H.Q., when down came a typical swift, deadly "stonk" unheard until the last second. One round hit the roof, glanced down and exploded some two yards from the front off-side of the jeep. Tim in the passenger seat, received a grievous chest wound and lost consciousness. Driver Holt on the other side miraculously escaped with a very bad shaking. Holt drove his troop commander straight round to the battalion R.A.P., and there I saw him ten minutes later, still unconscious. As soon as possible Tim was moved to the M.D.S. in Ranville, but despite all the efforts that were made for him, he never came to.

Driver Holt was not the only man to be shaken by this occurrence. Captain Juckes was known to the whole division and in his troop we held him in reverence. That evening, as soon as I could get away, I set off for the M.D.S. and was half-way to Ranville when I met the O.C. coming the other way. I did not have to say what was on the tip of my tongue, I could read the answer in Rosie's face. All he said to me was, "Well Johnny, it's your troop now, Tim died half an hour ago." We went back up the hill to brigade H.Q. and there Rosie had a few words with the chaps. The same evening No. 1 Troop arrived to relieve us, and in very low spirits we returned to the quarry at Ecarde.

Next day we buried Tim in the divisional cemetery beside Ranville church, the last rites were performed by our friend—and his friend—the Rev. John Gwinnet of the 9th Para. Battalion. The ceremony was one of the most moving experiences we had in Normandy, and I doubt if the burial of Sir John Moore was more impressive. The still, blanket-covered form we laid in a deep'grave beside the old tower of Ranville church, belonged to one of the best that England could produce. His friends from all over the division were there, and several times John Gwinnet's voice was completely lost in the ear-splitting gunfire. To quote Brigadier James Hill, Tim was "one of the finest junior leaders in the division." He was also the leader of the divisional rugby pack. It would be a fine thing for any man to boast "I am as good a soldier as Tim Juckes was in his time." At Le Mesnil No. I Troop had no better time than had been our lot. It fell to them to continue the work of mounting the anti-tank gun in the farm building. In three days they erected a very fine staging for it. On the third evening that self-same S.P. gun trundled up and riddled the whole place with solid shot. After this the project was given up, to the disappointment of "Freddy," Tony Wade, Jack Nash and the rest of No. I Troop.

#### CAEN'S DAYS ARE NUMBERED

The tempo of events slowed down somewhat for us during July. Whilst the division conducted its offensive defence, doing its best to be perfectly bloody to the enemy, big things were happening a few miles away.

Beyond the river Orne, a relentless mass of British and Canadian divisions were crushing their way around the other side of Caen. Some of us who were fortunate to escape across the river for a few hours in order to visit friends in those divisions, saw the havoc wrought by these battles. We had to pass through a countryside of obliterated villages and lacerated cornfields; everywhere stood pathetic white crosses, some marked, others merely bearing a helmet. So badly scarred was the countryside that map reading was difficult, even in broad daylight. Inches deep in dust, the roads were in many places indistinguishable from the intricate pattern of tank tracks. Many villages were simply heaps of charred rubble over which a few stunted walls leered drunkenly. There was abundant evidence of the passing of a mighty force, terrible in its destructive wrath.

Further on into the Bocage we never went, in fact so strict was security that one had difficulty in leaving ones own immediate locality at all. We knew that the frightful havoc extended right through Normandy wherever the opposing forces had met. At first it was difficult to see how this horrific struggle was going to affect us. The frightful slow battering of the villages and then the suburbs of Caen was so different from our war of nerves and swift death in the woods and orchards beyond the river.

After the fall of Carpiquet airfield, and as the battle reached the vicinity of the upper Orne, it was possible to go a little way into the city and see streets which everywhere bore signs of death and destruction. By reading these signs one could tell how heavily our more ponderous sister divisions were suffering.

One beautiful summer evening, whose peace had been disturbed only by the ear-splitting crack of our 75 mm. airborne howitzers and the whizz of the answering 88's, we witnessed a sight such as few men have ever seen. On that evening the city of Caen received its first 1,000 bomber raid. The sole object of the raid was the obliteration of all German opposition in front of our ground forces on the sector. Unfortunately for Caen, this also involved the razing to the ground of every building which chanced to be along the line of objectives. This was the first of the two great blows which destroyed the city.

The bombers came through the soft evening air at about ten o'clock, when the eastern sky was a blaze of red. Flying at varying altitudes, in line astern, the procession of Lancasters and Halifaxes stretched beyond the limits of our vision. As one man, the Squadron climbed to the top of the quarry walls and silently stood there watching the stream of power and potential destruction pass overhead. Soon we saw a leading aircraft let down a shower of dazzling flares which, floating slowly down, looked for all the world like that firework of Mr. Brock's called a "Shimmering Cascade." The sky over the eastern suburbs of the city was already an inferno of red tracer and black shell bursts. Down through the marking flares the 4,000 lb. bombs began to tumble in rapid succession. We could see the first one and followed its flight almost to earth, we both saw and felt its explosion. After a few minutes it became impossible to watch the bombs falling since a pall of smoke rose to many hundreds of feet.

The thunder of exploding bombs exceeded that of any bombardment we had heard—and we had heard plenty. They were still coming half an hour later and the flak, which had been so heavy at the beginning, began to die away into a few forlorn streams of tracer. As each aircraft delivered its load, it would circle away to the left or right and unconcernedly follow the homeward bound "cab rank." They were not without casualties, however, and it was no picnic for those aircrews. One plane in particular, instead of following the rest, came limping straight back over us with what appeared to be half of its starboard wing missing. It swung away across the Orne and disappeared in the direction of the airstrip near Reviers, losing height rapidly all the time.

At eleven o'clock the darkness was enhancing the brilliance of the fairy-like markers which came down at regular intervals. The vast pall of smoke and dust wafted slowly westwards over the main beachhead, under the influence of a light breeze.

The avalanche of bombs lasted for an hour and twenty minutes, then the last "heavy" droned away over the sea towards home. That night allied troops advanced four miles up our side of the river towards the "Fauberg de Vaucelles," the eastern half of Caen. The great foundry at Collombelles, which had previously given a lot of trouble, was brought well behind our lines and from it we were able to obtain quantities of badly needed engineer stores and materials during the ensuing weeks. Throughout this raid we did not see a single enemy fighter, proof enough of the supremacy achieved by the allied air forces in the west.

It was not until we were homeward bound in September, that we saw what was left of Caen after the second big raid had cleared it of enemy troops. The winnowed husk of what had been a vast foundry at Collombelles was evidence enough of what lay beyond ; even so, when we eventually saw the city we felt awed by the magnitude of the destruction.

#### SUPPLY DROPS

Throughout the operation in Normandy, the support given to us by the R.A.F. was beyond praise. We received regular supply drops from Stirlings and would sometimes get mail in this way when there was none for anyone else in the beach areas. On one occasion I saw 50,000 urgently required sandbags come tumbling down in a free drop. I take my hat off to the R.A.S.C. who were packing for us at the airfields in England.

The supply dropping zone used was across the river on the second glider "LZ," on the high ground flanking the Caen-Ouistreham road. We had a lovely view of these drops from our side of the river. A cloud of Stirlings would appear and flying in single file in quick succession over the "LZ," would let loose scores of lazily floating parachutes. The supplies would be quickly gathered up and sorted by the divisional R.A.S.C., and a few hours later we should be reaping the benefit of them. There were very few R.A.S.C. with us and they worked exceedingly hard under very trying conditions. At the beginning, when only a small amount of transport was available, I remember our compo rations were personally delivered by "BRASCO" (Brigade R.A.S.C. officer) of 3rd Brigade. This in itself was an extremely hazardous task at times, when any movement on the roads meant casualties.

#### THE LUFTWAFFE—NIGHTS IN THE QUARRY

Air supremacy we had, and none could have exploited it more fully than did the R.A.F. The result of this was that we seldom saw the Luftwaffe by day. There was the occasional "Tip and Run" raid by a Messerschmidt, but although the strafing of one unfortunately set the D.M.A. alight, they were generally viewed more with interest and excitement than with animosity.

A four-barrelled 20 mm. flak gun had been captured. It was mounted near the entrance to our quarry and manned, I think, by some keen gunners from the divisional armoured recce regiment. At first they were far from expert and shrieks of merriment would arise as tracer from "Little Willy," as it came to be known, cleaved the air several hundreds of yards behind a fleeting Messerschmidt. Sometimes we would hear the clatter of "Little Willy" opening up after the aircraft was out of sight and ribald comments would ensue from our Sappers. It became a source of comfort after dark however when the R.A.F. were not about, and the J.U. 88's made their nightly appearance.

Compared to the battalions up forward in the forest, we were very comfortably off in our squadron area. Moreover, life was interesting in that we saw so much of what was going on in the larger picture. Since we were beside one of the main routes we saw and knew what was coming in and going out of the area. This route was gradually developed until, after a particularly wet spell, during which it became almost impassable, the engineers of 1st Corps made it into a great tank highway, which led up from the Bailey bridges over the Orne to the top of the hill at Ecarde. Before this road was made we had to do a lot of maintenance along this route, especially at the time of a big armoured push which developed from our sector with the object of giving us a little breathing space.

#### ARMOURED OFFENSIVE

The armoured offensive which went due south from the vicinity of Ranville, involved a great build-up of armour over a period of thirty-six hours. Three armoured divisions were committed—the 11th, the Guards and the Polish Divisions, most of which passed through Ecarde. Non-stop for over twenty-four hours, this mass of metal churned its way up the dusty track past our quarry, making for the "LZs" above. Overnight the confields on the "LZs" became a vast tank laager as the brigades deployed and camouflaged themselves as best they could. Wherever there was a Horsa or Hamilcar fairly well preserved, a Sherman, Cromwell or Churchill could be seen nestling under its wing with its armament pointing viciously towards the enemy.

This mass of armour could not hope to go unseen by the enemy in such a small area, and on the second evening we expected fun and games from our playmates the J.U. S8's. Expecting the nightly 11 p.m. "hate" to develop into a real party, we were not held long in suspense. A minute to eleven saw the familiar red tracery in the sky and heard the ghastly rhythm of the German aero engines with the accompanying whine and thud of bombs. A few medium-sized bombs landed up on the "LZs" while we received more than our usual quota of the anti-personnel (S.D. 10) variety. The latter were about the same size as the shell fired by our 25 pr. guns. They were carried by the dozen in a large container slung in the bomb racks of the aircraft. This container was released over the target and a delayed action device would cause it to burst open a second or two later. Thus a high concentration of bombs was ensured, no matter what the speed of the aircraft. One canister must have carried a number "50" on it that night, since its contents went slap across

our quarry. We were fortunate to escape with only two serious casualties in the unit, only because of Rosie's foresight in making us continually deepen and reinforce the roofing of our slits. Two good members of the Squadron had to be extricated from the ruins of their slits to be given swift medical attention. They were Corporal Hooper, our ever-cheerful and very hardworking chief clerk, and Sapper Saddler, a tried and trusty Bren gunner of No. 1 'Troop. Both were men of the finest calibre, whose personalities had made them well liked by the whole unit. Both recovered from their wounds in England, but Hooper was left with one arm and Sadler with only one leg, so we paid the rent for our Normandy home with the loss of two men who could be ill spared.

This eventful night had its amusing incidents, one of which was the experience of two Sergeants, Bill Poole of No. 3 Troop and Docherty of. No. 2 Troop. They had both come to our division from the Guards Armoured Division, and so had been up the hill that evening to see some old friends in their field squadron. At eleven o'clock they were caught by the raid whilst half-way across the cornfield on their way home. They were forced to go to earth in the standing corn—like a couple of ostriches with their heads in the sand. There were other similar occasions to this. Geoff Smith and Sergeant Poole shared a fairly large shelter at this time, a shelter whose roof was far from substantial. One morning, after a particularly noisy night, they were shaken to find a massive corpse lying across the entrance. The body was that of a horse which, terrified by the bombing, had dashed itself over the quarry face.

#### FURTHER SCENES FROM ECARDE

After we had been at Ecarde a few weeks we began to get really settled down and all sorts of temporary structures made their appearance. Perhaps the most striking was the Squadron H.Q. shelter which came to be widely known as "the fortress." Designed by our civil engineer, "Bev " Holloway, originally constructed by Tom Marsh and a Section of No. 2 Troop and later strengthened by Jack Nash and some of No. 1 Troop, this shelter attained massive proportions. After most raids, the fortress was strengthened in some way or other. An extra foot of "burster course" on the roof, an extension to the blast wall or a few extra sandbags somewhere, and so it grew still larger and was probably one of the safest refuges in the beach-head.

Whenever a lull occurred in our engineer work, we spent the time in improving our area. The first structure, erected in Tim's time as a cookhouse for No. 2 Troop, had been named "Tim's Own " by the troop. No's. 1 and 3 Troops followed up by producing troop "offices" which, although very serviceable, rather resembled sheds on a building site. It is surprising how secure one felt inside No. 1 Troop's H.Q. Once inside its canvas walls, the cares and worries of the bridgehead seemed to fade away. The benign influence of the genial Freddy, commander of this troop, had much to do with it. Moreover, there was the cheerful presence of Tony Wade, commonly known as "Butch." In our second list of honours and awards, Tony was given the M.C. for his deeds during the early days. With a few men of No. 1 Troop, he accomplished an audacious night patrol into the village of Bavent, where he laid booby traps. Furthermore, since the alarm was raised whilst he was still there, he had the satisfaction of seeing the enemy trip some of the traps. Although this episode sounded screamingly funny when related by Tony, its success was a remarkable tribute to him.

Not to be outdone by the others, No. 2 Troop set to work during their next "rest" to produce further erections. A weird office rapidly took shape, it resembled a seaside shanty and one half-expected to see a hoary old mariner complacently smoking "Cruiser Plug" in the doorway. The salty appearance was given by the black tarred roof which was obviously part of a boat of some sort. In reality it was an old British army pontoon which we salvaged from a German dump near the river at Ranville. There was no doubt as to the age of the pontoon since it leaked magnificently after the slightest rain. The troop wag, one Sapper Smith by name, christened this shack "Spike's Retreat."

A constant source of amusement was the attempt to conceal our latrine sites from the eyes of the few French women who, from time to time, passed through the quarry on their way to a farm above. Many incidents occurred, which brought blushes to the checks of hardened parachutists who were caught at awkward moments. I am glad to say that these civilians were more amused at British shyness than alarmed by indecent exposure.

Ours was not the only quarry, it was merely one that had been worked out and had ceased to become a paying proposition. Nearby, a smaller one was soon set working by the Corps Engineers. Graded road metalling was urgently needed everywhere to strengthen and improve the few roads, which were rapidly crumbling under the strain of shell fire and ceaseless heavy traffic. From time to time we were forced to do the "double shuffle" for cover when blasting took place there. I felt very sorry for the Commandos who lived between us and this quarry.

A few hundred yards from us down the main lateral road, 286 Airborne Field Park Company were established in a much larger and more shallow quarry Here they ran a field workshops and had a massive stores dump, they also fixed up a very good bath-house which many units shared There was less cover here than in most of the quarries and so the resulting casualties were higher. 286 Company had some chaps killed by shelling in their location, a thing which was almost impossible where we were.

The Field Park had another annoyance in the form of the indefatigable Andy Lack. He was detached from No. 1 Troop in order to run a school of mines for the division. The site selected for the school was adjacent to the home of 286 Company. Completely oblivious of the dangers of his task, Andy would originate numerous disturbances involving loud noises and flying stones. His party piece was to take classes down into the Field Park's quarry and there to fire "Panzer Fists" at its walls. The *Panzerfaust* was the latest German invention for dealing with our tanks. It was a fearsome contraption, a cross between the PIAT and the BAZOOKA. Although a formidable weapon in the hands of a determined man, it required very careful handling, being quite dangerous to the operator; also being very heavy, it was found jettisoned in every hedgerow after a retreat. I collected several for Andy's school and so was indirectly responsible for some of the Park Company's unrest.

Always busy, 286 Company made and painted hundreds of sign boards for various units, two of their nicest ones were made for Pegasus Bridge; I hope they are still standing there. 'The carpenters' shop also turned out a very nice line in crosses, which were unfortunately required in fair numbers.

One thing our quarries had in common was a smell—and I mean a real smell—such as can only effuse from something long dead. It seemed to be a local custom to dispose of dead horses by allowing them to be covered by loose spoil from the quarrying. Sappers innocently taking the earth to fill sandbags, uncovered many such horrors—we soon learned to let sleeping smells lie.

Smells in Normandy that summer were really unique and one even gave directions by them. "Smelly Cow Farm" on the way to 3rd Brigade H.Q., in the later phase of the operation, was quite a landmark.

#### H.Q.R.E.

Late in July, the divisional engineers received another great blow when the C.R.E. and the I.O.R.E. were both removed from our midst by the same incident. Lieut.-Colonel "Frank" Lowman, D.S.O., M.B.E., and Leslie Shand the I.O., were inspecting some "dead" German tanks in a very forward area when a chance mortar bomb set off some mines close by. Leslie was killed instantly and the C.R.E. was seriously wounded. I am very glad to record that the C.R.E. later recovered in hospital at home. Leslie Shand, who originated from 591 Squadron, took over the job of I.O. when Johnny Shinner, who had held the post for a year and a half, dropped wide on "D" day and was taken prisoner in company with Jack Maynard, the Adjutant. Leslie had done a difficult job very well and was popular with all the divisional engineers. Of Frank Lowman I need say very little ; his had been the hand behind our training and operations since the very beginning and we missed him very much.

Our Adjutant since "D" day had been Peter Dixon, who had come over as the second-in-command of the Park Company; it reflects great credit on him that H.Q.R.E. was able to carry on at this difficult time. We very quickly had a new C.R.E., Lieut.-Colonel J. R. C. Hamilton, D.S.O. He came to us from a Beach Group further west, where he had been having a pretty sticky time since "D" day. I am glad to say that Colonel Hamilton stayed with us until the end of the war in Germany, and eventually said good-bye to the 6th Airborne Division in Palestine.

Bev Holloway of No. 3 Troop in 3rd Squadron, became the new I.O.R.E. and made a brilliant success of it. One of our great characters, and after the O.C. the only qualified engineer in the unit, Bev was universally popular. It was unfortunate for him that Intelligence Officer of the divisional engineers was a Lieutenant's appointment, since, had Bev remained with a unit, he was certain to have gained promotion quickly. It is sufficient to say that before being demobilized from Sumatra in 1946, he had held a majority for several months and had accomplished a vast quantity of engineer work in Medan.

#### MINES

In this campaign we rapidly became expert in the handling of many types of anti-tank and anti-personnel mines. The enemy used mines prodigiously and had enlisted the resources of captured dumps in the occupied countries, so we encountered mines of French, Belgian and Dutch origin, as well as German. Many of these were new to us, but we had few casualties; our training at home stood us in very good stead.

It was painfully obvious throughout B.L.A., that most casualties from mines were caused by carelessness, frequently in the handling of our own mines. German mines are devilishly complicated when compared with our simple ones, but to my mind, no more effective. The ingenuity of enemy design defeated its own ends, since one was ever alert for the presence of enemy mines and was imbued with caution when handling them. Once laid, mines respect no nationality, and so accidents with simple types of allied mines easily happen if one fails to be on the alert at all times when in the vicinity of them.

One particularly nasty mechanism which appeared for the first time in Normandy, was a new igniter for Tellermines, known as the TMiZ 43. In all "Tellers" the main fuse was situated underneath a large screw lid and one had, therefore, to unscrew the lid in order to disarm the mine. The new fuse was designed to go off if the lid were unscrewed—needless to say, our handling technique underwent rapid revision.

#### " Monty "

Late in July we were visited by our C.-in-.C., General Montgomery. He came to a small quarry near Divisional H.Q. and there presented the division with the first decorations it gained in the field. We had our share in 3rd Squadron. Rosie was awarded the D.S.O. and there was a M.C. for Tim Juckes which he had earned before his death a few weeks before. Fergy Semple of 591 Squadron received the M.C. which he had been awarded for his feat of organizing his sadly depleted squadron after the drop on 6th June.

For those of us who saw him for the first time on that occasion, "Monty" presented several surprises. First of all he was not as tall as we had thought him to be, and secondly, he was impeccably dressed—no corduroys and no sweater. Chief impressions were his piercing eyes and the magnetism which exuded from him during the ceremony and ensuing speech. I saw him several times in different parts of Europe later on and always felt he was proud of his airborne forces. We were certainly very proud to serve under him. Whenever "Monty" came to see us he wore a "cherry beret" which carried the badges of both the Parachute Regiment and Royal Armoured Corps.

#### PEGASUS WATER POINT

Water in the divisional area was always scarce, and sometimes very short indeed. It was eventually decided to sink artesian wells which would yield sufficient of this precious fluid to supply the whole division. A Well Boring Section R.E. appeared and commenced operations in an orchard behind Amfreville. Although the section was a mile or so from the forward positions, I never felt happy in its vicinity for two reasons. The first was the height of the derrick they were using, and the second was the infernal noise made by the clanking of the drill and by the engine. Both features were in glaring defiance of the principles which had already saved so many lives—keep down and keep quiet. They were also working in an area in which the enemy had so charmingly laid a number of "Schu" mines. However, those chaps went on with the job quite unconcernedly, their O.C., a lieutenant who appeared to be an expert geologist, proudly displayed to me a fossil he had raised from a depth of 50 ft.

The first boring proved unsuccessful and so a new site was chosen. The initial work was not entirely wasted however, since the deep hole was put to a very useful purpose. That well boring section was probably the only unit in the beaches with a latrine 70 ft. deep !

Work went on here for some weeks during which time No. 1 Troop erected a massive "Braithwaite" tank on top of a high tower of tubular scaffolding. No. 2 Troop constructed approaches to the proposed water point and prepared the pipe system at the point itself. We never had the satisfaction of seeing the division drink the water produced, since just as the job was completed we found ourselves going "hell for leather" after the retreating Germans.

#### "Holdfast"

There had been a divisional newspaper, *Pegasus*, since very early in the invasion; I still have its second edition and it is dated 12th June, 1944. We all thought a great deal of *Pegasus* and were extremely grateful to the divisional education officer who used to produce it, mainly out of his own head. He would travel the whole area on his motor cycle delivering the paper to units. We felt that something extra was needed occasionally however, and so after a long conference of "keen types" at H.Q.R.E., *Holdfast* was born. Here is the opening paragraph of edition No. I, dated 27th July:—



Photo 8 .- Supply drop from Stirlings, June, 1944.



Photo 9 .- The bridge over the River Orne, June, 1944.

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Photo 10.—Investiture, 6th Airborne Division, July, 1944. Major Roseveare is seated behind Major-General Gale and General Montgomery.



Photo IL.—Lance-Sergeant Irving receives the Military Medal. Investiture at 21 Army Group H.Q., 1at September, 1944.

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"' Not regarded by the G.P.O. or anyone else as a newspaper.'

"Right, we will explain what it is all about. This newspaper is (we hope) going to be a weekly affair for the special benefit of the divisional engineers and, of course, anyone else who considers he has the intelligence to make some sort of sense out of it. Complaints, suggestions and articles should be forwarded, preferably on a clean sheet of paper, enclosing your name and any other interesting details, to your unit 'War Reporter.' In case you are unaware that such a person exists, we will inform you, here and now, that No. 3 Squadron has a proper 'scoop merchant,' Captain Shave ; 591 is lucky in securing the services of no less a personality than Captain Baillie; 249 simply can't go wrong, they have Lieutenant Moncreiff, and 286, at great expense, have engaged Lieutenant Williams. We know quite definitely that the Div. R.E. is simply oozing with talent, so pop, pop, pop, pop it down. We are confident that after a short while this periodical will 'grow' on you, even if you don't think much of it. Anyway, we shall continue to publish it in spite of all the things you can do to stop us. So for the rest of your army career we are afraid you will just have to put up with this sort of thing every Tuesday-yes, we know it is Thursday today, but in future Tuesday will be the Great Day. Just one last point, we have no connexion with that highly esteemed publication Pegasus, except that we are learning a hell of a lot from it."

Thus came the first editorial from the typewriter of Sapper Clarke of H.Q.R.E. He was a power behind the scenes in *Holdfast* and but for him several editions might never have appeared when times were difficult. Another driving force behind *Holdfast*, and its censor, was the Adjutant, Peter Dixon.

The magazine followed the divisional engineers from Normandy to the Baltic, and became an institution. A sheet of this nature provided a good medium for the Sapper to get in a sly dig or two where he felt it was needed. Although most of the efforts which appeared in it were pretty average in quality, there were some very good contributions. The latter chiefly emerged from the humorous and extremely fluent pen of one, "C.O.R.", who shall be nameless, but who was a senior officer closely connected with both Para. Squadrons. His efforts were all very good and widely appreciated since they were so obviously inspired by experiences in the operation. Here is a typical example which gives a fair idea of what life in Normandy was like :—

#### IF, (WITH APOLOGIES TO KIPLING, R.)

If you can keep your head when shell and mortar Are falling thick as autumn leaves around, And lay those mines no thicker than you oughter And never give a thought to going to ground. If you can wait and not get tired of waiting, For pigeons bringing news for which you pine, And when the news is wrong not start creating, But cheerfully go back into the line.

If you can dig deep shelters for Commanders, Against the clock, in blinding rain, then rush 'Through mud as deep and foul as last war Flanders To find your own is two feet deep in slush. If then you find that all your clothes are soaking, The supper's only cheese and there's no mail, If you can say just, "Really how provoking" And with a cheerful will begin to bale. If you can navvy at the quarries until You're blind with dust, sweat soaked and wracked with aches, Yet always wear your beret horizontal And never hanker after NAAFI breaks. If neither NAAFI beer nor lack of matches Can fray your temper, sap your will to win, You'll probably get mentioned in despatches, You're a better man than I am, Gunga Din.

Despite the fact that it was only a "spare time" product, *Holdfast* continued to keep abreast of events amongst the engineers; we shall hear more of it later, it is now an essential part of the history of the Sappers of 6th Airborne Division.

#### 591 PARA, SQUADRON

For 591 Squadron, the Normandy operation was marred throughout by the unfortunate and crippling losses it sustained on "D" day. Due to faulty dropping, this Squadron lost its O.C., Major "Andy" Wood, one Troop Commander, Captain Tony Jackson, and two more officers, Tony Olivera and Keith Best. All were taken prisoner and were released in 1945 by the advance through Germany. Keith Best managed to remain at large for three weeks behind the enemy lines before being "put in the bag." Gordon Davidson, the second-in-command of the Squadron, was himself a prisoner on "D" day, but managed to escape. It was left to Captain Fergy Semple and a handful of officers and men to accomplish what they could of the Squadrons tasks during the initial assault.

The assault on the battery at Merville by the 9th Para. Battalion should have had Captain Jackson's troop to aid the gun destruction, but they were scattered to the four winds. This troop was taken over by Jock Hinshelwood.

Having done what they could during the initial phase of the operation, the Squadron established itself in a small farmhouse on the edge of Ranville and proceeded to re-form. Gordon Davidson became O.C. and Fergy Semple assumed dutics of second-in-command. Bob Beaumont and Ted Baillie of the 3rd Squadron were transferred to 591 as troop commanders.

It was not very long before the Squadron was undertaking its fair share of the works which piled up for us on all sides ; I do not doubt for a moment that they were as good as ourselves when it came to laying wire or mines, digging massive dugouts and mending roads.

Towards the end of the campaign, Gordon Davidson left the unit and Captain Allan Jack, our own second-in-command, took over. Geoff Smith of No. 3 Troop became our new squadron second-in-command, his place in No. 3 Troop was taken by our jovial Yorkshireman, Jack Inman.

All the interchanging of officers cemented the bond even more strongly between the two Para. Squadrons. Of course it was always our boast that the best men in 591 Squadron all had 3rd Squadron ancestry; I never asked a member of 591 Squadron what he thought of this idea.

#### COLLOMBELLES.

On the east side of the Orne, between us and Caen, lay the vast iron foundry of Collombelles. The havoc caused by our heavy bombers at this place was indescribable, the giant workshops were mere husks of their former selves. For a short time we were able to visit the place to obtain such things as roadmaking materials, corrugated iron, and so on. These trips proved quite exciting, since the high buildings could easily be ranged by German guns sited on higher ground to the south-east. Tom Marsh of No. 2 Troop was the first member of the Squadron to discover this. Tom arrived back at the quarry one day with a large water tank in the back of his truck, through the tank was a large jagged hole. Apparently he and his party had been playing hide-and-seek round the buildings with some 88 mm. shells. After a few more of these incidents we decided to find other sources for our stores.

#### How the Invasion Stood on 17th August

As the relentless pressure of the Allied armies closed the Falaise Pocket, it became clear that such of the German armies opposed to us that escaped, would sooner or later retire behind some big natural barrier to lick their wounds. This barrier would obviously be the river Seine and for us, would mean an advance of between forty and fifty miles on a wide front. Plans for an advance were prepared and we waited expectantly.

The plan for the Canadian Army, under whose command 1st Corps had been placed, was to break out towards Falaise and then to swing east towards the Seine through Lisieux, some fifteen miles inland from the coast. The task of 6th Airborne Division was to clear the coastal strip as quickly as possible up to the mouth of the Seine. This had a most important bearing on the advance of the rest of the army, since if the Germans fell back at all on our front, they would be forced to fall back all along their line or else their flank would be exposed.

In an operation of this nature, the division was not expected to do more than simply follow up the retreating enemy, owing to the shortage of transport. This however, was not the intention of General Gale and his commanders; in any advance they, and the whole division, intended to be in advance of the van.

It was realized that the task would be no small one owing to the nature of the country between us and the mouth of the Seine. To reach the mouth of the Seine we should have to cross a number of tidal rivers, not forgetting the widely flooded and very marshy area of the Dives valley which we should have to cross as soon as we emerged from the forests of Bures. Only two routes were open to us, the first went via Troarn—Dozule—Pont Leveque— Beuzeville to Pont Audemer. The other route lay along the coast via Cabourg, Trouville and Honfleur. The water obstacles we should have to cross would be, the Dives and its surrounding marshes, the Dives Canal, the Rivers Touques and Risle. The rate of any advance would clearly depend largely on the speed at which the Sappers could bridge these obstacles and remove any other ones the enemy might devise, including minefields.

The enemy plan would be to withdraw throughout, according to a highly organized scheme for making our advance as costly and as slow as possible. He could do this by efficient demolition on a large scale and by employing small, hard-hitting rearguards.

Well before the advance began on 17th August, our rôles in the coming operations were decided. Nos. 1 and 2 Troops would go forward with 3rd Brigade, cross the Dives at Bures and then cut across to the main highway well the other side of Troarn. No.3 Troop was allotted the unenviable task of helping 6th Airlanding Brigade along the coastal road, which was expected to be rather sticky since it went right through the thickly defended coastal strip.

There was an air of expectancy about the bridgehead, the feeling that the occasion we had trained and fought for was at hand—the liberation of the occupied countries and the killing of the flying bomb sites in the Pas de Calais. Moreover, the pursuit of retreating German forces would add a terrific zest to a life which had tended to become tedious.

#### CHAPTER 5

#### THE ADVANCE TO THE RIVER SEINE

At three o'clock on the night 16/17th August, 3rd Para. Brigade commenced to advance through the forest towards Bures and by dawn the division was advancing along its whole front.

The first battalion to move was the 8th Para.; its route lay through the paths and rides of the Bois de Bures which had been so familiar to us during the first days of the invasion. No. I Troop went ahead of the battalion in order to clear or mark any mines and booby traps as far as the river Dives. They found numerous traps, but fortunately had no casualties when dealing with them.

As soon as the 8th Battalion had crossed the river at Bures, No. 2 Troop followed up and put a light bridge across, alongside the demolished road bridge. Beyond the river lay a waste of low lying marshland; the only route across it was along the raised railway embankment, on to this we had to get the brigade's transport. The task was shared by both troops and a stream of jeeps and guns was soon following up the battalion, which by this time was miles ahead. During the whole of the advance, at a time when the division had not enough transport to lift itself complete, I never ceased to admire the marching powers of the infantry. After more than nine weeks of life among evil woods and sitting in damp holes, roasted by day, often frozen and wet through by night, they proceeded to march and fight at top speed for days on end. This was the 6th Airborne, with wings on its feet as well as its shoulders, and a spirit which said, "Bash on regardless."

On the road to Cabourg with 6th Airlanding Brigade, No. 3 Troop had plenty to do. The road was thick with craters and mines, the former were bulldozed in and the latter picked up. The brigade was then held up east of the town by pillbox defences.

This was a great day for us all and there was plenty of work to be done—what a marvellous change it was from the endless "potholing," water supply and shelter digging we had endured in the preceding weeks. I got a great "kick" out of bridging at the spot where we had blown the bridges on "D" day.

Whilst we were engaged in putting 3rd Brigade across the river at Burcs, 249 Company and 591 Squadron were bridging the multiple obstacle at Troarn, higher up the river. The main road bridge which had been originally hastily demolished by us, had since been repaired by the Germans. During their retreat they had once again made a really thorough job of the demolition, with the addition of three smaller water obstacles on the Troarn side of it.

249 Field Company effected the crossing of the first three obstacles, 591 Squadron then put a folding boat bridge across the Dives, just downstream of the site of the old bridge, which was by this time only a heap of brick rubble. The operation took quite a time and it was not until early next day that traffic could cross to support 4th S.S. Brigade and 5th Para. Brigade, who had meanwhile passed along this route on foot.

Late in the afternoon, we in No. 2 Troop found ourselves back on the main road leading into Troarn, filling in craters and picking up Tellermines. By nightfall we had picked up over 400 mines and were feeling a little strained. Bivouacking that night in an orchard by the roadside, we fell asleep dead beat. At about 1 a.m. we were awakened by a hullabaloo—a sentry had found a chap, Sapper Tillbrook, crawling around the orchard, still looking for "Tellers." We took him straight back to the M.D.S. at Ranville that night and I am glad to say he soon recovered at home. We felt very sorry to lose him like that, having been through all the very hardest times with us, he was now to miss all the fun of the advance and what little "liberating" we were able to do.

We had another casualty in the troop that day, a lance-corporal, whose name escapes me, stopped a shell splinter in his leg from one of the very few stonks of that day, another of our Scotsmen and an excellent worker.

## THE CROSSING OF THE DIVES CANAL



The evening of the 17th found 3rd Para. Brigade in the area of Goustranville, about half a mile short of the Dives Canal. That night the 5th Brigade moved up, and the following afternoon found the two Para. Brigades and the 4th S.S. Brigade with Divisional H.Q., all on the narrow strip of high ground along the main road. The enemy began a ceaseless shelling of Goustranville which was most unpleasant. One gun of very large calibre (210 mm.) began firing from the coast, it was apparently a coastal defence gun turned inland. This gun dropped its great shells in the area of the Troarn road bridge, making the crossing rather unhealthy. 3 Squadron H.Q. had moved up and was now located three miles south of Goustranville.

On the 18th, No. 2 Troop was pushed up again to assist in the projected crossing of the canal. It was thought that the bridges were all blown and so we were given some folding boat equipment, which waited with the bulk of the troop just short of Goustranville. Late that night 3rd Brigade attacked the crossings and the 9th Battalion advanced to the railway station at the top of the hill beyond. There were four bridge sites in all, two were blown, one

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was passable to infantry, and the last was captured intact by the Canadian Battalion. The crossings were immediately reconnoitred by Alan Forster and Tom Marsh and all information sent back to the C.R.E. "Canada bridge," as this one was christened, was a small, ancient brick arch affair some 300 or 400 yds. to the right of our axis of advance. When I went forward to recee a route from it back to the main road, I was surprised to see that it had been most carefully prepared for demolition and the buried charges were extremely well protected and hidden from view. Electric firing leads led away to some farm buildings beyond, but there was no exploder to be found. I surmised that there had been only one or perhaps two exploders for the four demolitions and the Boche simply had not had time to connect this one up.

5th Brigade passed through over this bridge as we were removing the charges during the small hours. Within a short space of time they delivered a new attack, and by breakfast time had taken the village of Putot-en-Auge with 120 prisoners. After this glorious night's work, both brigades rested the following day and the Commandos again took up the initiative.

It was decided that we should not use the folding boat equipment here, since Canada bridge would suffice for our light traffic until 249 Company could come up with some Bailey bridge. We were, therefore, told to improve the approach along a farm track and across a field to Canada bridge, by laying Sommerfeld Track. This was all right in theory, but unfortunately the place was still under observation by the enemy from high ground to the south. A three-ton lorry and a party of men off-loading Sommerfeld is quite a large object and liable to attract unwelcome attention. Ours was no exception. Shortly after the work had begun, the party was subjected to heavy and accurate mortaring, only prompt action by Driver "Harry" Gray saved the precious vehicle.

On the night of the 19th, the 1st and 4th S.S. Brigades, assisted by No. 3 Troop, crossed the canal to continue the attack. There were high hills commanding the main road both from the north and south. Over these hills went the attacking Commandos, 4th S.S. Brigade to the south-cast of Putoten-Auge and 1st S.S. Brigade to the north of the main road. Both brigades gained their objectives after heavy fighting, but 1st S.S. Brigade was then cut off and remained so for the best part of the next day.

Meanwhile, 6th Airlanding Brigade had been pushing its way into Cabour it had, under command, Belgian and Dutch contingents. They were now left to carry on along this route while the brigade itself was brought up to relieve 1st S.S. Brigade. The same night the enemy resumed his withdrawal and early next morning 4th S.S. Brigade captured Dozule, and we found ourselves once again sweeping the road ahead of the 3rd Para Brigade as it advanced.

#### Dozule

We found no mines in the first few hundred yards of road beyond the railway, but at the first crossroads eight enormous shells were buried in preparation for cratering. These shells, of 270 mm. French naval pattern, were heavy and well dug in, so that it was no easy task to dig them out and lift them to the roadside. During the advance we saw several such instances of shells being utilized in enemy demolitions. One particularly devilish anti-landing obstacle was seen in a field by the roadside, it consisted of a 210 mm. shell suspended in mid-air from a framework of logs. From an igniter in the nose of the shell, trip wires were led to all parts of the field; thus was provided a warm reception for any parachutist or glider unfortunate enough to land there.

Whilst we were clearing this obstacle, Andy Lack passed on a motor cycle, he was doing the duties of Squadron I.O. at the time. A few minutes later

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he came back to tell me that there was a mined road block at the entrance to Dozule, some 400 yds. further on.

The road block was lightly constructed from "knife rests," and a patrol of our armoured cars had crashed through it. Eight of the A.F.V.s. had passed through, but the ninth (and last) one had gone up on a Tellermine. With Andy, I went forward and helped a couple of sappers clear both mines and blocks. The damaged scout car was pulled aside with the aid of another A.F.V., its crew were quite unhart but very sorry for themselves.

The retreating enemy continued to shell the town for some hours after the passing of our first troops. The main street was blazing merrily when we appeared on the scene, several houses had crashed across the road and would prevent the passing of any further vehicles. We asked for, and soon received, the services of a bulldozer, and the way was soon cleared. To prevent repetition of this blocking, the fire had to be brought under control; we therefore set to work at firefighting with the aid of some of the townsfolk.

This was our first experience of the real French people, there had been so few in our part of the beach head. The atmosphere was one of semi-hysteria which prevails in a town from which the enemy has just been driven. Many of *les habitants* were still cowering in their cellars but there was a surge of activity in the vicinity of the fire.

Eventually an antiquated hand-operated fire engine was dragged into view and *Les Pompiers*, as the firemen were called, set to work. They were very short handed and the pump could only supply one small hose. We took over the hose and as many buckets as could be produced, while the Frenchmen slogged away at the pump handles. It was some hours before we had the blaze under control, by which time we were more than ready for the bucket of coffee, laced with Calvados, which was produced.

In Dozule we found the graves of several airborne soldiers and heard of others who had hidden there for various times before capture or escape to our lines.

At about twelve o'clock the O.C. gave us the news that the Germans were still in full flight and that the 8th Battalion had advanced several miles beyond the town. He also said that a large water purification trailer was on its way up to us and it was to be set up at any suitable site down the main road to act as a water point for the brigades now moving up. The trailer duly arrived and we had a good water point operating that evening.

The advance on the 21st was concluded with the capture of Annebault by the 8th Battalion after a stiff fight. It would be difficult to find a unit with a better fighting record than this battalion, or a battalion commander with more fighting experience than its C.O., Lieut.-Colonel Alistair Pearson, D.S.O. (three Bars), M.C. The 6th Division was now in the lead with a vengeance, the nearest allied troops were the 49th Division (Polar Bear), some ten miles to the right of our axis. Contact was maintained with them through the Armoured Recce Regiment.

Squadron H.Q. moved right up, and the night of the 21st found us all concentrated at a large farm on the way to Annebault. The 5th Para. Brigade moved up as far as this village in M.T., and in the morning they continued the advance to Pont Leveque on the river Touques. No. 3 Troop was sent up in support, with a view to bridging in the town, once the brigade had captured the crossings.

#### SQUADRON COMMANDER

At this point I intend to digress a moment in order to set down a few impressions of our squadron commander, which I feel sure were made in every man's mind. I think we were all at our best during this period of advance but none showed it better than he. The task of squadron commander can seldom have been an easy one and at times, especially during the static period, it must have been a great mental strain. I read this in Major Roseveare's face, and in the face of Allen Jack, during our stay in the quarry.

Once the advance had commenced, Rosie became a veritable fountain of energy. To control three troops with different brigades, each with a troop commander who wanted to do things in his own way, right or wrong, in a swiftly moving battle, would tax the spirit and energy of a genius. Rosie was no genius, but he closely resembled one on several occasions. It can safely be said that for nearly every task given to a troop, either by a brigade commander, the C.R.E. or by Rosie himself, he either reached the site soon after the troop arrived or he had been there hours before and had carefully briefed the troop commander.

There were some good reasons why he was able to accomplish so much. The most important was his ability to sit down at any time of the day or night and plan to the smallest detail. The second reason was the high standard of his "intercom" by wireless and D.R. Lastly—not quite so important, but it helped—his driving. I find it very hard to decide where skill ends and madness begins in driving. I am not ashamed to admit that when driven by the O.C. I often wanted to close my eyes and push my feet through the floorboards of the jeep. Miraculously he always arrived at the appointed place in an incredibly short time, usually without accident, but not without incident.

Two more characteristics seem to stand out from this time. Rosie always seemed to have the latest "picture," i.e., "battle situation,"at his finger tips, and again to our advantage, he had a flair for finding good billets.

#### PONT LEVEQUE

This small town at which 5th Brigade had been halted, lay in a flat fertile river valley about one mile across. Hills dominated the town on each side and a small determined force could easily deny the crossing. The river was not large, but divided in the town so that there were two bridges in the main street. It was evident that this small town might present a formidable obstacle to our progress. On the east bank of the river, beyond the town, ran a railway on a high embankment which commanded both the town and the water meadows on each side of it.

The 5th Para. Brigade's attack went in on the morning of the 22nd against the most stubborn resistance. In the middle of it, Andy Lack went down by himself to recee the bridges. He found that the first was blown, but after scrambling across the wreckage, he saw that the second one, some 80 yds. further on, was as yet undemolished. He cooly began to remove the charges, dropping them into the water. By this time the Boche had begun to take an interest and Andy noticed the presence of certain pieces of metal which had come rippling forth from the mouth of a "M.G. 42." Deciding that, after all, life was quite sweet, he began to retrace his steps. Whilst re-crossing the first obstacle, he received a burst through his shoulder, but managed to mount his motor cycle and report back to 3rd Brigade. Before we saw him again, some months later, he had been awarded the M.C. Soon after he left the site of the demolition, a louder bang than usual denoted that the second bridge had gone the way of the first.

No. 3 Troop distinguished themselves at Pont Leveque on the 22nd and 23rd, while attempting to improvise a crossing of the two obstacles in the main street of the town. The 12th and 13th Para. Battalions had positions well forward but they were not sufficient to keep down the enemy fire. No. 3



Troop was being commanded by Jack Inman at this time ; he and Tom Marsh with an armoured bulldozer and a crowd of Sappers, succeeded in making a crossing over the first obstacle, but not over the second. They were hampered by the presence of civilians, who, regardless of the danger, were crowding round offering voluble advice. Lieutenant Marsh had a very narrow escape on one occasion when an old man standing beside him was riddled with a long burst from a Spandau.

During the night 22nd/23rd, the enemy set fire to the town and, with the breeze in their faces, our forward troops were forced to withdraw, so making life even more unpleasant near the bridges. No. 3 Troop continued working while the shops burned on each side of them; they succeeded in partly staying the flames by blowing down a few walls, but in the end the task had to be abandoned.

Early on the 24th, the enemy withdrew and No. 1 Troop was able to put a folding boat bridge across in the meadows on the north side of the town. Traffic could not pass until the afternoon because, although the bridging went well, the route to the main road on the far side of the river was long and difficult. The route lay across some 400 yds. of low lying meadow to a narrow exit through a tunnel under the railway embankment. This tunnel gave on to a series of tortuous "one way" side streets leading to the main road east, about a mile further on. To avoid a complete traffic block it was necessary to conserve this "getaway" most carefully. No. 1 Troop therefore arranged a ferry by which No. 2 Troop, some Sommerfeld track and a bulldozer were put across before the bridge was complete. After some track had been laid and a hedge removed, traffic was allowed to pass and No. 2 Troop had the task of keeping it on the move beyond the river.

The 5th Para. Brigade continued rapidly along the road towards Beuzeville. About four miles east of Pont Leveque the leading infantry encountered another large obstacle in the shape of a brick arch railway bridge which had been dropped neatly into the road. The way for vehicles was blocked by a mound of rubble and masonry some 30 ft. high, and 80 ft. across. The railway embankment was also high and no immediate diversion was available. Past this obstacle, the infantry ran into heavy opposition and required the services of a gunner O.P. with wireless to direct the fire of our artillery.

Arriving at this obstacle at about five o'clock with a jeep and recce party, I was seized upon by Brigadicr Poett and told to do anything possible towards getting an R.A. wireless jeep across. I found what appeared to be the least impossible route over the embankment in a copse some 40 yds. to the right of the obstacle. Leaving Sergeant Docherty with Sappers Campbell and Guy to clear away the small trees with the tools we carred on the jeep, I returned to the bridge site and brought up the rest of the troop as quickly as possible. Just after we returned, Docherty was putting a second jeep over and we were complacently watching it being manhandled up and across the railway lines when suddenly a burst of Smeisser came singing up the tracks. Needless to say, we did not stand around very long. Fortunately there were no casualties from this burst, but the helmet was ripped from the head of one of the infantry who were giving a hand.

The troop set to work at the task of clearing the main obstacle, and after an hour we seemed to have made little impression on it. At this point the C.R.E. arrived on the scene and indicated a diversion along a side road a short distance back. The railway bridge across this route had also been demolished, but it was a smaller obstacle and more easily cleared. I felt very small myself for not sceing this diversion before. However, instead of getting a "rocket," I was given the help of some Commando Sappers who were put to work on the smaller obstacle and cleared a path through it in record time. We continued to work at the main obstacle until it was possible to get jeeps and trailers over with comparative ease ; we then bedded down in a barn which was already occupied by representatives of two other units.

The 1st S.S. Brigade passed through during the night and pressed on as far as Beuzeville, where they were held up. The 4th S.S. Brigade and 3rd Para. Brigade moved up in support and a stiff battle was fought on the south side of the town. 591 Squadron, which had by this time moved up from Troarn, was sent forward to support the brigades on this axis. Beuzeville was ours on the evening of the 25th and General Gale ordered the advance to be continued with all speed to Pont Audemer on the Seine. By securing the crossings there, he hoped to cut off the larger forces of Germans who were retreating in front of the 49th Division on our right. The 1st S.S. Brigade therefore pushed on and were "leapfrogged" by the 5th Brigade and the Royal Netherlands Brigade early on the 26th.

After a further sharp battle, Pont Audemer was taken and there the fighting advance of the 6th Airborne Division in Normandy ended. Bob Beaumont of 591 Squadron was one of the first into Pont Audemer and was able to greet the leading elements of the 49th Division an hour or two later. Some time afterwards, General Gale delivered a lecture to all officers of the division. The lecture concerned the lessons to be learned from the Normandy campaign. During the course of this lecture the G.O.C. told us an amusing anecdote on the taking of Pont Audemer. He said that, since the town had officially been a 49th Divisional objective, not one of ours, he had incurred the wrath of his friend "Bubbles" Barker, G.O.C. 49th Division, by getting there first.

After Pont Leveque, days became very pleasant for the 3rd Squadron. During the small hours of the 25th, No. 2 Troop were ordered to recce the road from Pont Leveque to Honfleur. Nos. 1 and 3 Troops remained behind to maintain the crossings and to carry on with the clearance of obstacles in Pont Leveque.

Going "flat out" down the road to Honfleur we found a gaping hole in the surface of it where there had been a culvert. The crater was some 40 ft. in diameter ; 20 yds. from it the remains of a German officer lay in the ditch. It was possible to skirt round the obstacle as some wheel tracks showed in the wood on our left. Not far from these tracks lay an unexploded shell of large calibre which had obviously been thrown there from the demolition. The story of the German officer's body I had from the Maquis a couple of days later. He had been shot by them the day before our arrival and his body placed in the culvert while the Maquis went off in his car. Then the German engineers came along, dug the shells into the road without looking in the culvert, and blew the crater. The Maquis had returned to the site, marked the position of the body with its pretty Wehrmacht cap which was in their possession, and had remained beside the crater to warn the oncoming allies of its presence.

The troop was put to work on repairing the crater and I continued to Honfleur. Between this spot and Honfleur city there were two more craters, both of which had already been filled by enterprising Frenchmen.

Honfieur on 25th August was in a state of violent excitement. The Belgian Brigade had just entered the city as we arrived and everywhere we were greeted with flowers, wine and smiles. The noise was tremendous. We stopped for a drink at a cafe a few yards up the street. To this spot the Maquis and various other "strong arms" were bringing collaborators, and were administering rough justice. The women were having their heads shorn—what happened to the men we could not see, and cared less. Regretfully pulling out of the town, we reported back to Squadron H.Q. and then finished off the work at the crater. When the work at the crater was finished, we moved to a large château in the forest some two miles away. Here Squadron H.Q. had been set up and it was the intention of the O.C. to concentrate the unit there to rest. Upon arrival, we found that the O.C. had again shown his flair for the best by locating a beautiful empty château recently occupied by a German Divisional H.Q. The place was a veritable palace and had evidently been well used by the enemy. The kitchens and bathrooms were in the usual revolting condition. One luxurious apartment, so we were informed by an old servant, had been occupied by two mistresses—it certainly bore every evidence of it.

Just as we were off-loading our kit and sorting out accommodation for the troop, we were ordered to proceed forthwith up the coast road in support of the 6th Airlanding Brigade. We travelled fast to Honfleur and thence along the coast to Conteville, where I billeted the troop at the farm of the mayor, and then set off in search of 6th Brigade H.Q. I found this at midnight, well in the country, also located in a palatial château. Having reported our whereabouts and learning that there was "little doing," I returned to the troop. The mayor proved very hospitable and was astonished when Alan Forster and I expressed a wish to sleep near our men in the straw-lined stables instead of in the beds he offered.

The 6th Airlanding Brigade finished its advance to the Seine on the following day, and after reporting on the condition of the route, there was little for us to do. One small task we had was the setting up of another mobile water purification trailer. Another task was carried out by Alan Forster. He travelled round to most of the farms in the district disposing of the discarded ammunition which, at that time, littered the countryside.

On 26th August, Squadron H.Q. had to vacate its château to allow Divisional H.Q. to move in. Rosie quickly established the Squadron in another beautiful country house, this time at the small village of Ablon which lies between Honfleur and Beuzeville. Château d'Ablon was owned by a rich Frenchman, M. André de Brévendent d'Ablon, who was in residence with his wife and two daughters ; here were billeted Squadron H.Q., and Nos. 1 and 3 Troops. The officers were regally entertained by M. André and his family. The accommodation was insufficient to allow No. 2 Troop to join the Squadron. After a long rece we found billets for No. 2 Troop in La Riviere St. Sauveur, a pretty village on the coast road between Ablon and Honfleur. The buildings had been occupied by Russian troops of the Wchrmacht and were in a revolting condition. However, we soon had the place cleaned up and spent some delightful days there.

The Maquis group at La Riviere St. Sauveur had led a very active existence and were still patrolling the woods every night and bringing in the odd German. They proudly exhibited their cache of arms hidden in a cupboard of the schoolroom; on the other side of the school courtyard there had been a German billet. They gave us souvenirs in the shape of swastika flags and German badges. We passed on to them some spare tins of "M and V" (compo tins of meat and vegetables), for which they were extremely grateful.

Several incidents stand out from these few days—a minor one, but at the same time very important and most enjoyable, was a visit to a mobile bath unit near Divisional H.Q. Owing to the speed of our advance and the restricted area we had been operating in, we had only seen a mobile bath once before, but for units which were fortunate enough to be located near one they were as gifts from heaven. The blessings of the Mobile Bath Unit seem small in print, but I doubt if any other unit did more to raise the morale of our armies. A visit to such a unit entailed a hot shower and a complete change of towels and underclothing.

#### INVESTITURE

The 1st September was a great day for the unit and for the whole division. On that day officers and men who had been awarded decorations in the field since the early days of the campaign, proceeded to a small village near Evreux, many miles away, where H.Q. 21st Army Group was located. There the second ceremony of presentation of honours and awards to the division was conducted by the C.-in-C. Not only did the newly promoted Field-Marshal Montgomery present the decorations, he also gave an informal talk to the fortunate few who were present. In it he gave a short résumé of the campaign to date and told us a little of his future plans. He impressed upon us that we were shortly going home and that he wished us to tell the people at home just how enormous the accomplishments of the army had been and what a colossal thing this invasion really was.

"Monty" felt proud of the 6th Airborne and did not conceal it; he revealed to us the now widely known grand strategy of the Normandy campaign. How it had been his intention from the beginning to engage the bulk of the German forces with the British and Canadian armies in the Caen sector. When sufficient "build up" had been achieved he had intended to effect a break-through and a killing "right hook " by the new American armies which were to pour in. The safeguarding of the exposed left flank by the 6th Airborne Division was a particularly vital part of the plan. He went on to say that the spectacular American break-through had been a terrific success. Then, approaching the climax of the campaign he said :—" Gentlemen, Hitler lost the war on the day that he ordered the Panzer offensive, whose object was the splitting in two of the American armies. As soon as I heard of it I ordered the American columns to swing due north in order to seal up the ' pocket ' which had been formed in the Falaise arca—' Rockphoons ' then finished off the battle."

The C.-in-C. went on to tell us that his next objectives were the flying bomb sites in the Pas de Calais, these he intended to kill with a further series of "right hooks."

The Squadron had four representatives at the ceremony, two officers received the M.C., and two sergeants the M.M. The announcement in *Holdfast* ran as follows: $\rightarrow$ 

"We would like to extend our congratulations to the following who have been decorated for distinguished conduct in the field $\rightarrow$ 

Captain J. S. R. Shave, Lieutenant G. A. J. Wade-Military Cross. Sergeant S. R. Shrubsole, Lance Sergeant W. Irving-Military Medal."

That evening a dinner party was given by our hosts at the Château d'Ablon in honour of the recipients of decorations in the Squadron. Sapper Drummond of H.Q. R.E. had also been awarded the M.M. but he was too far away to come to the dinner.

The dinner was, of course, known as a "Gong Party" and it was a great success. Despite the food shortages, the meal was delicious, the wines were second to none. Our glasses were charged time and again with everything from Champagne and old Burgundy, to fine old Liqueur Calvados. With traditional hospitality our host, M. André frequently went round the table to see that our glasses were never empty. Rosie was in terrific form that evening. Apart from the fact that his D.S.O. made him the chief guest of honour, he also worked hard to see that everyone, including himself, enjoyed the occasion. Late at night he drove Alan Forster and myself back to La Riviere St. Sauveur—enough said—I think he utilized the wings on our shoulders to get us there.
This, for us, marked the end of the campaign and the next day we received the orders for our move to England.

#### GOOD-BYE TO NORMANDY

On the 5th September we moved in troop-carrying vehicles to Arromanches, where we spent one night in a transit camp before embarking on the following day. The journey right up through the beach-head revived many memories and also enabled us to see many of the marvels of the invasion which we should otherwise have missed.

Between Beuzeville and Troarn I felt clearly that we were now in a "backwater," the invasion having passed on. Leaving Troarn behind, we approached Caen through the area where had been the objectives of the 1,000 bomber raids which we had witnessed. The chaos in this area was indescribable. At the point where the village of Bannerville was marked on the map, the road just became very bad, with a series of enormous craters on each side. That was all that was left of the village.

The east side of Caen consisted of a continuous heap of rubble and masonry, through which the Canadian army engineers had buildozed a path and made a good road. Beyond the city of Caen and right through the bridge head, we saw the vast dumps which had been created during the build-up. Here, a mile of ammunition or a twenty-acre field stacked high with compo boxes, there, a vast engineer stores base depot containing thousands of tons of bridging equipment. After passing Reviers, we were thrilled by the sight of hordes of German prisoners in vast wire cages. We also saw the airfield from which thousands of the badly wounded had been flown home after treatment in the general hospitals at Reviers and Bayeux.

As we walked out over a quarter of a mile of pontoon landing bay through the "Mulberry Harbour" at Arromanches the next day, I realized we had been only a minute part of the whole invasion. I felt very glad to have helped the Squadron play that part.

After an extensive, large scale airborne operation, followed by nearly nine weeks of gruelling action in the bridgehead over the Orne, the division had carried out a fighting advance of 45 miles, largely on foot, to the river Seine. Over 1,000 prisoners had been taken during the advance. At the close of the advance, the following message was sent by Lieut.-General Crerar to the Commander of 1st Corps.

"Desire you inform Gale of my appreciation of the immense contribution 6th Airborne Division and Allied contingents under his command have made during the recent fighting advance. The determination and speed with which his troops have pressed on despite all enemy efforts to the contrary, have been impressive and of greatest assistance to the army as a whole."

(To be continued)

B,A.O.R.	British Army of the Rhine.	
Bazooka	American anti-tank weapon which fires a rocket.	
B.L.A.	British Liberation Army.	
Blower	Slang term for wireless set.	
B.W.E.F.	British Western Expeditionary Force.	
C.C.S .	Casualty Clearing Station.	
Сотро	Composite rations. Forms of canned, dehydrated, compressed and concentrated foods. Packs vary from the twenty-four-hour "Assault Pack" con- taining food for one man for one day, to a pack which contains sufficient food to feed fourteen men for two days.	
Dak.	Dakota-troop-carrying aircraft,	
D.R.	Despatch rider.	
DZ ·	Dropping Zone—a clear space into which parachutists can drop, or stores may be dropped.	
Gong	Slang term for decorations and medals.	
L.C.A,	Landing Craft Assault.	
L.C.T.	Landing Craft Tank.	
L.S.I.	Landing Ship Infantry.	
LZ	Landing Zone-clear space on which gliders may land.	
M.D.S.	Medical Dressing Station.	
O. Group	Orders Group. Any group of junior leaders to whom a commander gives orders.	
O.P.	Observation Post.	
Para.	Parachute or Parachutist.	
P.B.I.	Poor bloomin' infantry.	
PIAT	Projector Infantry Anti-tank.	
Pigeon	A rumour.	
R.A.P.	Regimental Aid Post.	
Rockphoon	Slang term for rocket-firing Typhoon aircraft.	
R.V.	Rendezvous.	
Schu	Small anti-personnel mine buried in the ground.	
Soft skinned,	Adjective normally applied to lorries etc., to distin- guish them from armoured vehicles.	
Sommerfeld track	Type of wire mesh track used for temporary roadways.	
S.P. Gun	Self-propelled gun.	
Stick	The group of men who jump from one aircraft, or a number of bombs released from one aircraft.	
Stonk	Slang term for salvo of mortar bombs, or shells.	
U.X,B,	Unexploded bomb.	
"Y.M.C.A." drop	Parachute jump when training for parachuting only. A Y.M.C.A. van is usually in attendance on the DZ; jumpers go to it after the drop and are given tea.	

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## GLOSSARY OF TERMS AND ABBREVIATIONS



## THE MAIDEN VOYAGE OF THE "YAM SENG" (continued)

### By MAJOR J. W. BOSSARD, M.B.E., R.E.

In the previous article I described the difficulties and problems in designing and building *Yam Seng.* The following is the log of the voyage home to the United Kingdom.

When finally rigged and equipped Yam Seng was a 17-ton auxiliary Bermudan Cutter. She was 35 ft. L.W. and 43 ft. overall. Her beam was 12 ft. and her draught 6 ft. 6 in. The sail area was 760 sq. ft. and the yankee added another 250 sq. ft. The mast was 52 ft. long above the deck, the lead keel was 4.75 tons and the internal ballast 5 tons. The engine was 15.4 h.p. The net registered tonnage was 10.83. There was nothing special about the rigging, except that the running backstays worked on slides on the deck, and that almost all the fittings were home made. The sail track was ordinary  $_{16}^{4}$  in. flat brass ; the slides were made of copper sheet and all deck fittings were made by a local blacksmith, and galvanized in the dockyard. My brass fittings were cast in one of the numerous little workshops that I call " Front Room Industries" in Chinatown. The ship had no trials and she wasn't even painted. By the time I left I had neither money nor time for such luxurics as paint. And in case any one should suggest "Why Bermudan rig ? It is no rig for ocean cruising." My answer is "Nonsense ! Bermudan rig every time."

The crew consisted of four. McCaughan, a Northern Irish sailor, whom I had met when visiting Ives and Godet, had early expressed a wish that he might join us. He was a Lieutenant R.N.R. and an excellent navigator and came for that purpose. He took his release in Singapore in order to make the voyage. Richard Hind, a young officer in the Royal Engineers, who had begged me to let him come, got his place when another fell out. He also was Northern Irish, living not far from Mac. He took on the job of engineer. Mary Donavour-Hickie came as cook. She was a gem from the Emerald Isle-Southern Ireland she would have you know-who had never sailed until she came to Singapore two years before. She put up a wonderful show. And lastly myself who had never sailed from sight of land. Of us all Mac was the only deep sea sailor, by virtue of his service in the Blue Funnel Line and the Royal Navy. He was worth the rest of us put together. He knew the sea and he knew his seamanship. He gave one a wonderful feeling of confidence and "Failure " was a feature never considered. As he had never sailed the ocean in a small boat it was a great adventure for us all.

We started at 8.20 a.m. on 10th January, 1948. We were to leave at 8 o'clock, but a carpenter was still fixing the deck cleats. A large crowd saw us off and to the accompaniment of their good wishes and a few blasts on some ships' sirens we slipped through Keppell harbour and said goodbye to Singapore. Our start had been planned at that time of year to take advantage of the N.E. monsoon, a good beam sailing wind that should take us to Aden. It was conspicuous by its absence. For several days we worked our way up the Malacca Straits with the engine going incessantly. What wind we had was

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limited to land and sea breezes. They blew up daily for about two hours in the early hours of the morning, and for the same period about mid-day. It was exceedingly hot. After passing Malacca we had trouble with a fuel pump and we put back to have it repaired. We were there two days. The fourth day at sea Mac pulled in the spinner—a large one that we trailed over the stern throughout the voyage—and landed a big barracuda. It was a fine fish, and our first, so he posed in the approved style for a photograph. That night we also had our first flying fish on board. That too was a large one. We were to have many more. Here also we met our first shoal of porpoise that came in hundreds and besported themselves about the boat. It was to become a daily performance, usually about sunset, right through into the Mediterranean.

On Saturday the 17th we had our first fresh wind, and with it our trouble started. It brought a heavy swell and caused the ship to roll badly. All our stowing came to naught. The spring catches on the lockers, doors and drawers were inadequate and they opened and cascaded their contents over the cabin floor. Packets of Rinso fell and burst, a large tin of cooking oil, horrible smelly stuff, tipped over, and most of the assorted bottles of sauce were smashed. The scene and mess were indescribable. After it had been cleaned up we had to sand the floor so that we could stand, and even then movement in the cabin was fraught with danger. On Sunday we were still pitching and rolling uncomfortably and sailing hard. Someone went below and discovered the seams of the water tanks leaking. They were insufficiently stayed and braced internally and could not stand up to the buffeting. At 7.30 a.m. Diamond Point was abeam and we altered course to N. 75 W. intending to call at Sabang on the northern tip of Sumatra. All night we sped along at a furious pace keeping up a steady eight knots. I sighted the loom of the Pulo Burn light at four o'clock on 19th January and called Mac to confirm it. I suggested that we shorten sail and stand in towards the shore. Mac thought we should carry on as we had twenty-five miles to do. We went on. The watch changed at 6 a.m. and the first land to be sighted by Dick and Mac was Pulo Rondo, fiftcen miles west of Sabang. They had failed to pick up the Sabang light and we had made good 105 miles in the last twelve hours. We turned about and beat into the strong head wind and heavy sea, trying to get back to Sabang. The ship simply would not point. We tacked backwards and forwards at 180 deg., gradually getting farther and farther away. All day and all night we did this under very trying conditions and in the middle of the inky black night we were almost run down. Our port side light had gone out and a large ship bore down upon us and only altered course at the last possible moment in response to frantic signals on our Aldis lamp. Mac took a fix next morning that put us twenty-nine and a half miles west of D.R., miles and miles from Sabang. I had the water tanks dipped as they were leaking in no mean way, and went off into a corner to appreciate the situation. Sabang was out of the question. I made my decision and we turned for Ceylon, 900 miles away.

We reached it in nine days; a relatively quiet passage. One topmast shroud had broken in the buffeting and we had to reef down all the way to ease the strain on the mast. Our daily runs were 108, 94, 90, 106, 80 miles, and so on. We had amusing moments, as when our first bird joined us and spent what must have been the most uncomfortable night of its life in a constant flutter on the leech of the mainsail ; when Mary started a hare that we were working on the wrong date and our navigation was nonsense ; and when we put the clock back the first hour and decided we were indeed going west. We had some beautiful moments too. The sunsets were wonderful and there was a grand instant on the 26th January, when sunrise and mooonset coincided. They were scenes of indescribable loveliness. On the 27th, at 3.20 in the afternoon, we sighted land. It was a great thrill to see the mountains of Ceylon in the dim, dim distance. We altered course to clear the Basses, two groups of rocks off the S.E. coast. We passed them in safety that night and I was thankful to see the malevolent looking red light disappear astern as we left what is a nasty unpleasant spot. Next morning we were sailing close inshore along a lovely coastline of sand and palm trees and by evening we cleared Dondra Head. As darkness fell we watched the Dondra Head lighthouse flashing its friendly warning miles astern of us. That was on 28th January. At 1.30 a.m. on the 29th we were entering Galle harbour and as we had no chart of the approaches we felt our way in very carefully. The anchor was let go at 2 a.m. and we were safe and sound in our first port of call.

We all slept well and I was awakened by the Master Attendant's launch bumping alongside at seven o'clock in the morning. We were cleared by the doctor and went ashore. Mary went to the bazaar for fresh food and I to the Port authorities to arrange my repairs. As they could do nothing for us I paid my dues and we left again at 12.20 p.m. for Colombo. They charged me Rs. 60 for pilotage, although I never saw the pilot from first to last. On our way out of the harbour the Master Attendant's clerk chased us in a launch and came alongside to tell me they had made a mistake. I owed them another Rs. 9. I passed a ten rupee note over and consigned them all to a warmer place. We entered Colombo harbour without incident at 8.0 p.m. on the day after. A pilot came aboard ; a grand chap who was most helpful, and took us up the harbour and moored us to a large buoy beside a big tug. I mixed drinks to celebrate our arrival and Mary prepared supper. In the midst of it the doctor arrived, then the police, the customs, and Crombie, an Engineer officer I had known in Singapore, and who had seen us coming along the coast earlier in the evening. Finally to add to the crowd three ships' chandlers joined us. I had the ship's papers in one hand, and supper in the other, answering such questions as :-

"How many rats died during the voyage ?"

"How many of the crew died ?"

" Of what did they die and where did you bury them ?"

" How many stowaways have you ? "

" Do you wish to prosecute them ?"

precisely the same procedure and formalities to which the Queen Mary conforms. It was pandemonium but I enjoyed every minute of it. We were there three weeks. We had arrived in the midst of their Independence Celebrations, and almost every other day was a holiday. It seemed as if the work would never be completed. We were made honorary members of the Royal Colombo Yacht Club and given a gay time. The Gordons, the Nicholsons and the Merries were wonderful hosts and we had never a dull moment. Walker's, the marine engineers, did the major part of my repairs, for which I paid them Rs. 1,100 (approx £86). Repairs to the rigging were done very efficiently by Mac. We were ready to go on Friday, 13th February, but nothing would induce Mac to sail on that of all days. I spent the day getting my port clearance and paying my dues whilst Dick got the diesel oil aboard. I came back to find the bilges full of oil. It was leaking through a small blow hole in the brazed joints of one of the large fuel tanks beneath the cabin floor. I plugged it with a small set screw and we pumped the bilges dry, and put the oil back into the tanks. It left a horrible mess below floors and the ship reeked of diesel for days.

We got away at 6 p.m. on Saturday. The Gordons came a mile or two with us, and then we cast them off in their small craft which we had towed astern. The wind was west so we set off on a starboard tack, rising and falling to the swell. It was good to be at sea again. At 10.30 p.m. the last light disappeared below the horizon and Colombo was a place of the past. The head wind persisted throughout Sunday and Monday and we beat northwards and southwards trying to make good a westerly course. At 2.30 p.m. on Monday the 16th we saw the southern tip of India. As we ran in towards the coast we met a very choppy sea and had to batten and lash everything down. We had several large waves break over the bows and went about on the other tack. It was much drier that way and we sailed very hard throughout the night with the wind whistling through the rigging. On Tuesday the wind gradually eased and by evening it was calm. We had three days in a glassy sea, running incessantly on the engine, and at 11.15 a.m. on 20th February we entered the lagoon of the tiny island of Minikoi. We were met by a pilot cutter, a long boat manned by eighteen oarsmen, who came alongside and all swarmed aboard. They showed us to an anchorage in about 20 ft. of the bluest water I had ever seen, approximately one mile from the village.

The island is four miles long and about 200 yds. wide. It is a forest of coconut palms, and coconuts and fishing provide a living for its 4,000 inhabitants. One spoke indifferent English and many Hindustani, so I was able to explain what was wanted. The crew of the boat asked permission to go back to their prayers and promised to come for us at 2 p.m. Mary and I went first. We went to the headman's house and there sat in state on the verandah. They hadn't seen anything like Mary before. Certainly she is unique. Their womenfolk carried her off to their houses, beautifully clean and cool ; sat her in their chairs and on their beds, and pinched and felt her to see if she were real. The village rang with their laughter and chatter. Meanwhile, I was taken to the village store where I bought potatoes. Bread and eggs, the things we needed most, were unobtainable. I met Mary again at the headman's house and there we were given tea and coconut milk, which we drank and enjoyed, watched by hordes of grinning people of all ages. The headman took us to the ship and Mac and Dick went back with him to be treated with similar ccremony. Later that evening we were joined by some Indians from the Wireless and Mcteorological Station. I produced what drink I had and we spent a very pleasant hour with them.

We left at 8.15 a.m. the next morning and bounced on the bottom once or twice when trying to find our way out of the lagoon, over the barrier reef. By "Evening Stars "-Mac's fix at 6 p.m.-we had done forty miles. On Sunday the 22nd we made good ninety-eight miles, on Monday another 100, on Tuesday eighty-one miles, Wednesday sixty-eight and from bad to worse only fifty-two on Thursday. I grew very despondent. And then we met the N.E. monsoon. On Friday the 27th the wind freshened steadily and throughout the day and night we slipped along quite merrily. That night in the bright moonlight many flying fish came aboard, to be collected and eaten for breakfast next morning. The day's run was ninety-six miles. It was the first of several days of the best sailing I have had. Our runs were 126, 140, 122, and 123 miles in successive days. The wind was constant and the ship steered itself. The last good day was a Wednesday, the 3rd March. We saw Socotra abeam about fifty miles away and during the afternoon we had an escort of three large whales. That evening when there was every indication that the wind would not hold, thousands of "portuguese men of war "-little jelly fish with sails—went sailing by. All the next day there was a flat calm and we ran the engine for hours. The heat was frightful. We had completed



Photo 7 .- Independence Day at Colombo.



Photo 8.-Slipped at Colombo.

## The Maiden Voyage Of The Yam Seng 7,8



Photo g .--- One that swept us from stem to stern.



Photo 10 .--- Another that passed us by.

# The Maiden Voyage Of The Yam Seng 9,10

seventy-two miles by the evening fix. The day after we had to stop the engine as we had only three days' fuel left, and we wallowed under sail in "light variable airs." That day our run was only fifty-five miles. Saturday, 6th March, was a change for the better. We scudded along to a fresh S.E. wind that brought with it a horrible swell. We rolled uncomfortably all day, and made 104 miles to the good. We saw yet another whale and the largest shoal of porpoise to visit us. On Sunday, under the same conditions, we added 124 miles and my morning fix on Monday put us only 130 miles from Aden. As if to celebrate, the wind died completely and all day in a glassy calm and sweltering heat we plodded along on the engine. We saw our first ships since leaving Minikoi, mainly tankers plying to and from the Persian Gulf. At 9 p.m. that night when within seventy miles of port the engine died on us, and all attempts to restart it failed. I turned out early next morning and with Dick's help stripped the fuel system and thoroughly cleaned it. At 9 a.m. we started up again and at ten o'clock sighted the Aden peninsula just off the starboard bow, exactly where we wanted it. It was a perfect landfall after eighteen days at sea. At mid-day a wind got up and we bowled along with engine and sail and turned into the harbour at 4 p.m. We followed a dhow in through the entrance and hoisted our "G" and "Q" flags. A pilot came aboard and took us right to the other end of the harbour, where we dropped anchor in a desolate spot, miles from anywhere.

When the doctor had cleared us the first people alongside were the ships' chandlers. After my experience with one of them in Colombo I had sworn I would never deal with another. But we were longing for fresh things to eat and it was so simple to sit on board and order what we wanted that I broke my resolution immediately. This one promised to go and send bread and vegetables back to us by 5.30 p.m. and at 5.30 they arrived. We had supper and turned in early. The next morning I called on the R.N.O., Commander Richardson, and he greeted me by saying I had been expected three days ago. He was very kind to us and went to a lot of trouble to help us get all we wanted. He took me to the N.A.A.F.I. for food ; to the Anglo Iranian Oil Co. for my diesel; he gave us water at his jetty and let us moor to one of his buoys, much nearer the town. He could give us no help with charts, but arranged for me to go to the Harbour Master's office to copy the only available one of the approaches to Port Sudan, our next port of call. He introduced us to Wing Commander Broad of the R.A.F. and his wife, and they made our short stay very pleasant and enjoyable. We called on the submarine Tantivy, in on its way to India, and the skipper lent me a chart of the Jubal Straits. We met neither soldiers nor yachtsmen whilst there.

We were ready to leave on Friday, but it blew a gale and we tugged and snatched at our buoy, thankful to be there and not at sea. We left at 9 a.m. on Saturday, 13th March, in a strong wind. We had planned to round Perim Island at dawn but we sailed at such a pace that we were there at midnight. At 2 a.m. we entered the Red Sea. Two birds came with us and one perched on the Ensign staff. Every time one of us moved aft to handle the main sheet it took off and tried to land on the head of the person at work. Several times I saw Mac clawing a bird from his hair. We sailed very hard all next day before a strong following wind and mountainous seas. Twice we were pooped. At the first my impression was one of complete astonishment. A huge wave came up behind us and broke and passed through us as though we didn't exist. It was terrific. At four o'clock we passed Jebel Zukur Island and had made good 200 miles since leaving Aden. This was grand but it wasn't to last. The wind died to a calm during Monday and got up again dead ahead in the night. All day Tuesday we tacked and at evening the wind freshened to half a gale. We reefed right down and spent a very uncomfortable night. In daylight the seas looked colossal and many came aboard that day. The Blue Funnel ship Priam passed very close to us at 11.15 a.m. with seas breaking over her foredeck. Wednesday started with a bright dawn but too much wind for comfort. The seas were still huge and we were tired and wet. Mary rose to the occasion and prepared an excellent stew. Came a bigger sea than usual and a crash below. Mary called out "The whole - lot has gone over the floor." It was the only time throughout the voyage that I saw her near to tears. After a whole day of these conditions we were only ten miles nearer Port Sudan. Thursday was better and Friday was spent with the engine running incessantly. Saturday was another day of calm and Mary tried to poison us all. She gave us film developer instead of lime juice. Dick had put his solution in an empty lime juice bottle and Mary had used it in error. On Sunday there was a very light wind but by evening that had gone and the sea was without a ripple. We entered Port Sudan harbour at 3.15 a.m., but could not find the leading lights. At 3.50 a.m. we saw a crane in the darkness and tied up to the quay beside it. We celebrated in the usual way and turned in.

We were there two days. Two vivid impressions remain with me. The first, of the multitude of fish of all sorts, shapes, sizes and colours that swam around the boat in water so clear that we could see the bottom at 32 ft. depth. I tried for hours to catch one and learnt more as a fisherman in those two days than during the remainder of my life. I now appreciate the significance of the phrase—" A fool at one end and a worm at the other." I watched fish remove bait of all types from my hook by nibbling and sucking without feeling the lightest touch on my line. It was an education in the piscatorial art that few fishermen receive. The second was the visit of the S.S. Magdapur of the Brocklebank Line. The captain and officers gave us a grand party, and during dinner, when discussing the voyage, I mentioned our troubles with the sail off Sabang. The Captain sent for one of his quartermasters and he and another sat up all night and recut the mainsail. The ship left at 6 a.m. and they tossed it over the side on to the quay from where I collected it later. It was a great effort and was to stand us in good stead from the moment we left.

This was some eight hours later, after lunch. We came out into a strong head wind—the wind we had been told to expect. It freshened to Force 7 and we had a very uncomfortable time, shipping it green again and again. Water cascaded down the decks and found all the weak spots. The bunks were soaked. Thursday, Friday and Saturday were the same. We were making good about one knot in the right direction and having a rough, tough time doing it. Everything was soaked and the wireless set was unserviceable. By Saturday we felt that it had gone on long enough and that it must break soon. It just could not go on for ever. The next day was Easter Sunday and the following is an extract from my diary :—

"Easter Sunday, and at last, thank God, the wind has eased and the sca settled, and we bowl along under the engine in the right direction. We have certainly had a buffeting. Water everywhere and everything soaked. Even the wireless set "U/S." I put that right and switched on to hear Easter music pouring from an organ and filling the ship. How good it sounded ! We each start the day with a good wash—the first for several days—then a grand breakfast, and then clean ship. Everyone feels so much better, and bedding and clothes hang on every vantage point, drying in the sun. I go to bed but cannot sleep, and spend a lovely hour on the radio, tuning in stations all over the world and hearing their Easter rejoicings. By evening stars we had done fifty-two miles since 6 a.m. We shall be on the next sheet by midnight."

Most of Monday was calm and our average to noon was 5.6 knots. With sunset a wind got up and by the time I turned in we were labouring against a brisk head wind and a steadily growing sea. At midnight we saw a brilliant shooting star or comet shoot across the sky to end in a vivid green flash of great brilliancy. Tuesday morning saw us back to the conditions of three days earlier-the wind at gale force and the seas mountainous. All day we pounded into them, first on one tack, then on the other. Periodically odd seas crashed over us, and, if whoever was at the helm was quick enough with his warning, there was a general dive for cover. Wednesday, Thursday, Friday and Saturday saw no change. At night it was bitterly cold and we all wore every garment we could find in an endeavour to keep warm. Our daily milcage made good was as low as thirty-one. On Thursday morning I grew reckless and pressed her at ten knots fully rigged for two hours. It was most exhilarating but dangerous, and I was finally forced to reef down to get some speed off her. Sunday was worse than ever and the worst to date. We still made progress and the ship was being well and truly tried. So unfortunately were the crew and all were showing signs of wear. At noon the S.S. Taurinia almost ran us down. She refused to give way and I had to luff up into the wind in colossal seas to let her go by undisturbed. Later that night another came much too close and only bore away at the last possible moment in response to frantic signals on the lamp. Monday night was appalling. Reefed right down we sped along at a furious pace with seas continually breaking over us. It wasn't much fun in the inky blackness of the night. I almost gave up and hove to, but was glad when I saw Shadwan Island the next morning that I hadn't succumbed to a moment of weakness. We were abreast of it at 6 a.m. and becalmed at 9.30 a.m. It was the entrance to the Jubal Straits, the hazard I feared more than any. The calm didn't last. Within an hour it was blowing a head wind again and by noon we were once more reefed down to half a gale. We kept the engine running quietly to assist us in going about or in case we needed it in a hurry. By nightfall we were literally "screaming" along and when I saw our speed in daylight the next morning I was appalled. The cockpit was continually awash and we were all soaked. The passage is restricted to about five miles wide and is bounded by reefs and islands. The lights are on the port hand. Mac did the navigating and did a splendid job. Dawn saw us abeam of the last light and we were through.

We moved into more open water, still at the same frantic pace, still as wet as ever. Never had I seen such short steep seas. They hit the bow or side and broke, and the wind did the rest. The mainsail was saturated half-way up. At lunch time the wind dropped. We started the engine and lowered the sail to repair some of the damage, and at 3 p.m. were tacking towards Suez under much pleasanter conditions. These lasted until supper time when Mary and I were on watch. I had just had my soup and BANG ! the wind hit us again and we were away with a hiss and a roar like an express train. I had to call the others and reef right down, and we spent another hectic night. We changed watch at midnight and at 2 a.m. a tanker almost ran us down. Dick was at the helm and I heard Mac shriek-FULL SPEED AHEADand the engine raced. I rushed on deck to see it pass so close to us that I could touch it with a boat hook. It was the only time I was really frightened. All day on Wednesday we were hard pressed. At tea time the wind dropped rather suddenly and we spent an hour or two on the engine. I came on at midnight to find a fresh wind and we bowled along nicely for the remainder of the night. The cold was intense and I was wearing three pullovers and my Ursula jacket. At dawn we were doing a steady six knots under ideal conditions and I enjoyed it so much that I let the others sleep on. Mary brought me a delicious cup of tea as we passed the last light in the Gulf of Suez. We saw an Arab dhow filled with men. I gave them a wave and they all stood up and cheered lustily. The wind died at 0.30 a.m. and within an hour we were doing five knots on the engine in a calm and glassy sea. We all set to work cleaning ship, and ourselves, and at 4.20 p.m. dropped anchor in Suez Bay. I was thankful to be in. The worst was over and we were half-way home. The calm and quiet of the harbour was indescribable. It made the past few days seem like a wild dream. Never again will I come that way. The next time I shall go round the Cape.

The doctor didn't come aboard till 8 p.m that night and then charged me  $\pounds 3$  for my Sanitary Visa, necessary for my passage through the Canal. The next morning I went ashore and arranged with the Canal Company for my passage to Port Said. They measured the ship and charged me  $\pounds 2$ —including the provision of two *Pilots*, one to Ismailia and another from there to Port Said. Ashore I was picked up by the Egyptian police for landing without permission and spent the remainder of the day under escort. Officials of the Canal Co. were very good. Nothing was too much trouble and I was greatly impressed by them all. We picked up our pilot early in the morning and left for Ismailia.

We arrived at 3 p.m. and tied to the Marina buoy, having come most of the way with engine and sails together. An I.W.T. (Inland Water Transport of the Royal Engineers) launch brought some people out to welcome us. They were quickly followed by Colonel Waring, whom I had last seen in Chatham, in 1936, and his wife. Lots of people sailed out to us in all types of craft and shouted greetings, and invitations showered upon us. It was a grand reception. We stayed three days and had a wonderful time. Numerous officers of the Royal Engineers, M. St. Pierre of the Suez Canal Co. and M. Savon were our hosts. Brigadier Fox, the Chief Engineer, and his wife carried us off, and many came from G.H.Q. Fayid, to call on us. It was one long party from dawn till dawn. G.H.Q. arranged for me to be repaired in the I.W.T. Workshops, Port Said, and on Tuesday 13th, April, we went there, very loth to leave Ismailia. Within a mile of the port swarms of flies descended upon us. They were the first I had seen in any quantity for several years and they were most unpleasant. We were not to lose them until we left Port Said. We were met by the O.C. of the Workshops, I wanted to go down into the Basin flying my "Q" flag and go through the usual formalities. He said it was unnecessary as he could fix all the details. So we went through the Junction Canal to the Workshops. I was to regret it later. We were there three weeks and lived ashore in tents and fed in the Officers Mess. We were not allowed to go to Cairo and only with the greatest difficulty did I get police permission to go back to Ismailia for a week-end. The ship was slipped, caulked, and painted, and I had the wheelhouse extended, and the engine overhauled. That, and several minor jobs cost me another £136. Whilst there we suffered a loss from which we never recovered. Much of our tinned food stock was stolen. together with clothing, and all Mary's presents like nylons, chocolates and souvenirs that she had collected to take to her family. We lost milk, marmalade, jam, meat and stews, and never managed to replace them in subsequent ports of call. Other tins such as soup and biscuits had been opened to see what was in them and then discarded. It was most infuriating and there was nothing I could do about it. On the 1st May we were nearly ready and I went to get my Bill of Health and Port Clearance. I had awful trouble getting them. There was no record of the ship's arrival, and we had broken several laws in landing without permission. All the "old boy" stuff was of little value and I spent



Photo 11 .-- The Skipper in the Red Sca.



Photo 12 .--- The rest of the crew in the Bay of Biscay,

## The Maiden Voyage Of The Yam Seng 11,12



Photo 13 .- On Lake Timsah at Ismailia.



Photo 14 .--- The end of the voyage at Portsmouth.

## The Maiden Voyage Of The Yam Seng 13,14

all day with the Customs and a whole day with the Quarantine officials before I got the necessary papers. It was a lesson I shall long remember. In fact I shall never forget Port Said.

We left at 8:45 a.m. on 4th May. We got into the canal and found we could not steer. I called for a tow and was taken back to Workshops. A diver went down and reported the rudder broken at the top bracket. We were slipped again the next morning for a hasty repair. We started once more on the 6th and found the swing bridge closed and we could not get through. It was a holiday and was to remain closed for the next two days. I went to the Customs to try and get it opened and had to go through the old procedure, the same old rigmarole, all over again. I was there for hours. They telephoned Quarantine who said I couldn't go because my Bill of Health had expired. It was only good for forty-eight hours. Even that was finally settled and at 4.30 p.m. we headed down the canal and out into the Mediterranean. My impressions of Egyptian officialdom were unprintable. By midnight we were past the Damietta light, and all next day averaged four knots. At dusk a sloop, the U95, saw us and came alongside and a very friendly voice asked if we were all right and was there anything he could do. He wished us "Bon Voyage" and disappeared into the darkness. That night the wind freshened and the sca got up and Saturday the 8th May was spent in rough going. In the evening the rudder broke again and we managed to change course gradually until we we were running hard before the wind and quite large seas. At dawn we were off Alexandria and at 6.30 a.m. we were safe and sound at anchor inside the harbour. Methinks the gods were with us on that occasion. There we met a very different reception, and saw a much pleasanter side of Egyptian hospitality. We were made honorary members of the Royal Yacht Člub of Egypt, and they slipped Yam Seng and took the rudder off, and Mr. Shepperdson repaired it. Day after day we were taken to one party or another and we all had a whale of a time. I was sorry indeed to leave. The last day or so was made irksome by the fact that Egypt had become a belligerent state and whereever we went we needed passes. I learnt the value of a rubber stamp as never before. The place bristled with soldiers who took us for Jews carrying bombs, and whenever we came to the Yacht Club in a taxi it was almost pulled apart in the search that regularly took place. I heard an amusing story of the Egyptian soldier at the time. An officer who shall be nameless had the task of training them in searchlight drill, at which they became very proficient. A V.I.P. decided on a night visit and was taken to the most efficient detachment. All went extremely well. He was properly challenged and the detachment commander saluted and reported-all according to the book. The V.I.P. was asked if he would like to see the light working and said "Yes." The detachment commander bawled the order "Expose" and the Searchlight Operator promptly answered "What for ?"

We were away again on 21st May and made 110 miles in the first twentyfour hours in pleasant conditions. Except for odd periods of constantly changing winds we kept on at a steady hundred miles per day average to a fair north wind for six days. At one time I noted that "I gybed seven times within an hour." On the 24th we made good 120 miles. On the 26th our first migratory birds joined us. At one time we had three house martens and a willow wren. The wren could not find a spot to its liking and did not stay long. The others stayed for about three days and then flew off in a northerly direction. They were terribly tired and sat about the boat with their heads tucked under their wings, ignoring us completely. On the 27th the frigate K651 came alongside and sent a party aboard. The captain said he wished to inspect my ensign warrant. I think he made it an opportunity for training

for his boarding party. In any case it was a great moment, and I asked the visiting officer if they could let me have some fresh bread. The captain sent it over, plus a welcome bottle of gin. When he moved off he called out over the hailer "Bon Voyage. See you in Malta." Unfortunately we never met again. I think his name was Welbey and I hope one day to thank him personally. At ten o'clock on Friday, 28th May, the wind freshened dead ahead. By evening it was very strong with a short steep sea. Saturday and Sunday it was still blowing half a gale with quite large scas running and our decks were often awash. At noon we sighted Malta and at 6 p.m. we were speeding down the eastern shore, close in and close hauled. When opposite the breakwater we ran up our "G" and "Q" flags and the signal station flashed back "Pilot will meet you inside." We went about and shot into the entrance rather like a rabbit scuttling down its burrow. The calm was incredible. From the turmoil outside to the peace and quiet of the harbour the change was more pronounced than I had seen at any other time. We picked up the pilot and entered the Grand Harbour at Valetta and moored to the Pinto jetty, close to the aircraft carrier Ocean. Within ten minutes we were most efficiently cleared by the doctor and police, and we were ashore !

I went to the agents, Messrs. Lambert Bros., and met their principal, a charming old gentleman who took us round and showed us where to go. I met another ships' chandler of the same breed that I had met in Colombo and was treated—for the last time—in an identical way. We were there three days. We were given a good time by Commander Fell, R.N., one of Mac's old friends, who was then stationed in Malta salvaging the Floating Dock. He took us to all the interesting places. There were many American sailors in from their ship the *Rochester*. We went to an excellent concert in the square.

The thing that impressed us most were the streets thronged with able bodied working people throughout the whole day. They were so densely packed from morning till night that one walked down the centre of the road in order to get along. Someone told me that it was because the population had been given so much in compensation that they no longer needed to work. Prices were certainly very high.

needed to work. Prices were certainly very high. At 1 p.m. on the 3rd June, we left. We no sooner cleared the harbour than the wind dropped almost completely and we turned westwards with engine going and sails set. At 6 p.m. the western tip of Gozo was abeam and we headed for Pantellaria. The wind incessantly changed direction and entries in the log show it as North Force 4, N.E. Force 3, S.E. gybed, and between 1.30 and 3 a.m. we gybed seven times. At 3 a.m. in a glassy calm I noticed the barometer falling and although it was dark it didn't hide the mass of black cloud gathering about us. At four o'clock it burst upon us and we sailed away at a terrific pace. We kept this up for nearly half an hour before the sea got up and slowed us down. I had to keep luffing up into the wind in some of the exceptionally heavy gusts that struck us and I could not log our course with accuracy. I could only estimate that we were getting north of our course line. It lasted an hour and then suddenly backed to N. 30 W. and we were close hauled at four knots. Fifteen minutes later it switched again to N. 20 E. Capricious wasn't the word for wind in the Mediterranean at that time of year. At 11 a.m. we sighted Pantellaria. At 4 p.m. the wind was N.W. Force 6 and by 7 p.m., just at dusk, it was blowing a gale. I turned out the others and took in the jib and reefed right down. Even then we were making too much way and at 7.45 p.m. we have to for the first time in the voyage, in lee of Pantellaria. She lay to admirably and throughout the night we made about a knot at right angles to the wind. She lifted easily to each wave, and if it wasn't exactly comfortable, it was dry. None came aboard.

At 6.30 a.m. we gybed round and sailed away to a strong north wind, still reefed down. By 6 p.m. it had moderated to Force 6 and the coast of Africa was in sight. At midnight we went about on a N.E. course and spent a reasonable night on that tack. At first light it was much better and we shook out the reefs and turned westwards. We rounded Cape Bon at 1.40 p.m. and set a course along the African coast. By ten o'clock that night both Tunis and Bizerta were astern. Monday the 7th was spent on the engine, touring up the coast at five knots, about fifteen miles off shore. Tuesday, 8th June, was my birthday. Mary made a special lunch and we had cake and sweet biscuits for tea. We passed Cape Bougaroni at 8.20 p.m. Wednesday was quiet and at 10 a.m. on Thursday we saw Algiers looking most attractive. Friday was another day of calm and a sea like glass and the engine was in constant use. At 3.30 a.m. we crossed the Greenwich Meridian and put the clocks back the last half hour. At mid-day a wind W. by S. Force 4 got up and we had to tack on a course N. 60 W. At tea time it died and we started the engine and turned towards Gibraltar. Next morning we hore off again on the port tack to another fresh wind and at 8.45 a.m. saw the hills of Spain and the majestic sight of the snow-capped Nevada mountains. By noon it was blowing hard and we had an uncomfortable afternoon. At sunset it died completely and suddenly, and left us pitching and rolling in a very steep sea. Within an hour a wind had sprung up dead aft causing a horribly confused sea. We almost stood on our heads at times. I noticed the bilge water looked rather black and oily, but Dick assured me nothing was wrong. Monday the 14th was a flat calm. We started the engine and it failed in a few minutes. All the sump oil was gone and it was most definitely out of action. All day we lay idle and hardly moved. My sun-sight, at 8.30 a.m. on Tuesday, put us back four miles east of last night's position. It was heartbreaking. We were only seventy miles from Gibraltar, and couldn't get in. We drifted slowly southwards all day. Wednesday morning we were farther back and farther south and that afternoon we saw the coast of Morocco. We signalled a distant man-o'-war, but got no acknowledgment. On Thursday the 17th we had a little wind and found that by steering N.W. we made good north. At 8 p.m. we were back on 36 deg. latitude and ten miles east. This was awful. At 5 p.m. we had signalled a Greek steamer with a name like Psatra that passed within half a mile of us, but he did not help. All we needed was lubricating oil. That night we had a fair breeze and I thought we were making headway. It was wishful thinking. My morning stars put us still farther east, still on 36 deg. latitude. We decided to make for Malagar instead of Gibraltar. Our noon sight put us another eight miles south and three miles east. We had drifted round in a complete circle in the past four days. There was only one answer. Since we couldn't go N.W. we would go south. We looked at the chart and decided on Villa Sanjurjo and set our course S. 05 E. At tea time we sighted the coast of Spanish Morocco and just before midnight the Morro Neuvo light was abeam. We prepared to enter the port. We had no chart and relied on the instructions in the Pilot. We ran the full length of the harbour sounding all the way, and could not define the leading lights. We doubled back in a fresh wind that put our gunwale under and in the dark discerned what looked like a jetty with a small crane on it. I made for that and ran alongside it, luffing up at the last moment for Dick to leap ashore and make us fast. We had our usual drink and turned in at 1.30 a.m. on 19th June.

I got up early and looked round and had an awful shock. The quay wall we were tied to was being extended to form a breakwater and sticking out into the water for 200 yds, was a line of rock and stone just breaking the surface. In our run in we must have missed it by a few feet. Had we hit it at

the speed we had been going the ship would have been wrecked. The doctor and police came aboard. Neither spoke English and as I knew no Spanish I had to struggle with my very indifferent French. I explained my currency difficulties (I had only about £5 sterling in cash) and what I wanted. They took us to the Secretariate, an imposing looking Moorish building, where we met several Spanish officers. The language problem caused great amusement. At one time we were surrounded by at least forty people, all trying to help. If kindness throughout the voyage could be assessed those people easily topped the bill. We needed oil and engine repair, eggs, vegetables and bread. All was laid on. They looked up the daily paper for the exchange rate and gave me full value for £5. I came away greatly impressed. They were grand folk. We were ready to leave on the 21st, but a nasty wind got up and a frightful swell developed in the harbour. We lost four fenders, torn to ribbons between the ship's side and the quay wall. Finally, in company with all the fishing craft, we had to tie up by the bows and hold the stern out with both kedge anchors. We were warned on no account to try to put to sea until it had abated. At 10 p.m. it had eased a little so we took a chance and cast off. This time we made no mistake and kept close inshore in the narrow belt of west-going current that hugs the coast. By 9 p.m. on 22nd June, Ceuta was abeam and fifteen minutes later Pt. Almina was passed. I started the engine for the dash across the straits. No sooner were we clear of the headland than we were caught in the strong east-going current and a nasty choppy sea. I had to set a course N.W. to make good Europa Point, due north of us. The lights of Tangier made a brilliant display off our port quarter.

At 1.30 a.m. we entered the harbour at Gibraltar only to be ordered out again by the police. We hadn't got the Captain of the Dockyard's special permission to enter. They took us to an anchorage near the Commercial jetty just off the end of the air strip. Later we moved in to the Commercial jetty. I called on the Chief Engineer, Colonel " Joe " Bennett, and he and his Staff Officer, Huggett, gave us a great welcome. I visited the Captain of the Dockyard and gave him the Mediterranean Pilot and Light List to send back to Port Said. I borrowed the necessary Pilots to see me home, but forgot the light list. I could get no chart and had only the general ones for the remainder of the voyage. The one to Finisterre hadn't even the light characteristics on it. I went to the agents, the London Coaling Co., and was asked to wait. I sat in an atmosphere of high leather backed chairs, dark furniture, high stools and panelled office. Only the quill pens were missing. It might have been a page from Dickens. I thought "This will take hours." Within two minutes I was greeted by the manager who placed his resources at my disposal, and in another eight I had all my papers ; everything complete. The next day each of us went shopping, buying mainly clothes of which there was no shortage at all. My only regret was that I hadn't more money available. That evening Mary and I joined the Chief Engineer and Huggett at the Yacht Club for an hour. We all turned in early, prepared to go the next day on the last lap.

It was Friday, 25th June. We left at 3 p.m. having waited for Huggett to come and have lunch with us. Unfortunately he didn't make it. We motored out with all sail set for three hours and when Tariffa was abeam we stopped the engine and altered course to N. 80 W. We got into a strong east wind that became a gale. We ran before with all sail, determined that nothing should stop us. Eventually the ship became almost unmanageable and it could only end in one thing—a smashing gybe. The mainsail had to come down. I put her into the wind and I shall never forget the sea that came over us. I managed what I hadn't dared to do in the Red Sea. The mainsail down we turned

and ran under the jib only, and at 9.25 p.m. we passed Cape Trafalgar at ten knots. We were pooped several times and the self bailing cockpit cleared it admirably. The next morning it eased sufficiently to hoist the mainsail and we reeled off the miles all day. At 2.15 a.m. on the 27th we passed through a fishing fleet, again without mishap, and at 8.50 a.m. Cape St. Vincent was abeam. This was fine going. We altered course to N. 05 W., for the run up the Portuguese coast and almost immediately the wind switched to north. On Monday at 5.30 a.m. I was taking my sight, using Polaris for my latitude, when we were suddenly blanketed out by thick fog. It lasted until tea time in spite of a fresh north wind and in the afternoon we found ourselves in the midst of another fishing fleet with nets everywhere. Yet once again we got clear of them safely. We stood out into the Atlantic all the morning in the fog to keep clear of the shipping lane and turned towards land in the afternoon. There followed six days of what I call "Pure Bashing "-beating up the coast inch by inch against a strong head wind and uncomfortable seas. Each night it increased to gale force and we had to reef down. On the 30th June it blew so hard that we had to heave to. The top reefing cringle tore out and we could only take in one reef. Even then the ship behaved very well although many seas broke over us from stem to stern. On Monday, the 5th July, it eased a little and at breakfast Cape Finisterre was abeam. We turned the corner into the bay hoping to make Ushant close hauled on the same wind. Unfortunately the wind turned with us and on our new course it was still head on. So we turned westwards into the Atlantic hoping to find a west wind that would take us into the Channel.

For two days we did this, with wind and sea much too strong for comfort. Food was low and we were restricted to biscuits and spam. We felt the losses at Port Said sadly. I was beginning to feel the strain. The jib was full of holes ; the rigging was showing obvious signs of wear and the engine was far from good. I had visions of having come all that way and then failing. On the 8th, as there was no west wind we turned cast, heading back into the Bay of Biscay. Towards evening the wind eased a little and I shook out the reef and pressed her hard for an hour, until the clew of the jib blew out with a bang and we had to reef down once more. We spent another hectic night, but kept going. It was bitterly cold. The next morning was quiet and we lowered the mainsail and repaired the slides, many of which were broken away. Mac mended the jib. By 3 p.m. we were away again with all canvas set, but looking much the worse for wear. I took a fix and found we were 200 miles south of Ushant having been carried there by the Portuguese current. During the night a lovely sea anemone was washed into the cockpit. Saturday the 10th was a much quieter day with the wind gradually backing. Unfortunately it was wery unsteady and I sat in the cockpit and watched it reach N. 60 E, with glee and swing back to N. 80 E. with dismay. On Sunday at 3 a.m. we started the engine and headed, at last, direct for Ushant. At nine o'clock a light N.W. wind got up and we were away. We passed a French tunny fisherman quite close and I hailed him in my best French and asked for fish. He answered in perfect English "I don't understand. What do you want?" By noon the wind had freshened on our beam and we were sailing in fine style. The next morning broke grey and overcast with visibility under one mile. At 10.30 a.m. Mac managed to get a snapshot at the sun that put us fourteen miles west of . course. At noon he decided we must be abreast of Ushant and we turned into the Channel. The mist suddenly lifted at 5 p.m. and the Ushant light was seen south of us about fifteen miles off. All was well I We entered the Channel at about six knots in a nasty following sea that caused us to roll most uncomfortably. A sad depressing fatality occurred. A swift tried to land on the

boom, and missed and fell into the sea. We sped up the Channel and at noon spotted the Casquets. I took a fix and checked our course for the Isle of Wight and St. Catherine's Point. At 8 p.m. there lay the coast of England—the Isle of Wight and Hampshire, looking lovely in the evening light. I think that was the greatest moment of my life. I turned in to get some sleep. It was to be my watch at midnight.

I came up to see St. Catherine's light five miles ahead. I took a fix from that and the Needles, and altered course to east. We were a little north of course line. I turned for the Nab Tower as soon as I could clear Dunnose, and I was back in my old sailing ground of many years ago. Perhaps in the very place where I had made my wild statement that was now within a mile or two of an accomplished fact. At the Nab the light wind turned to north and I had to tack up the fairway. I passed between the two forts at dawn and there lay Southsea, strangely quiet and deserted. I called the others and we started to clean ship, whilst following the fairway in towards the Castle. I turned along the shore and Dick hoisted our "Q" flag. The Signal Station on Fort Blockhouse winked at us and we entered the harbour mouth. We were late. The tide had just started to turn and the wind dropped. After great difficulty we got the engine started and clouds of black smoke puffed out of the exhaust. We literally limped into the Camber rather like a lame duck. At 7 a.m. exactly, on 14th July, we tied up and the voyage was over.

We had taken six months instead of four. We had sailed 9,850 miles. One hundred and eighteen days were sailing days, giving us an average of eighty-three miles per day, and sixty-eight days had been spent in port. Total engine running hours, including battery charging periods, totalled thirty-four days. The jaunt had cost me a little over  $\pounds3,000$ . The voyage itself cost over  $\pounds500$ , not counting my four months loss of pay and allowances. Nearly  $\pounds250$  of this was spent in repairs.

Never again will I sail against the clock, and never again will I come north through the Red Sea. Next time I shall go round the Cape. On an average I think one day in five was foul and the pleasures of the other four well outweighed the fifth. "Would I do it again?" Work it out for yourself !

#### CONSTRUCTION OF JETTIES IN THRACE

#### By BRIGADIER G. B. GIFFORD HULL, C.B.E.

IN a previous article entitled "R.E. Work in Thrace" published in the December, 1945, *R.E. Journal* it was stated that jetties were to be built in Kilya Bay and were to be adequate to land and maintain five divisions, which entailed the provision of facilities for discharging and handling about 2,000 tons of stores per day. It was proposed to build, in the first instance, two lighter jetties and one mole for ocean-going ships, followed by two further lighter jetties if other suitable sites could be found after reconnaissance. The jetties were to be at least 200 yds. apart.

The design of the works depended, as it often must, on the construction materials available. It so happened that an English firm of contractors had recently finished a barrage across the Nile, a few miles below Cairo, and a considerable amount of plant, together with some steel sheet piling, was available for purchase from this source. The piles were Ougree and Larsen, varying in length from 20 ft. to 40 ft. In addition, there were also available a floating piling frame with 3-ton drop hammer, a suction dredger, steel barges, steam cranes, derricks, as well as useful small plant and stores. As the time allowed for completion—four months—did not permit materials being obtained from England, and as no other plant or material was immediately available, the decision to use this, and to design the works accordingly, was forced by circumstances rather than adopted from choice.

Admiralty charts were used to supply information as to the depth and nature of the sea bed. These showed that a depth of 26 ft. could be obtained about 200 ft. from the shore and that the bottom consisted of mud and sand.

A tentative design was made which showed an enclosure of sheet piles 600 ft. long and 40 ft. wide, the first 200 ft. of it roughly normal to the shore line till 26 ft. of water was reached, then turning roughly parallel to the shore line to give the 400 ft. long deep water berth required. The box so formed was to be filled with material dredged from the sea bed. This gave an unstable structure and to provide stability it was proposed to deposit concrete in bags against the piling to form rough gravity walls which would relieve the piling of pressure from the mud and sand fill. Thus, the 40-ft. piling, which allowing 5-ft. freeboard, could only have a penetration of 9 ft., was merely to act as shuttering. This design for the mole involved some 10,000 cu. yds. of concrete with about 20,000 cu. yds. of filling between the walls. The proposal had several obvious demerits, but the political necessity of making an early start to implement the undertaking given at Aleppo over-rode them. In any case they did not apply to the jetties, where the fill did not exceed 13 ft. and it was hoped that further study on the site would lead to a better alternative design for the mole.

While the Construction Party was being assembled in Cairo efforts were made to find a tug capable of towing the port plant and equipment from Alexandria to Kilya, a tow of about a week, but it was not until the latter part of May 1940, and after considerable difficulty, that the arrangements were completed, a tug and crew having been found in Greece. The tow consisted of the piling scow, with the frame dismantled; two steel barges loaded with the parts of a 5-ton steam crane and general port stores and small tools, and the suction dredger. On arrival at Kilya, a week overdue, the suction dredger was missing. The tug master reported that a storm had sprung up one night and in the morning he found that the dredger had broken away and disappeared. He said that he had anchored the pile frame and barges and had spent two days searching for the dredger without success. The loss of the dredger naturally forced the abandonment of the proposal to fill the piled enclosure with material dredged from the sea bed.

About half the required quantity of Ougree piling in mixed 20-ft. and 40-ft. lengths, and some Larsen piling in miscellaneous lengths, was dispatched to Istanbul by ship. This was transferred into lighters, and brought through the Sea of Marmara to Kilya.

In 1921, when about a division of the British Army of Occupation held the Kilya area, a jetty had been built at the south end of the Bay. The storms of the intervening years had wrecked all but the shore end of it, which consisted of earth fill between well-built concrete-in-bag walls, and by patching up and stiffening a light timber extension to this which had been built by the Turks, it was possible to unload lighters bringing piles and other stores.

The erection of the frame on the piling scow was finished by about the middle of June and the plant was then put to work on making a permanent extension to the old jetty by driving a sheet-pile box, 100 ft. long and 20 ft. wide reaching 9 ft. of water at its end. Piles 20 ft. long were used for this. The box was filled with earth dug from a near-by hill and run in by decauville. After final settlement had taken place, the fill was covered with a concrete deck 1 ft. thick and a 4-ton derrick erected at the end of the jetty. Decauville tracks were laid connecting with a track laid round the Bay and the future unloading and handling of stores was thus made casy.

Meanwhile, an alternative design for the deep water mole was considered in the light of information now available on the site. The proposals for a solid filled box seemed impracticable because of lack of sufficient suitable aggregate for the large amount of concrete required; besides, it had to be placed in 26 ft. of water and it was not clear how the feat of placing it at the desired batter could be accomplished. The dredger was lost, the 20,000 cu. yds. of earth for filling would therefore have to be dug by hand and transported half a kilometre, or the fill made with soft light stone from Abbassi, 8 km. away; and a penetration of only 9 ft. for 40-ft. Ougree piles was considered insufficient.

In the circumstances, it seemed best to consider the possibility of being able to build an open structure of columns supporting a concrete deck, and in considering how best to obtain supports for the deck it was thought that satisfactory columns could be made by placing Larsen piles back-to-back with clutches touching to form a hollow column. By joining the clutches at intervals with metal clips, hand-forged from 2 in.  $\times \frac{3}{2}$  in. flat iron, and placed in position while hot from the forge, it was thought that the clips would shrink on cooling, sufficient to grip the two clutches tightly enough to permit the pair being driven as a hollow pile. It was thought that while the column would have little bearing capacity, it would have double frictional capacity, since friction could be considered on both inside and outside surfaces of the pile ; and even some useful bearing value might be obtained by filling the column with concrete through a tremie, after driving.

Experiment proved the idea to be both feasible and sound, but before details of the deck, and means of giving the structure stability against a possible bump from a ship, etc., could be settled, information was received from Egypt that no more material could be sent and the mole was to have "second priority" pending later instructions. This followed Italy's entry into the war. In view of this order, further work on the mole was dropped.

Consideration was given to the best design for jetties having regard to the material available and the number required, and to the soundings which had then been taken. It was found that the greatest economy in material resulted in making the part from the shore to the point where water was 3 ft. deep as solid fill 20 ft. wide enclosed between two concrete side walls and an end wall of sheet piles ; and to make the rest of the jetty, except for the last 8 ft., of Larsen "back-to-back" columns spaced at 9 ft. 6 in. centres, supporting a steel rail and timber deck, and to finish at the water end with a sheet pile box, 40 ft. long and 8 ft. wide, filled with concrete in bags. This design was adopted.

The soundings showed that from the middle of the Bay northwards, the sea bed shelved quickly at an approximate distance of 80 ft. from the shore and that in providing the side length of 40 ft. into a minimum of 8 ft. of water, as required by Transportation, the end of the jetties would be in 20 ft. of water. This was considered to be a fortunate circumstance as it made it possible to berth a medium sized Turkish coastal ship, which might prove to be a useful alternative to the bigger ships for which the mole had been proposed.

After the old jetty had been rebuilt, work was started on the first of the new jetties, at a site selected about the middle of the bay which left enough space between it and the old jetty for the mole, if and when it should be decided to build it. Work started by driving, in 3 ft. of water, the curtain wall 20 ft. long, to form the end of the solid section, and was then continued by separate gangs both shorewards and seawards of it. The excavation for the foundation of the side walls to the shore was done by first driving two rows of C.G. sheeting and scooping out the sand between them, the sheets being lowered by mauling as the sand was taken out. It was possible by this method to excavate a depth of about 3 ft. into the sea bed. The trench was taken out in short sections and filled with concrete in bags up to water level. Thereafter the walls were brought up in the ordinary manner to a height of 5 ft. above water, which had been fixed as the best deck level. When the walls were built, the area enclosed was filled with sand from the foreshore. Meanwhile the pile frame drove the hollow Larsen columns for the approach and for the 40 ft.  $\times$  40 ft. head, and the Ougree sheeting for the 40 ft.  $\times$  8 ft. box at the end. As soon as it had finished its work it was moved to begin the piling for another jetty.

The decking consisted of 60-lb. rail, 30 ft. long, laid as continuous primary beams over three spans with secondary beams of 20-lb. rail, spiked to 9-in.  $\times$  4-in. timbers to form a T-beam and to provide a means of fixing deck timbers. These were spaced at 2-ft. intervals and the decking was finished in 9-in.  $\times$  4-in. planks with a 2-in. gap between. The primary beams were tied to the hollow columns by  $\frac{1}{2}$ -in. bolts, hooked into concrete placed in the upper 2 ft. of the column. A filled sandbag was suspended by wire cradles 2 ft. down the inside of a column, the hooked U-bolt placed in the column and over the rail and the whole concreted securely in. The secondary rails were spiked at intervals along the flanges to 9-in.  $\times$  4-in. timbers, making rough T-beams and laid bulb downwards on the primary beams. The deck timber was then spiked to the secondary beams and both beams and deck securely tied by U-bolts to the primary beams to prevent the whole being lifted by wave action, from underneath. Two jetties, one into 20 ft. of water and one into 22 ft., were built in this manner. The calculated and tested safe loading was 3 cwts. per sq. ft. of deck.

In the early part of June a Franco-British reconnaissance party studied the Kilya and Akbasi valleys, and also the district around Gelibolu, for the purpose of selecting base depots for the five divisions promised at the Aleppo conference; and the Naval member of the party examined the Thrace coast of the Dardanelles between Kilya and Gelibolu for sites for further jetties.

Following the report, orders were received to construct up to four jetties, the number depending upon the material available, in Bachesme Bay, just north of Gelibolu. In order to reach 8 ft. of water here, jetties had to be over 300 ft. long. In July, when the piling for the third jetty at Kilya had been completed, the piling plant and crew, with two barge-loads of sheet piling, was sent to Bachesme to begin the work there.

Though apparently sheltered from N.E. and S.W. winds, it proved to be a very rough bay. Perhaps because of some peculiarity of size and shape, and its position at the end of the funnel-shaped coast line at the western end of the Sea of Marmara, light breezes from the N.E. and E., which prevail from July onwards, produced at Bachesme, waves which rocked the floating plant to such an extent as to make it quite unmanageable. On two occasions it was blown ashore and narrowly escaped serious damage. Turkish Maritime opinion was that the bay could not be used for more than four or five days a month, and this was to some extent borne out by the fact that the Turks made no attempt to use it. After nearly a month's ineffectual effort, during which the concrete walling for the shore end of the first jetty was partially built, but demolished by wave action before it could be finished, the conditions were reported to Egypt, resulting in instructions to abandon the bay.

The Turks at this juncture made an official request that the face of the central jetty at Kilya should be lengthened, so that both holds of a "medium sized" Turkish ship could be unloaded at the same time. As there was no other immediate use for the plant, the British agreed to do this. The very narrow interpretation of "Security" Regulations governing the supply of information to Aliens, in which category the British were officially placed, prevented the Turkish officials who made the request for the extension from giving the average distance between the two holds of their "medium sized" ships. Nor could permission be given to measure it. It therefore had to be guessed. The guess was 140 ft.

The face of the jetty, which was 40 ft. long, was accordingly lengthened by 100 ft., making its shape that of an inverted "L." It was decided to drive a box of sheet piling, 11 ft. wide, and to fill it up to water level with concrete in bags, and thereafter to build a concrete lining to the box, 2 ft. thick, with occasional cross walls, and to fill between with sand, finishing with a concrete deck. As the pile frame could not be brought into position to drive piles adjacent to the completed jetty, a gap of 20 ft, was left between the old work and the new, and was bridged by a reinforced concrete deck carried on Larsen pile columns.

In all cases bollards consisted of 20-lb. rails embedded in the concrete below deck level and projecting 2 ft. above it, the projection being covered with concrete. Four fish plates were fixed on the inside of the shuttering before concreting to provide rubbing strips.

At about the time when the piling for this extension was finished orders were received from Egypt to build jetties at Galata and Gelibolu. The bays at these places are wide and scant protection is afforded by the headlands at each end of them. Soundings showed that to reach 8 ft. of water the jetties would have to be 260 ft. and 300 ft. long respectively. A member of the N.A's. Staff made a careful examination of both bays and selected the most sheltered sites for the jettics, and, in view of the lack of natural protection at both sites, recommended jettics of the inverted "L" shape which gave good protection in the angle of the "L" against winds from the S.W. and E., and some protection against winds from the N.E.

The design developed for the Kilya jettics, that is, a solid section into 3 ft. of water for the shore end, pile columns carrying a deck for the middle, and a solid filled sheet-pile box for the water end, was followed for the new jettics.

Only enough Larsen piles remained to provide columns for one jetty, but sufficient 10-in.  $\times$  10-in. timber was available for piles for the other. It was decided to build the open middle section at Galata with Larsen piles carrying a reinforced concrete deck, and to use the 10-in.  $\times$  10-in. timber pile at Gelibolu to carry a wooden deck, the safe load in each case being 3 cwts. per sq. ft. Enough Ougree piling remained to provide a length of 90 ft. in 10 ft. of water at the face of the "L" which, as the approaches were 20 ft. wide, gave a length of 70 ft. in 8 ft. of water on the inside of the "L."

After delays in obtaining from the Turkish Naval Commandant a tug to tow the plant and material from Kilya, a start at Gelibolu was made in September. As unsettled and windy weather could shortly be expected every effort was made to drive the piling with the least delay possible. Little success, however, attended the effort. Rough water, constant shortage of labour, and delays in obtaining the Naval tug for bringing piles from Kilya, led to disappointing progress, and it was not until late in November that the piling in both places was finished.

In October the Turkish Military asked for British help on the construction of a jetty they wished to build at Bulair. There is no bay anywhere near Bulair, and the whole coast as far as Sarkoy is exposed to wind from all directions, being most exposed at the rocky site selected by the Turks for their jetty.

At an interview with the General Commanding the Bulair area, it was disclosed that the reason for selecting this particular site was that it was the precise spot at which Turkish troops landed from Anatolia to conquer Europe, as far as Vienna, in the fourteenth century ; and that as the modern Turkish soldier might be called upon to emulate the deeds of his forefathers, he would start from this memorable place. Whether the British could help or not the Turks would build a jetty there, somehow or other. This romantic reason, and the Turks' valorous defiance of wind, weather, rocks and all the other defects of the site, was sufficiently appealing to the British and they readily agreed to do all they could to help in this venture ; and following this promise, took advantage of a period of apparently settled weather which occurred in November to obtain a tug and send the plant to Bulair. The jetty was to consist of 12-in. and 14-in. square piles supporting a heavy After fifteen piles had been driven-one day's work-the timber deck. weather broke to a severe storm, the anchors dragged and only by the Grace of Providence, and an all-night wrestle by the crew, was the plant prevented from being wrecked on the rocky coast. It was towed back to Gelibolu, where damage was made good.

After this attempt, the Turks were asked to lend two 1-ton anchors to hold the plant in case a similar storm occurred again. These were available in Istanbul, but in spite of the help of the N.A. and the Turkish Admiralty, it took three months to effect their delivery at Canakkale. During the winter the water at Bulair had been too rough for the floating plant, but the Turks had managed to extend the jetty into 4 ft. of water by using a small land frame. In mid-April the British took over the work and extended the jetty to 300 ft. into 3 metres of water. At the end of April it was finished and immediately put into very active use, as it shortened the distance over which the Turks had to transport supplies for the Bulair defence line by 20 miles.

Meanwhile, work had proceeded on the filling of solid sections and the decking of open, at the Galata and Gelibolu jetties, and these were finished at the end of March. Both jetties were put into immediate use by the Turkish Army, now on the move from Canakkale, north of Bulair, as well as by the Turkish P.W.D. (the NAFIA) in unloading stone lighters from Marmara.

Throughout the year 1940 all work on the finishing of jettics after the piling was driven, was seriously delayed by shortage of labour, due to the same causes as those which created the similar shortage on the roads ; with the additional reason that labour for jettics was supplied by the NAFIA, who, because of cumbersome financial regulations, were unable to pay wages regularly, sometimes being two to three months late. This condition naturally did not win a ready response to calls on such free labour as existed. The local Sub-Governors did all they could to help and in-between farming seasons sent a little forced labour from villages. Appeals to the Army resulted in a short term loan of 50 Kurds. These semi-soldiers, semi-slaves, received a wage of 6d. per month, punishment for the looting they did after the earthquakes, and for other older misdemeanours, and they had no will to work. They were quite useless except for fetching and carrying, and for light digging, and even then it took four or five of them to do the work of one good Turk.

In addition to the delays caused by the acute shortage of labour, progress was further handicapped by sickness amongst the British personnel employed as supervisors, drivers of machinery and on other skilled work, such as making shuttering, operating the cutting and welding plant, fixing deck members, etc. In late June, malaria of the malignant type occurred in camp, and persisted till late October, during which period all personnel at Kilya, except one officer and five other ranks, contracted it.

At first, the sick were treated by a Turkish Military medical officer from Maidos, and nursed as well as possible by the R.A.M.C. medical orderly, but the number of sick increased so rapidly that this became impracticable and it was decided to accept the offer of the local Turkish Military Authorities, to treat the men in the Military Hospital on the outskirts of Canakkale, and eight were accordingly sent there. This alternative was not entirely successful, as although the medical treatment was effective and sympathetic, dietary and other cogent reasons arose which made it inadvisable to repeat the experiment and thereafter sick were sent to Istanbul, although this involved a long and trying journey. One of the men, a lance-corporal, R.A.O.C., died in the hospital and was buried in the small cemetery at Canakkale, which the Turks allotted to the British in the Crimean War.

After treatment in the American Hospital in Istanbul, followed by convalescent treatment at the British Embassy, the men were returned to duty; but as many of them suffered almost immediate relapses or re-infection, and as other men continued to fail ill, including the Turkish cooks, which made living conditions very inconvenient, it was decided to retain all sick in Istanbul until the malaria season was over, and to carry on with jetty work in the best way possible with such skilled and other Turkish labour as could be found.

When winter weather came in early December, the extension of the central jetty at Kilya was not more than half complete and further work was very limited. Advantage was taken of occasional frost-free periods to carry on

with the work, and it was finally finished in March, thus coinciding with the completion of the jetties at Galata and Gelibolu.

In March instructions were received from Egypt to build as rapidly as possible a quay providing a waterfront 500 ft. long in 8 ft. of water, to replace, as far as was practicable, the discharging capacity lost by the non-construction of the deep water mole. Timber for the construction of this was available from the Istanbul branch of the United Kingdom Commercial Corporation who, anticipating the German occupation of Rumania, had purchased a large quantity of Rumanian timber and brought it to Istanbul. The quay was therefore designed in timber, with wooden piles supporting a timber deck, and two sections of it strong enough to take the 26-ton tank. The width of the deck was 40 ft., which brought the shore side of it into 4 ft. of water. From there to the shore, about 80 ft., it consisted of earth fill supported by a concrete-inbag retaining wall built against the shore-ward piles. The wooden piles, and the 600 cubic metres of squared timber required for the deck, were purchased from the U.K.C.C. and sent to Kilya.

At the same time instructions were received to build a dry-weather landing ground at a site near Gaba Tepe, 4 km. up the Kilya Valley, and to carry out anti-malarial work, for completion before the breeding season commenced in May, to protect base depot areas.

At this juncture, mid-March, a reconnaissance party representing Q., Tn., and the R.A.F., arrived in Turkey to examine in detail all matters relating to the landing, moving and maintaining of three British divisions, one of them armoured, in Thrace, with Izmir as a main base and Kilya, Galata and Gelibolu as advanced bases. They were to state what R.E. work, such as roads, railways, water supplies, jetties, etc., would be required at main and advanced bases, and were empowered to give instructions for the works to be put in hand to a priority programme.

After their study, the party reached the conclusion that the proposed quay at Kilya was not required and recommended that its construction was not proceeded with, pending their report to G.H.Q. They had found the discharging capacity, and the port communications at Izmir to be inadequate for a main base, and wanted jetties there instead.

The winter weather cleared up and it was possible to commence work on the Gaba Tepe airfield at the end of March. The Turkish Military Authorities took a great interest in this field and lent 150 soldiers for clearing and light levelling. By using a grader for the heavier levelling work, a tractor for the preliminary consolidation of ploughed fields, and six rollers for final consolidation, all working fourteen-hour shifts, an area, 1,200 metres by 800 metres, giving all-way landing facilities was completed at the end of April, after losing four days from rain.

At the same time, anti-malarial work, involving about 15 km. of ditching, was put in hand. As previously stated, labour became abundant following the evacuation of North Thrace, and this work, together with the filling of brackish swamps near the foreshore, and digging the main channels to the sea, was finished just before the breeding season, at the end of May. The R.A.M.C. officer who had recently arrived from Egypt as Malaria Control Officer for Thrace and Anatolia, gave his opinion that Kilya could now be considered as being reasonably free of malaria, and fit to work in ; provided routine maintenance and a minor oiling programme was carried out.

The R.E. work in Thrace given to No. 1 Party was now complete, and as stated in the previous article, the party was moved to Anatolia to work with No. 2 Party on the construction of airfields.

## PRESTRESSED CONCRETE SLEEPERS MANUFACTURED BY THE LONG LINE PROCESS

By COLONEL R. B. EMERSON, C.I.E., O.B.E.

**P**RESTRESSING concrete on the long line principle for the large scale manufacture of sleepers suitable for use under main line traffic was developed in England during the last war. It is now an accepted process according to which approximately three-quarters of a million sleepers per annum are being manufactured for use by British Railways in their main lines.

This process depends for its success on the bond strength between the concrete and the high tensile steel wire reinforcement and on the accurate tensioning, to the same stress, of each wire in a sleeper. The sleepers are manufactured in lines of varying length, usually in the neighbourhood of fifty sleepers in each line, and all the wires in one line are tensioned equally by anchoring at one end and pulling out the other ends in pairs on a specially designed tensioning machine which ensures equal loading. This machine consists of two hydraulically operated rams to which are attached wire grips. Each wire grip holds one wire and, the two rams being connected to a common hydraulic system, an equal tension on both wires is assured. Each pair of wires is tensioned to a specified reading on a pressure gauge, and protection against overtensioning is provided by an overload release valve set to work at the specified pressure. There are twenty wires in each sleeper, and when a whole line is tensioned in this manner each wire in the line has a load of 2.2 tons on it.

The necessary bond strength depends on the cleanliness of the concrete and the steel, the length of wire embedded in the concrete, and the proper compaction of the concrete round the steel. The minimum length of wire necessary to ensure adequate bond can be calculated to a fine limit, and provided this limit is exceeded in practice, subsequent alternating loads do not have any tendency to cause failure by fatigue. In fact, sleepers made by this process have been submitted to over 2 million stress reversals in laboratory tests without causing any failure, or even signs of fatigue.

The long line process can be used to produce sleepers, according to requirements, in any number. Units to produce numbers varying from 25,000 to 140,000 per annum are in use and turning out sleepers to Class E. of B.S. 986: 1945. In the smaller units the moulds are filled *in situ* at their final positions, but in the larger ones they are filled at the centre of the line, on a vibrating table, and are then drawn along the wires to their final position. Here they are vibrated a second time before being left to cure until the concrete reaches a compressive strength of 4,000 lb. per sq. in.

Curing takes place at atmospheric temperature but can be accelerated by passing a heavy electrical current through the reinforcing wires, the heat thus generated enabling the specified compressive strength of concrete to be reached within twenty-four hours. After curing, the wires are detensioned by unscrewing the anchor plates at the end of each line and thereafter the wires between adjacent sleepers are burnt off with an oxy-acetylene flame.

It is considered that prestressed sleepers produced by this method are better than sleepers produced by the positive anchorage method because there is more certainty that each wire in the sleeper is equally prestressed.

The accompanying drawing shows details of the standard sleeper now being produced for British Railways by the long line process.



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### THE DEMOLITION OF THE BERLIN FLAK TOWER

#### By MAJOR R. W. OBBARD, R.E.

#### 1. The Explosion (see Photo 1)

FRIDAY, 30th July, 1948, was a lovely day in Berlin. The weather was fine and clear and the Berliners forgot the rigours of the blockade as they relaxed in the warm sunshine. At 1220 hrs. a lance-corporal of No. 1 Troop, 338 Construction Squadron, R.E., pressed the handle of an old Mk. VII exploder and a thunderous roar shook the city as 35 tons of explosive detonated in the Flak Tower, 1,000 yds. away. Four great columns of smoke shot vertically upwards through the bastion lift shafts and simultaneously a gigantic wave of smoke and dust, 80 ft. high, burst outwards in all directions from the walls. This mighty wave appeared to the startled onlookers to surge as inexorably forward as did the great Bikini atomic tidal wave, but some 300 yds. from the tower it started to lift and break up. Then the tower was concealed by a tremendous cloud of smoke and dust spreading upwards and starting to form a vast new cloud in the hitherto cloudless sky.

The onlookers gazed awestruck. Had the tower fallen or had it survived yet once again ? Suddenly through a rift in the smoke could be seen a great fallen bastion, the Flak Tower-the pride of all Berlin-had at last been totally destroyed.

### The Flak Tower (see Photos 2 and 6)

It is now necessary to go back several years to learn the history of the Tiergarten Flak Tower, to investigate its manner of construction and to find out why it proved so tremendously difficult to destroy.

The tower was built during the years 1941-2. It was a colossal six-storied reinforced concrete building 120 ft. high by 232 ft. square and it weighed some 190,000 tons. At each corner was a great bastion on which a heavy anti-aircraft gun had been mounted.

The building was of a monolithic construction, with no expansion joints to weaken it, and it was carried on a great dish shaped reinforced concrete raft, covered with a thin layer of bitumen.

The roof was in two parts, the actual gun platform being 11 ft. 4 in. thick and then, after an air gap of 10 ft., came the lower portion some 8 ft. 8 in. thick. Four great pillars, 10 ft. square, stretched centrally from the ground to the roof. Each floor was strongly reinforced and was carried on eight main beams 10 ft, wide and 3 ft. 3 in, deep, which stretched from the central pillars to the outside walls and which were in addition tied in to the buttresses. The walls were 8 ft. 4 in. thick and were strengthened by twenty-four internal buttresses—six a side—stretching from the ground to the roof. These were 28 ft. long by 5 ft. wide up to the first floor level and thereafter 20 ft. by 3 ft. 3 in. In each bastion was a very strongly constructed annular stairway, with walls 1 ft. 8 in. thick, and the floors of the bastions were carried on beams independently of the main floor. The building was tied in on itself in all directions so that even if the central pillars were blown neither the roof nor the floors need collapse, and if the outer walls were blown the buttresses could support the roof and the annular stairways the bastions.

The reinforcement of the concrete in the walls and roof incorporated the following constructional points, both of which were anathema to any form of normal drilling operation. In the first place the numbers of reinforcing bars were considerably increased close to both the inner and outer faces of the structure, partly no doubt to mitigate against the flaking of the concrete in the event of a direct hit, and secondly the whole of the reinforcement frame was intertwined with helical reinforcement—a type of construction used by the Germans in all their really heavy reinforced concrete structures (see Photo 3). The reinforcement in the beams and pillars was of stock design, but so exceptionally heavy that beams failed to collapse even after being stripped in places of all their concrete.

The above description entirely fails to do justice to the awe-inspiring size and impression of vast strength created by the tower, but it may give a slight idea of some of the difficulties involved in the demolition work.

#### 3. The Squadron

Early in 1947, 338 Construction Squadron, R.E., under the late Major Soden, R.E., had become demolition experts and had blown numbers of shelters throughout Berlin, both above and below ground. The Squadron had early found that for the normal above ground reinforced concrete shelters the formula for concussion charges of  $C = KT\sqrt{VT}$  gave too great a charge if K was taken as 1.1. A special factor of  $\frac{1\cdot 1}{3}$  for built-up areas and  $\frac{1\cdot 1}{4}$  for closely built-up areas was always used. The Squadron became so expert at these demolitions that shelters could be safely destroyed without damaging buildings or breaking glass even a few yards away.

### 4. The First Blow

It was decided in view of past successes to apply a concussion charge  $(C = KT\sqrt{VT})$  using ammonal to destroy the Tiergarten Flak Tower. The calculated charge worked out at 65,138 lb. and in this case, in view of the great size and strength of the building, no special reduction factor was used. As, however, the control tower—another very large reinforced concrete structure—had already been satisfactorily demolished using three-quarters of the calculated ammonal charge, the charge for the flak tower was reduced to the round figure of 50,000 lb.

This charge was distributed between floors as follows :---

22,500 lb.—ground floor	4,300 lb.—third floor
3,800 lb.—first floor	4,000 lb.—fourth floor
7,800 lb.—second floor	7,600 lb.—fifth floor

Very briefly the detailed plan was to place 7,000 lb. in 500-lb. charges against the central columns at various levels in order to destroy them and the beams supported by them and to place the remaining charges symmetrically on the ground, second and fifth floors, against the north face on the first and fourth floors and against the south face on the third floor. Charges were to be either 400 or 300 lb., except on the second floor where a number of 100-lb. charges were placed against the buttresses.

The target date for the demolition was 30th July, 1947, at 1600 hrs., but because of the unit's priority work on the Berlin tattoo the date and time was put off until 30th August, 1947, at 1600 hrs.

Unfortunately, stocks of British ammonal were not readily available. Some German commercial ammonal that had been exposed to the atmosphere was considered unfit and rejected. The only readily available explosive was T.N.T., and this was used. All steel window shutters were closed and the openings sealed in addition with sandbag walls. Doors were sealed with sandbag walls and finally the entrances to the tower were bulldozed up.

A cordtex ring main was placed on each floor and an initiating point on each landing. Five vertical ring mains—one in the centre stair well and one in each bastion stair well—connected these horizontal mains. The six initiating points were electrically detonated.

At 1600 hrs. on the 30th August the charges were detonated as planned but the demolition was a partial failure. The T.N.T. in contact with pillars and beams made a far better job of destroying them than the equivalent ammonal charges would ever have done, but the use of T.N.T. instead of ammonal as a concussion charge was not a success. The sealing of the whole building had been designed for ammonal and it was not nearly strong enough, when T.N.T. was used, to allow for the necessary build-up of pressure to burst the building. In the light of knowledge, subsequently gained, of the phenomenal strength of internally buttressed flak towers it is improbable that even a British ammonal concussion charge would have destroyed the tower.

The first floor of the tower collapsed but the remaining floors, though badly damaged still stood and the outside walls and internal buttresses were only slightly cracked. All the brick partitions and the ceilings throughout the tower were completely disintegrated and covered the inside with masses of loose rubble and steel, whilst a thick layer of cement dust lay over everything.

### 5. The Experimental Blow

The problem of what to do next now arose, as it was clear that it would never be practicable to seal a damaged building, so strongly constructed and with so many windows, sufficiently well to allow for a concussion charge to destroy it. In addition the state of the building and the difficulty of moving about amidst the rubble and the choking dust made working inside both difficult and dangerous.

It was finally decided to experiment on the north-west quarter of the building before a further attempt at complete demolition was made. The plan was to cut the walls at ground and second floor levels, disrupt the annular staircase and strip the buttresses at second floor level, and at the same time fire an internal booster charge to help throw the cut portion outwards. It was then hoped that the massive unsupported weight of the roof and walls above the cut would descend and complete the work of destruction.

If this proved to be a success the same process was to be applied to the other three corners simultaneously and so achieve the complete collapse of the tower.

To obtain the cuts two rows of 30-lb. bechives at 3-ft. centres were used at ground and second floor level and these produced boreholes to approximately two-thirds of the thickness of the 8 ft. 4 in. walls. Bechives at ground level were fired from outside and those at second floor level were fired from inside the idea being that when filled and fired the explosion would produce in the walls an outward turning movement. The booster charges consisted of three 1,400-lb. charges of ammonal, one charge being placed in each of the outer bastion corners at first floor level. For all the other charges the " all purposes " explosive " 852 " was used.

Difficulties of a tight time table and complications due to the Russian controlled railway being only 80 yds. away were accentuated by the late delivery of the beehives. About 380 boreholes had to be made and filled, and the final filling was still taking place on the morning of the target date (27th September). So rushed was the work that it only proved possible to fill each borehole with an average of 11 lb. of explosive instead of the normal 25 lb. As a result, only 4,200 lb. of explosive (instead of the calculated 9,500 lb.) had actually been loaded into boreholes by the target date.

The charges were initiated by two ring mains fired simultaneously from a junction box, one ring main connected all the "852" charges and the second all the ammonal charges.

On the 27th September the charges were duly detonated, but the N.W. bastion failed to fail though the walls were cut laterally and the reinforcement was exposed almost to the full depth of the boreholes (see Photo 3). The S.W. corner had a hole blown completely through it by the ammonal charge placed there.

Several very valuable lessons were learnt from this experimental blow.

- (a) First and most important there must be close co-operation between the "planner" and the "doer" of major demolitions and if time is not of over-riding importance the target date should always be arranged mutually so that the optimism of the "planner" can be kept under control by the practical pessimism of the "doer." Subsequently if special unforeseeable circumstances should arise, such as Russian blockades, non-arrival of explosives, etc., the "doer" must place the "planner" in the picture and ask for the extra time or assistance required.
- (b) The borehole charges cut the concrete laterally, but only cut the walls to the depth of the boreholes. This showed that boreholes in reinforced concrete walls must penetrate the full depth of the walls and that penetration to only two-thirds of the depth as recommended in R.E. Pocket Book No. 4 is not sufficient.
- (c) H.E. and ammonal should not be fired in the same demolition.
- (d) The penetration of 30-lb. beehives in good reinforced concrete is only 60 in. and not 75 in. as laid down in R.E. Pocket Book No. 4.

#### 6. The Reckoning

Unfortunately, a section of the Press and the B.B.C. misrepresented the purely experimental nature of the blow and made announcements that gave the impression of yet another Sapper failure to blow down the flak tower. Added to this were the somewhat pointed remarks of our Allies in Berlin. As a result it was considered essential that the flak tower should be blown in such a manner as to make the whole structure collapse and that meanwhile no further experimental blows—not even minor " bangs "—should be made in its vicinity.

7. Interlude. The Harburg Flak Tower (see Photos 4 and 5)

Shortly after the experimental blow I was posted to 338 Construction Squadron, R.E., in Berlin and I was fortunate enough to be able to pay a visit to Harburg to see the blow carried out on the flak tower there.

The Harburg tower was a smaller tower than that in Berlin, being an eight-storied monolithic reinforced concrete building 133 ft. high by 158 ft. square. It had walls 6 ft. 6 in. thick supported by six large and four small buttresses and it had six internal 6-ft. 6-in. pillars. Beams 6 ft. 6 in. in width by 3 ft. 3 in. in depth stretched between pillars and buttresses and supported the floors. Where, however, it had its greatest advantage over the Berlin flak tower was that it had no windows except for one large opening and a few small openings all on the same high level floor.



Photo 1.-Berlin Flak Tower-The explosion.

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The Demolition Of The Berlin Flak Tower 1



Photo 2 .--- Berlin Flak Tower--- North face after experimental blow.

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Photo 3.—Berlin Flak Tower—Reinforcement exposed by borehole charges on outside of walls after experimental blow.

## The Demolition Of The Berlin Flak Tower 2,3


Photo 4 .--- The Harburg Flak Tower-A good impression of size and massive construction.



Photo 5 .--- Harburg Flak Tower--- The explosion coming through the walls.

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# The Demolition Of The Berlin Flak Tower 4-5

It was decided in this case that the tower should be destroyed by a concussion charge using the "852" mentioned in Section 5 above. The plan was to place the charges against beams and buttresses and to strip and damage these to such an extent as to ensure that the weakened building would be unable to resist the bursting effect of the concussion charge.

Every care was taken to seal the building so as to ensure its complete destruction. The large window was blocked with sandbags to a depth of 12 ft. and the small openings were sandbagged solid right back to a blast wall that shielded them. Every entrance to the tower was blocked with double sandbag walls several feet thick and altogether 40,000 sandbags were used on this work.

750 lb. to each of 6 large (6 ft. 6 in. by 16 ft. 6in. ) buttresses	4,500 lb.
500 lb. to each of 4 small (6 ft. 6 in. by 6 ft. 6 in.) buttresses	2,000 lb.
500 lb. to each of 6 columns (6 ft. 6 in. by 6 ft. 6 in.)	3.000 lb.
(charges placed on beams.)	, <b>·</b>
Third floor 500 lb. to each of 6 large buttresses	3.000 lb.
500 lb. to each of 4 small buttresses	2.000 Ib.
750 lb. to each of 6 columns	4.500 lb.
Fourth floor as for second floor	9.500 lb.
First floor tamping charge, 200 lb. at foot of lift shaft	200 lb.
Fifth floor tamping charge, 200 lb. at top of lift shaft	200 Ib,
_	<u> </u>
Total	28,900 lb.

The concussion charge formula  $C = KT\sqrt{VT}$  gave 27,000 lb., allowing for a wall thickness of 6 ft. 6 in. and making no additional allowance for the buttresses.

There were two vertical ring mains up the lift shaft and horizontal ring mains on each floor. There was an electric circuit with four electric detonators per floor and two detonators on the vertical ring main junction box outside the building. The exploder used was a dynamo condenser.

When the exploder was pressed very little effect was visible externally, so well was the building sealed (see Photo 5). The explosion caused all the internal floors to collapse and this in turn cleared the sandbag seals from the few windows, also the blast did force its way out through the heavily sandbagged entrances, but, as the photo shows, the sealing of the tower could hardly have been improved upon. The tower was badly cracked horizontally all round especially at third floor level and the object of the demolition, which was to damage the tower to such an extent as to make it useless and beyond repair as a war-like structure, was fulfilled. Even so the tower still stood and the outer walls and the roof had not fallen as was essential in the case of the Berlin flak tower.

#### 8. The Problem

Meanwhile Rhine Army demolition experts were studying the problem of the Berlin flak tower. How was it possible to destroy in one "blow" a badly damaged building that could not be sealed and yet whose walls were too thick to be attacked by stripping charges and too heavily reinforced to be boreholed by compressor driven tools and which—due to the ban on "bangs" prior to the actual demolition—could not even be boreholed by beehives. The problem scemed wellnigh insoluble and called for a completely new method of making boreholes in reinforced concrete.

## 9. The Experiments (see plates 1 and 2, which show the final solution)

In October the first design of an oxy-thermic drilling set was sent down to the Squadron to experiment with. Very briefly the principles involved in the process are, that if oxygen at high pressure is passed through a steel pipe filled up to 75 per cent of its bore with steel wire and ignited, then the heat generated is so intense that when the pipe (lance) is pressed against a concrete wall the concrete melts in front of it, mixes with the molten iron from the lance and runs out of the hole as a liquid slag, assisted by the blast of excess oxygen escaping from the hole. The apparatus used consisted essentially of a stand to hold six oxygen cylinders complete with regulators, a manifold to which all the cylinders could be connected at the same time and at the same pressure, high pressure hose to connect the manifold and the lance holder, a lance holder complete with stopcock to hold the lance and regulate the oxygen supply to it, a lance, and finally a shield to protect the operator. An oxy-acetylene welding set was also required as the end of each lance had to be heated to white heat with a welding torch so that the oxygen when turned on would be ignited. The Squadron had been instructed to use an oxygen pressure of 20 lb. per sq. in. and the method was reported as a failure for making boreholes to a greater depth than 4 ft. Beyond this depth the expenditure of both lance and oxygen was excessive and it was found impossible to bore to a greater depth than 5 ft. 8 in., unless cordtex was used for clearing the hole of slag.

Even using cordtex the maximum depth reached was only 7 ft. 3 in., and this not only contravened the "no bangs" order, but was also forbidden as dangerous, there being the possibility that an enthusiastic and impatient sapper might try it out on a red hot borehole.

However, the S.O.R.E. 1 (E. & M.), at Rhine Army H.Q., refused to abandon hope and after inquiries and experiments he finally discovered that if pressures were increased from 20 to 80–100 lb. per sq. in. then an 8-ft. concrete wall could be bored through comparatively easily. Like all great discoveries a very simple one when arrived at.

## 10. The Plan (see Plates 3, 4 and 5)

At last a plan could be worked out for the demolition of the flak tower and the final plan decided on was as follows.

Two rows of boreholes were to be made completely through the outer walls and completely round the building (except in the N.W. corner which was already severely damaged), one row at a height of about 4 ft. and the other about 44 ft. above ground level. The boreholes were to be so spaced and filled that a complete cut, both laterally and right through the outer walls, would be formed at two levels. The buttresses inside the building were to be attacked by stripping charges at similar levels. The eight great beams supporting the second floor were to be stripped near their junction with the wrecked central pillars and all minor bastion beams on the first and second floors which were still intact were to be stripped near their junction with the wall or the stairway. Finally the annular stairways and their supporting pillars in the N.E. and S.E. bastions were to be cut at ground, first floor and second floor level. (The S.W. bastion stairways were not to be cut as they were nearest to the railway line and explosives on that side had to be kept to a minimum. The cutting here was not essential as if all the other bastions fell the S.W. one must follow suit.)

Heavy overturning charges were to be placed on the first floor to throw the cut portion of the wall outwards and, to make doubly sure that the top portion











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of the wall fell outwards, 5-lb. "scabbing" charges were to be placed internally on each of the second floor boreholes and externally on each of the ground floor ones.

Thus at the instant of detonation a length of wall 40 ft. high and extending three-quarters of the way round the building would be cut and all buttresses and beams holding this portion into the main structure would be stripped. Simultaneously the overturning charges, aided by the scabbing charges, would throw the wall and the cut portion of the buttresses outwards and the annular stairways would be stripped at three levels. The tremendous roof having nothing left to support it—the central pillars and N.W. bastion already being out of action—would fall and break its back completing the work of wreckage in the process.

#### 11. The Preliminary Work

Whilst the demolition plans were in hand and recces were in progress the Squadron was preparing the site, collecting scaffolding, erecting store huts, wiring the perimeter, making trial boreholes and testing their explosive capacity, and constructing oxy-thermic burning sets based on the initial design but to a greatly improved pattern. Meanwhile pipe, wire and explosives were ordered by Rhine Army and arrangements made for the supply of 600 cylinders of oxygen to Berlin every week. By the middle of March all the preliminary work had been completed and it had been ascertained that oxy-thermic drilling sets, using  $\frac{1}{2}$ -in. pipe filled with ten strands of 10 gauge wire, would make boreholes in the 8 ft. 4 in. flak tower wall capable of taking an average of 45 lb. of "852."

#### 12. Organization of Work

On the 15th March, 1948, the "all clear" was given for work to proceed and the target date for the final demolition was given as the 15th July. It • was estimated that it would take a minimum of nine weeks to complete the boreholes and six weeks to fill them and the balance of time would be required to cover the placing and connecting up the charges.

- No. 1 Troop was made responsible for the oxy-thermic drilling and the filling of the pipe with wire.
- No. 2 Troop was responsible for keeping up the oxygen supplies, for moving stores and for erecting scaffolding.
- No. 3 Troop was responsible for carrying out all the outside Squadron duties in Berlin, but was to be used on the flak tower for clearing sites and fixing the forms and boxes for internal charges as soon
  - as the filling of boreholes commenced.
- No. 4 Troop did not exist.

#### 13. The Making of the Boreholes

Calculations for the amount of explosive per ft. run of wall required to cut the wall were based on the formula  $C = 1 \cdot 1 T$ , where C is the charge in lb. per ft. run and T is the thickness of the wall in feet. To obtain the spacing of the boreholes, which were to hold these cutting charges, it was necessary to divide the average borehole charge (45 lb.) by C. This gave a borehole spacing of 4.8 ft., but due to the impossibility of boring them exactly at right angles to the surface of the wall and due to the extreme strength and weight of the walls a factor of safety was allowed and the holes were spaced at approximately 4-ft. intervals. At this spacing it was calculated that 435 boreholes would be required. Each oxy-thermic drilling set could make between four and six holes a day and required a team of one N.C.O. and eight men to work it efficiently. Each hole used up 1,500 cu. ft. of oxygen and 110 ft. of lance. The work went ahead very well and was well up to schedule when without warning the blockade of Berlin was started, and as all oxygen came from the British zone by train, drilling was completely held up. For a short time some convoys of lorries carrying cylinders were able to get from Berlin to the British zone and back, but this was uncertain and was eventually stopped altogether even before the autobahn was finally closed. Desperate searches in the American and French sectors, and even in the Russian zone adjoining Spandau, enabled us in the end to get a dribble of cylinders with which to finish the work, but meanwhile serious delay had been caused and the last hole was not completed until 12th June.

No special troubles were encountered in the actual drilling work but the following operational points are important (see Plates 1 and 2).

- (a) In order to fill the pipe with wire and thus form a "lance" it is necessary to first stretch the wire beyond its elastic limit. Under no circumstances whatsoever must oil or grease be used to facilitate the loading of the wire into the pipe as if used "flashback" will occur and an explosion will result. For the same reason the pressure hose must be new and free from oil.
- (b) The next lance must be heated ready for insertion immediately the previous one is turned off or else the slag near the face of the hole will cool and harden and prevent further slag running out.
- (c) The hole should be drilled at an angle of about 5 degrees to the horizontal.
- (d) The most efficient technique for boring was to push the lance steadily into the wall occasionally moving the lance up and down to clear any slag that had cooled.
- (e) The operators had to be careful not to force the lance too hard, especially at depths of 2-3 ft., as otherwise the lance in the hole, which had been softened by contact with the slag, bent, and a straight hole was not obtained.
- (f) The sappers operating the lance must wear protective gloves and goggles.

A thick yellow toxic smoke belched from the holes as they were drilled and would have made it impossible to drill from within the flak tower. In addition on a few occasions on the second floor level as the lance finally penetrated the inner surface of the wall it burnt up with a fierce flame the remnants of T.N.T. not completely detonated at the first demolition.

The completed holes were very uneven inside, being lined with rough solidified slag and it was found necessary, before starting to fill them with explosive, to pass a 2-in. cruciform bit operated by a pneumatic hammer drill through each hole. In order to drill to a depth of 8 ft. 4 in. a 40-in. drill was adapted to fit on to a 72-in. drill.

Finally in order to take scabbing charges the internal or external mouth of each borehole was enlarged into a conical shape with a pneumatic hammer.

#### 14. The Erection of the Scaffolding

The job of the scaffolders was to erect scaffolding 40 ft. high and 25 ft. wide at the rate of 66 ft. per week, and as there was sufficient scaffolding for only three such blocks, dismantling and erecting had to go on simultaneously. Some German scaffolders were obtained to help with the work and gradually a light design of scaffolding was designed that allowed for five instead of only three blocks.

This lighter scaffolding was also specially designed so that after the drillers had finished their work the scaffolding could be dismantled down to an 8 ft.

width in preparation for the borehole fillers. The scaffolding thus dismantled was erected to an 8 ft. width elsewhere, until by the time the filling of the boreholes was started there was scaffolding around most of the tower.

#### 15. The Filling of the Boreholes

The filling of the boreholes produced no special difficulties. Each borehole first had a piece of cordtex passed right through it, the end foot of the hole was then filled with "852" and a primer pushed down the cordtex, filling continued until the centre of the borehole was reached when another primer on another piece of cordtex was placed in the hole by means of a plastic tube, filling again continued until about a foot of the borehole was left and then another primer was pushed down the second piece of cordtex, finally the hole was completed. Thus each hole contained three primers and two lengths of cordtex protruded from its external face and one from its internal face. These lengths of cordtex had scaling caps fixed on them and were coated with scaling compound.

The best method of filling the holes was found to be to use two wooden rammers, one of  $1\frac{1}{2}$ -in. dia. and one of  $\frac{3}{2}$ -in. dia. and pointed. The drill was to impale a 2-4-in. length of "852" on the end of the thin rammer and then "feel" it to the back of the hole where it would be consolidated by the large rammer. This saved considerable time and two men could easily do the work that it had previously taken four men to do by the normal methods.

## 16. The Stripping Charges (see Plates 3, 4 and 5)

The stripping charges were calculated in accordance with the formula charge in lb. per ft. run =  $3.5 \text{ T}\sqrt{1}$ . This gave 40 lb. and 21 lb. per ft. run respectively for the 5 ft. and 3 ft. 3 in. buttresses and 8 lb. per ft. run for the 1 ft. 8 in. thick annular stairway. Actually in order to get a well shaped charge with height approximately twice the width it was necessary to use 45, 24 and 12 Belgian T.N.T. slabs per ft. run. The excess of charge thus created was compensated for by the fact that the buttresses had openings in them and so did not require charges along their whole length.

The charges on the beams were 600 lb. on the main beams, 300 lb. on the main bastion beams and 100 lb. on all remaining minor beams. These charges were big if calculated entirely as stripping charges, but it was essential to get well shaped charges across the whole width of each beam to make sure that the stripping was completed.

Finally 60-lb, charges were used for the 2 ft, 6 in, by 3 ft, stairway pillars.

The making of the forms to hold the charges and the preparation of each site was the responsibility of No. 3 Troop. Beams had to be cleared of rubble to allow the charges to be placed in actual contact with them and this was dangerous and unpleasant work as the beams were covered to a considerable depth with rubble, steel and dust and landslides were common occurrences. Rubble had to be levelled to enable charges to be placed against buttresses and stairways and wherever possible the charges were fixed a couple of feet above floor level to avoid the strongest reinforcement.

The forms made for the holding of stripping charges against buttresses were "L" shaped boxes closed at the ends and made of 8-in. by 2-in. timber. Holes were bored in the centre of the back of the timber frame every 3 ft. to allow for cordtex leads to pass through. The boxes were then strutted firmly against the buttresses and filled with T.N.T. except at the initiating points where G.C. primers and slabs were used.

Sand was used for tamping and packing where necessary. The forms for the annular stairways were similar except that the backs of the forms were made of plywood, and the forms having to be made to fit round a circular wall were



Photo 6 .- Berlin Flak Tower-South face before final blow.



Photo 7.—Berlin Flak Tower—South face after final blow. Note—How the whole building has dropped as the result of the collapse of the bottom floors.

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Photo 8 .- Berlin Flak Tower-East wall after final blow.

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Photo 9.-Berlin Flak Tower-North-west Bastion after final blow.

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more difficult to construct. In two cases the forms round the whole wall had to be supported on tubular scaffolding.,

The forms for the beams were boxes with no tops or bottoms and after packing them with T.N.T. two initiating points were made with primers and G.C. slabs in the top of each box.

Care was always taken that the direction of initiation was in every case at right angles to the face of the buttresses or beam to be cut.

## 17. The Overturning Charges (see Plate 4)

The overturning charges consisted of twelve 1,250-lb. charges and were placed on the first floor-where it existed above the magazines-or were supported on tubular scaffolding platforms at the same height. The charges were packed in large boxes without tops and each charge initiated by two G.C. primers and slabs placed in the back of the box with direction of initiation towards the outer flak tower walls. The charges were placed 6 ft. back from these outer walls so as to give a push to a large area of wall.

#### 18. Method of Initiation

There were two horizontal external cordtex ring mains, one at ground floor and the other at second floor level, this latter being fixed by using a fire escape, and to these were connected all the external cordiex leads from the boreholes. These two mains were connected together by vertical switches.

There were two vertical ring mains, one passing from east to west and one from north to south, up the central shaft and these were each connected to all the horizontal ring mains.

The ends of all ring mains passed via a subsidiary junction box at their own floor level to the main junction box. This main junction box was located about 20 yds. away from the N.W. bastion and consisted of two sets of three primers to each of which were strapped seven cordtex leads, the whole being embedded in 5 lb. of "852" pancaked in to the lid of a cordtex box.

There was also an auxiliary junction box on the ground to the north of the tower and from this one cordtex lead was connected to the subsidiary junction box on each floor.

The firing was done electrically, the main circuit having eight electric detonators in it-two in the main junction box and two in each of the subsidiary junction boxes-all connected in series.

There was a subsidiary circuit that could be fired from another exploder at the firing point and this had four detonators in it-two in the main junction box and two in the auxiliary junction box. This circuit was an emergency one for use in the event of the main circuit being cut or damaged.

#### 19. Summary of Explosives

The final distribution of explosives throughout the flak tower was as follows :—

Ground floor	21.046 lb. T.N.T.
First floor	17,892 lb, T.N.T.
Second floor	16,532 lb. T.N.T.
Boreholes,	,
Ground and second floors	22,463 lb, " 852 "
Total	77.933 lb. of explosive or approx. 35 ton

77,933 lb. of explosive or approx. 35 tons.

#### 20. The Period of Doubt

Whilst the final work of connecting up the internal and external ring mains was in hand, worry had been growing as to the damage that might be caused by the detonation of 35 tons of explosives in an unsealed building, especially as no less than 10 tons of this total was in boreholes.

Berlin was under a strict blockade and all road, rail and water transport was at a standstill. Under such circumstances serious damage to buildings could not be risked, but as never before had such a monster unsealed demolition been undertaken no precedent could be found for its probable effects. Serious differences of opinion arose on the size of the necessary safety area and precautions. These had considerable political and practical implications.

Whilst the matter was still under discussion the heat of the sun and the exposure to all weathers began to affect the "852" used in the boreholes. Some of it turned black, some of it exuded and some softened and fell out of the holes. In addition, where the cordtex leads emerged from the boreholes they began to swell up and turn dark yellow. An ordnance expert was hurriedly summoned from Rhine Army H.Q. and he declared that the explosive had become unsafe and was liable to detonate if interfered with.

In view of this and other reports, it was decided to proceed with the demolition at 1200 hrs. on Friday, 30th July, exactly one year after the target date for the first blow. The safety area was fixed at 1,500 yds.

Fortunately the vital day dawned fine and clear, as had the sky been cloudy and dull there would have been serious danger of the blast being deflected from the clouds back on to other areas of the City and there would have been no option but to postpone the demolition yet once again. In addition the air route to Tempelhof airfield passed close to the tower and, even though Central Flying Control had been warned, it was necessary to keep a sharp look out for aircraft.

Everything was ready at the appointed time, but the exploder was not pressed till twenty minutes later owing to the necessity of chasing away enthusiastic press photographers and other difficulties over safety precautions.

#### 21. The Results (see Photos 7, 8 and 9)

The demolition was a perfect one and went exactly as planned. The cut portions of the wall were overturned and the tower fell 40 ft. cracking itself up in the process, especially on the east and south-east faces. Three bastions pulled away from the roof and sloped drunkenly towards the ground. The S.W. bastion in which the annular stairway had not been cut was the least damaged, probably due to its settling down more gradually. So strong were the walls that when they blew out they still retained right angle bends in them.

The damage done by blast and debris over the area surrounding the tower was slight. The main railway line—electric and steam—that runs past, 80 yds. to the west, was undamaged and the only visible damage was that the Zoo wall that ran within 30 yds. of the tower had collapsed.

Debris was not thrown to a greater distance than 50 yds, and had done no damage. An area of several hundred yards around the tower was covered with a thick white layer of cement dust.

#### 22. The End

Thus ended the great Berlin Flak Tower. It had been a worthy adversary, and in all 66 tons of explosive had been required for its destruction. It had taught us many valuable lessons in demolition technique—may they long be remembered.

Note.—Photographs No. 2, 3, 5, 8 and 9 are reproduced by permission of the Controller of H.M.S.O.

## THE HISTORY OF A WARTIME FIELD COMPANY OF THE Q.V.O. MADRAS SAPPERS AND MINERS

#### By MAJOR P. M. BENNETT, R.E.

#### PART I-RAISING AND TRAINING

#### INTRODUCTION

THE object of this article is to describe how a young Madras Sapper and Miner Field Company was formed and trained, and carried out the tasks allotted to it during operations in Burma. It is hoped that the account may be of interest to those officers who have in the past served in Corps of Sappers and Miners, but who did not have contact with the Indian Army during the 1939-45 war.

It is hoped that no opinion expressed in this article will cause offence to officers who served in other sapper companies in the Burma campaign. In some respects this company may have been above average ; in others it was certainly not so. By recording at some length the history of one company, it may perhaps be shown on behalf of the many wartime sapper and miner units, that they justified their creation and upheld the traditions of their corps. The Burma victory could not have been won without them.

#### STATE OF THE INDIAN ARMY IN EARLY 1942

In the regular pre-war Indian Army there were a total of only seventeen field companies and some twelve smaller engineer units. It had not been foreseen in 1939 that a vast expansion would be rendered necessary by the course of the war. Planning was consequently lacking with the result that a very high percentage of the personnel of the long service regular Indian Army was allowed to proceed overseas with the senior formations. By the end of 1941, ten divisions and many corps and army units were on active service overseas, and some of these suffered heavy casualties during the early months of 1942. By April of that year a Japanese invasion of India was considered imminent, and new Indian formations had to be created to oppose it.

It will be fully appreciated by ex-Sapper and Miner officers, that there were by that time in depots very few experienced soldiers to form the nucleus of new units; and that, of these, a good proportion were of the types most easily dispensed with by companies that had departed overseas.

There were by then three training battalions in Bangalore, each several times the size of the peace-time training battalion. Thousands of young recruits were being rushed through a crowded curriculum and turned out as trained soldiers in less than six months. The officers were nearly all new and few could speak the language. The N.C.O. instructors were largely young soldiers who had never served in field units and their standards were low. Clothing and personal equipment were in very short supply and training stores were scarce. The unfortunate recruit was worked from dawn to dusk ; many subjects were included in the syllabus, but what he actually absorbed was very little. This sudden transition from a simple village life to a crowded routine was a rude one, and it is not surprising that there were a number of desertions.

The Indian Army had sustained heavy casualties against both the Germans and Japanese and morale at that time was low. Opinion in the country was widespread, that this time Britain would be defeated and that to join the army was to invite certain death. Yet recruits continued to pour in, and it was from this young and undertrained material that the new units were raised. These units were destined to carry out the many engineer tasks, that contributed to no small extent to the victorious 1944-5 campaign against the Japanese in Burma; a campaign in which the Japanese sustained 40 per cent of her total war casualties, and in which the engineer problems were at least as great as in any other theatre. During 1942, seventeen field companies and a number of other units were raised by the Madras Sappers and Miners and dispatched to field formations, and by the middle of 1943 another nine field companies, in addition to other units, had left Bangalore.

#### THE MADRAS SAPPER

The Madras Sapper has long held a very high reputation in the Indian Army, but for those who have not served with him, a short description may be of interest. In the days of the East India Company, the Madrassi provided a large portion of the sepoy armies that won India for the British Crown. During the last hundred years, as the focus of military interest shifted ever further to the north-west, the Madras Presidency Army saw less active service and the quality of the officers that joined Madras units deteriorated. Consequently, the quality of the units dropped and eventually more and more were disbanded. The Madras Sappers continued to attract good officers and to see active operations ; and, in consequence, escaped the extinction of the rest of the Madras Army, and maintained and added to their reputation. Even so, it was often stated before this war that although a Madrassi made a first-rate sapper, he was not a real fighting man. World War II proved that he is still both.

The Madrassi is small and slight and, contrary to general opinion, the classes recruited by the Madras Sappers have very little education. Almost all are village boys who have spent the first sixteen or eighteen years of their life cultivating the paddy fields of South India. A fair proportion are semiliterate in that they can read and write their own language—Tamil, Telagu or Malayali ; very few have any knowledge of English or of Urdu, the basic language of the Indian Army. Very few enlist with any knowledge of a trade or of motor driving. The Madrassi's characteristics are a capacity for hard work and long hours, keenness, cheerfulness, and loyalty which is typified in a strong personal devotion to his own officers. He has tenacity and, led by officers whom he trusts, he has plenty of guts and develops a keen fighting spirit.

In pre-war days the intake had been highly selective and a large proportion of the Corps were from families who had served as Madras Sappers for several generations. With the heavy wartime expansion, however, the vast majority of recruits had no family connexion. *Esprit de corps* had little time to develop in training battalions but had to be built up in field units. From the wartime recruits the best were retained for a spell as N.C.Os. in training battalions, the second grade were given trade training to artificer standard; the third grade were given eight weeks M.T. training; and the fourth grade were posted direct to field units as fifth and sixth rate sappers.

#### RAISING A FIELD COMPANY

The field company which is the subject of this article was one of the many. raised during this period of enormous expansion. It started life in May, 1942. The company commander and subadar were newly promoted, having just returned from regular units overseas. Subadar Ramokrishman, who remained with the company for four years, was an excellent example of a firstclass Indian Army V.C.O. As a member of an old Madras Sapper family he was intensely loval and a strict disciplinarian. He was hard-working and energetic, and always prepared to take responsibility and make decisions when occasion demanded. He proved himself an excellent leader in action. The senior V.C.O. is the key man in an Indian Army unit and this company was most fortunate in having a first rate subadar. The second-in-command, a territorial officer, remained in the company for two and a half years, but there unfortunately had to be several changes amongst the subalterns before the unit went to war. The four jemadars and nine other ranks were regulars, but of these only three had seen overseas service. One jemadar and the havildarmajor had been lance-naiks in 1939, and the remaining regulars had been sappers who in peace-time would never have achieved a stripe, and some of them had to be replaced during the long months of training that lay ahead. In June, 1942, when the company was brought up to strength, the average age of the remaining 240 ranks was just over eighteen years. Few N.C.Os. had been as much as twelve months in the army and nearly half the sappers were sixth rate tradesmen ; that is to say that they knew nothing at all about their trades ; many men were without any education.

A good deal of thought had been put in as to how a unit should be raised and trained. The first requirement was a high standard of discipline, and this . took many months to achieve, as standards had greatly fallen with expansion. The second requirement was to turn the young sapper into a tough and selfconfident soldier with a high opinion of the capabilities of himself, his weapons and his unit in a fighting rôle. Toughening and weapon training featured prominently in the training. The company trained rigorously during the twenty months before it went to war, and a few weaker elements were eliminated during this period. Little time was devoted to education, although Urdu was enforced as the normal language of the company. The company achieved a higher standard of fluency in Urdu than most other wartime Madras Sapper units, and as a result it was able to establish and maintain good liaison with the infantry units with which it trained and operated. At first little time could be spared for trades training, but upgrading in trade rates helped morale, and it was later possible to send a number of men on workshops courses. It took many months to attain a satisfactory standard of drill and turnout.

It is considered that the primary object was achieved of a unit with good discipline, a high *esprit de corps* and an offensive spirit. With limited time for training, valuable qualifications may have to be dispensed with ; but both a soldier and a unit must have discipline, morale and a will to fight. This unit had them. Possibly, technical training was neglected, but during a year of continuous operations in close contact with the enemy, the company carried out all the engineer tasks it was set.

A British field company formed from recruits and young N.C.Os. would have some big advantages compared to an Indian company. An English boy comes from a mechanical background and a world of movement, his brain is quicker and more developed; he is more imaginative and receptive to new ideas. But an Indian boy is keen and if a lesson is simply put to him he does

not forget it. The secret of training an uneducated Indian recruit is to cut out unnecessary elaborations and reduce a subject to its bare essentials ; once he has grasped the elements, he can absorb more ; as his general experience. grows he is able to learn a new subject more quickly. For example, it was found that a trained sapper after a year in the company could be taught to drive in two or three weeks ; but he was only taught to drive and do simple daily maintenance ; once he had reached that stage and was put in charge of a vehicle he soon widened his knowledge. The company trained for twenty months before it went to war, and during intervals between formation, jungle, and battle training, small individual training courses were run ; courses in trades, weapons, mechanical tools, vehicle maintenance and driving. When the company formed, one sapper could drive a compressor, two could be trusted with a mechanical pump, there were no reserve vehicle drivers. Gradually the nucleus was built around and reserves created, but compared to a British company the reserve of technical knowledge must always have been very small.

Similarly, the standard of knowledge and training in field engineering in a wartime sapper and miner unit was low. The recruits had been put quickly through a comprehensive syllabus in a training battalion, but many men had absorbed very little. It was necessary in our company to select the more important subjects and train and re-train. Many sappers would have failed their T.O.E.Ts. throughout their service in the company ; but the facts had to be accepted that the volume of knowledge was small ; that officers must supervise many small jobs, which in a British or peace-time sapper and miner company could be delegated to N.C.Os. ; and that certain tasks which one had been brought up to consider within the capabilities of every sapper must be left to specialists. As the company grew up so knowledge and experience percolated down.

An officer's responsibilities are thus greater in an Indian unit compared to a British. He has to make certain that the method by which an order is to be carried out is understood; he may have to supervise the execution of his order; he certainly has to check the result. The officer's day is a long one, but since his unit is usually situated in some remote corner of Asia, there are few outside distractions. The Indian Army has overcome many difficulties in this war by the enthusiasm of its officers and the keenness and loyalty of its men.

From June until October, 1942, the company remained under command of the Troops Forming Battalion, but for two periods of three weeks it was away from Bangalore.

The first period was three weeks of jungle training near Shimoga in the Western Ghats. This camp was introduced for forming units by the new Commandant just back from the Malayan campaign; and our company was one of the first to attend and went at the height of the monsoon. The monsoon may have been exceptional that year, but it rained over two inches during every day of the three weeks. The men had not previously been in camp and had had no training in how to look after themselves under difficult conditions. Most of them had not previously seen jungle, nor experienced a heavy monsoon. It generally rained hard early in the morning so that the men were soaked before the start of the day's training, and it invariably rained hard at dusk so that they were soaked before they went to bed. A large river in full spate flowed past the camp and watermanship formed part of the training. Providentially no boat overturned ; had it done so the occupants would almost certainly have been drowned. By the end of the three weeks all had

foot rot. After the camp a few men decided that conditions had been too unpleasant and deserted, but the experience stood the remainder in good stead. Two years later the company was to spend a monsoon operating with a forward brigade in the Arakan. If a man was asked then what he felt about the weather, he usually replied, "It's all right, Sahib, nothing compared to Shimoga." Throughout the life of the company, Shimoga was to remain a landmark of toughness against which any later periods of physical unpleasantness were measured and rejected as inferior.

The second period was outside the normal curriculum. In August, 1942, as the result of activities likely to prejudice the war effort, the leaders of the Indian Congress party were imprisoned. As a result, there were serious disturbances throughout India and it became necessary to call out the army to protect communications. Our company became responsible for protecting about 250 miles of the Bombay-Madras railway line ; they were split up in half platoons, who had to patrol their sectors at irregular times. It was a simple military task and there were only a few minor contacts with trouble makers. However, it was an important step in the company's growth. 'The detachments had some administrative training and independent responsibility. The men realized that they had been given a military task and they responded with great enthusiasm. Detachments organized frequent patrols and most men spent more than half their time on the move. At the end of the three weeks the morale of the unit had greatly increased.

## AN INDIAN DIVISION TRAINING FOR JUNGLE' WARFARE

In October, 1942, our field company joined a division that had been recently formed in the south of India. A Japanese invasion on the Madras coast was considered probable that autumn, and formations that would have had to combat it were new and composed mainly of wartime units. A short term training policy was necessary, as the future rôle of the division was still obscure, but the possibility of having to repel an invasion at short notice insured that no training time was frittered away. Apart from two corps exercises in which the division functioned as a formation, units were split up amongst brigade groups and the divisional engineers had little opportunity of working together.

In March, 1943, it was announced that the division must be fit to operate in jungle country in six months' time. The corps at that time was training in a follow-up rôle and they hoped to be included in an offensive operation against the Japs before the end of the year.

Our brigade group moved into a jungle area near Belgaum and settled down to intensive training. Battle inoculation courses, jungle patrolling, and field firing featured prominently in the programme. At the beginning of May, with the permission of the local forest officer, the company moved into some remote, dense and largely undeveloped jungle. Some useful engineering experience was obtained by cutting a new road through a tract of virgin jungle. The problem of local self-protection of engineer working parties against enemy patrols was studied, "jitter" parties being provided by small parties of officers and N.C.Os. who shot up the working platoons with live ammunition.

Each section was sent out on a four day self-contained patrol in order to attain confidence in jungle lore. They were provided with hard scale rations of tice, salt, tea and sugar, and issued with live ammunition and explosives, and ordered to supplement their rations by living on the country. Several jungle fowl and deer were brought back and presented to the officers' mess, but history does not relate the quantity of fruit and vegetables that was stolen from the patches of cultivation belonging to the inoffensive local inhabitants. The G.O.C. visited the camp and was regaled with a lunch of gun cottoned mahseer, the tongue of a cow bison, roast jungle fowl and jungle fruit salad. Battalion pioneer platoons attended this camp and enjoyed their training.

It was known that heavy casualties were being caused by malaria in Assam and Burma, and standing anti-malarial orders were in force ; but few units realized, until they had been caught out, what rigorous discipline must be enforced in a highly malarial area. As the result of this three weeks' camp, our field company suffered 40 per cent malarial casualties, and in the course of that summer other units in the division were even more badly caught out. The G.O.C. ordered that the mosquito be considered Public Enemy No. 1 even more dangerous than the Jap. Weekly figures of unit casualties were published in Division Routine Orders. A standard punishment of fourteen days R.I. was ordered for any minor anti-malarial offence such as a small hole found in a mosquito net at a snap inspection. Evening anti-malarial parades and inspections became the most important event in the day. When inspecting a unit the G.O.C. and A.D.M.S. would examine mosquito nets ; the latter claimed that he had never failed to find an unmended net in any unit, but by the time he visited our company they had learnt their lesson and he had to search hard ; eventually he got inside a net and, making a sudden stab with a pencil, he triumphantly produced a small hole. This insistence on antimalarial discipline paid good dividends. Later in Burma the division, although in a bad area for many months, suffered the lowest percentage of malarial casualties in Fourteenth Army.

In June our brigade group rejoined the division for a strenuous corps exercise that lasted a fortnight. There were some real engineering tasks, and our field company, with a number of its key personnel still malarial casualties, had a hard time. A further six weeks' camp in scrubby hill jungle, more intensive battle training courses, and another corps exercise occupied the next three months. In September everyone was disappointed to learn that there was no immediate prospect of an operational rôle. Our field company passed through a difficult period at this time. Battle training and toughening had created a spirit of recklessness ; mentally and physically the unit was ready for war and when they did not go there was a reaction. A sudden increase in V.D. and a number of courts martial were the unfortunate results.

The threat of invasion of the Madras peninsula had now decreased and in October the division was able to move into the Malabar jungle for a further three months of intensive training. All ranks lived under active service conditions in huts that they had built from jungle materials. Once a week there were alert periods of twenty-four hours, in which units and brigades sent out fighting patrols to test the defences of their neighbours. When operating in the jungle, close to the enemy, silence is very necessary if one wishes to avoid attention. This is not an easy trait to cultivate in an Indian unit ; V.C.Os. and N.C.Os. are apt to shout at their men, whilst Indian troops in the early morning are prone to indulge in discordant throaty noises. It was necessary to rule that noise was a crime, and that in no circumstances were orders to be shouted but always given at close range in a low voice. After considerable effort, a very satisfactory standard of elimination of noise was achieved and subsequently maintained in active operations. Each brigade group was exercised in the advance to contact, and the training culminated in a divisional exercise that lasted for three weeks. The necessity for strict traffic control on the narrow jungle roads, both in a forward area and on the single L. of C., became obvious ; and it was realized that units would have to operate largely on a man pack basis with a very limited scale of M.T. Field companies in particular realized that they must and could dispense with much of their

heavy equipment. The experience gained in operating on a light scale with a minimum of transport was to prove of great value in Burma. This period provided the much needed opportunity for the units of the divisional engineers to train together and get to know one another.

Three new jemadars with operational experience had joined the company during the previous six months. Signal personnel and equipment had arrived in good time to form an efficient signal section trained in operating under jungle conditions. A number of promising young N.C.Os. and good tradesmen had been posted from the training division or the depot to replace weaker elements.

The standard of M.T. driving and maintenance had been deplorable in the early days of the company. Slowly, road and mechanical sense was acquired and as the numbers of drivers was increased it was possible to weed out those below average. Weaknesses were overcome in the training days, and on operations the unit M.T. was surprisingly free from trouble.

At the end of January, 1944, the division left the jungle to re-equip and unit commanders were informed that it would shortly move to the Arakan.

In March, the company moved by sea, with its brigade group, to Chittagong, and on arrival learnt that the remainder of the division was already in action. Having connected with their M.T., they moved south down the long Arakan road towards Maungdaw. Morale was excellent throughout the company and not a man had absented himself during the move from southern India. The long weary months of training were over and at last they were to see active operations.

#### PART II-OPERATIONS

## SITUATION IN THE ARAKAN IN MARCH, 1944

When our division moved into the Arakan in March, 1944, the Japanese had just sustained their first defeat in the Burma campaign. A Jap divisional task force, that had surrounded and attempted to destroy the administrative area of 7th Indian Division in the Ngakyedauk Pass, had, after heavy fighting, been largely destroyed itself. Meanwhile the Japanese offensive in Manipur had started to develop and it was necessary for two divisions to be flown from the Arakan to Imphal to reinforce 4th Corps. It had been decided, therefore, in view of the nearness of the monsoon, to limit operations in the Arakan to the recapture of Maungdaw and of the Maungdaw-Buthidaung " Tunnels " road. The outgoing divisions had been set the task of recapturing the Tunnels road before they withdrew. The rôle of our division was to consolidate and hold the Maungdaw Tunnels road area until after the monsoon when the offensive could be resumed. The task fell into three distinct phases. The first or pre-monsoon phase in April and May was that of holding an extensive position in hilly jungle country against a determined enemy, who, it was anticipated, would make a strong effort to recapture the key Tunnels road before the start of the monsoon, and who was in a position to attain local superiority against any particular point. The second phase was to hold an area slightly less extensive, but with very inferior communications, throughout four months of heavy monsoon against three enemies-rain, disease and the Jap. The third or post monsoon phase was to expand the perimeter to cover a build-up and dominate the country beyond, in preparation for an offensive as soon as the ground became dry enough for it to be maintained.



## Consolidating the Maungdaw Tunnels Area

Our company was placed under command of the brigade responsible for holding the hill section of the Maungdaw Tunnels road. The position had to be taken over gradually as the enemy were still holding several key features when the brigade started to move in. Hill 551, a knife-edged cliff that dominated the eastern section of the Tunnels road and formed the south-east bastion of the position, was tenaciously held by the enemy, and was the scene of heavy fighting before it was captured and handed over to our brigade early in May.

The brigade took over an area previously held by five battalions and was therefore fully extended. Our field company was made responsible for the defence of brigade H.Q. and soon became acquainted with the nocturnal activities of Iap "jitter" parties.

Many units on first experiencing the discipline testing ordeal of holding a position in thick jungle against Jap nuisance patrols have yielded to instinct and let off a box fusillade. One battalion expended 40,000 rounds in a night and were unable to produce a single Jap body the following morning to exonerate themselves. Our field company did not succumb to this temptation. Picquets fired odd shots and threw a few grenades, but never lost control of themselves. The strain on a field company of working hard all day and mounting perimeter picquets at night is a heavy one. On account of the density of the country nine section picquets had to be maintained at night. Double sentries were mounted, but in the event of an alarm the whole picquet of seven men would have to stand to for a part of the night. During the first three months, platoons had an average of one off day in three weeks, but they chose to employ these in developing their section posts rather than in resting.

Much work was required in the development of hill tracks to forward infantry posts and it frequently involved a long climb to the working site. Our company neither expected nor received infantry local protection for their working parties, who soon had practical experience in protecting themselves against Jap nuisance patrols. Each section worked in a group with two lookout men, and each sapper kept his loaded weapon and a pair of grenades close at hand. Every morning the battalions opened their sections of the road by catrier patrol, and a detachment of a lance-naik and a sapper accompanied each patrol, detecting, and removing road mines placed overnight by Jap patrols. It was the end of the dry season and shortage of water was a constant problem. To maintain one battalion at the top of the Mayu range a water point was developed from a trickle in a gorge 800 ft. below the summit. It was carefully constructed to collect every drop of the total yield of 2,000 gallons a day, and without it the battalion could not have been maintained. Another water point had previously been used by the Japs, who were now able to observe our water trucks approaching it and harass it with artillery and mortar fire. They succeeded in knocking out the point on several occasions. The weather was hot and windless and the air heavy and dusty, it smelt from dead Japs and the unhygienic sanitation of our predecessors. Flies were legion. One felt the shortage of water, particularly the want of a good wash.

Our brigade became responsible for holding Hill 551 early in May, but by a ruse the Japs had succeeded in recapturing the top of the hill and held it for another month. Our troops held exposed positions on our part of the hill and our company developed mule tracks for their maintenance. It was an unpleasant task, as they had to work on a bare skyline in view of the enemy and were sniped by mortars and small arms. They constructed a jeep track to the foot of the hill, which included bridging a chaung. The enemy on Hill 551 had observation on this bridge, and the sappers were shelled daily at this work and were thankful to see the job completed. They also constructed an aerial ropeway from near this bridge to the top of the cliff. It proved a troublesome task, but the brigade commander was very keen, expecting it to solve the maintenance problem. To the disappointment of the sappers, the battalion made very little use of it. Towards the end of May the Japs, as had been expected, made an attempt to recapture Hill 551. One night they overran part of the position, but this contingency had been foreseen and the battalion had had orders that, in the event of this happening, they were to put in an immediate counter-attack. The counter-attack went in and the position was restored. Pressure on this sector continued until the end of the month, but with the start of heavy rain in early June, the Japs withdrew from their forward positions around Hill 551 and on the spine of the Mayu range. Phase I of the divisional task was accomplished, but the fight against the monsoon was about to begin.

Our young field company had had a rude baptism to operations. They had moved from training in the south of India straight into battle and for over two months had lived and worked under fire. They had suffered casualties, but their morale had remained good. They had been grossly overworked and had had many disturbed nights with loss of sleep, but they had remained keen and cheerful. There had been no malingering and the sickness rate had been very low. Subadar Ramokrishman remarked, "The men know now what war is, and they like it !"

## MONSOON

Throughout the 1944 monsoon, our field company remained with its brigade deployed astride the Mayu hills securing the Tunnels road. At the start of the heavy rain the remainder of the division had withdrawn to concentrated localities on the Maungdaw plain, where basha accommodation had been erected with the help of civilian labour. The division was dependent on a water line of communications to the rear, where the other two divisions remaining in the Arakan had been withdrawn to rest.

Monsoon accommodation in the Tunnels area was erected by the troops in their defensive positions. Tarpaulins were available as roofing material and there were a limited number of trench shelters and sandbags, but all other material was from the jungle. Sub-unit shelters had to be tactically sited with a view to protection and concealment, and in the first place many were constructed on the slopes of steep hills. It was not realized how liable to landslide the shale subsoil of the Mayu hills would become when saturated with water ; and in the early weeks of the monsoon our troops experienced the mortification of seeing many carefully constructed shelters and also large sections of hill track disappear down the khudside, buried under a mass of earth and jungle. Ideas on revetment, learned on the field works ground, proved totally inadequate when subjected to the test of an Arakan monsoon that averaged 2 in. of rain a day for over three months. As the commitments of our company in the Hill 551 area eased off at the end of May, they were able to concentrate their efforts on the construction of monsoon accommodation for brigade installations, such as mule stables and a field hospital. The company's own area was a particularly difficult one in which to erect huts, as it was on the reverse slopes of two steep hills, large chunks of which periodically subsided throughout the monsoon.

A great deal of thought and energy was devoted to the revetment and surfacing of hill tracks. Even on a steep hillside, a track rapidly becomes a

quagmire of mud beneath the hooves of a train of mules; but it was vital that these tracks be kept open, otherwise the forward picquets would not have been maintained and could not have remained deployed. Stone for surfacing these tracks had to be laboriously carried up from the chaungs by mule or porter.

The most serious problem of the monsoon period, however, was neither accommodation nor hill tracks, but the only L. of C., the Tunnels road, of which our company was responsible for the forward sector approximately eight miles in length. Transport was reduced to a minimum, battalions being permitted to maintain only six light vehicles in the brigade area, and one-way traffic was strictly enforced by the provost. The road had little soling, and what little metal there was consisted of the soft, shaley rock from the Mayu hills, which when wet rapidly disintegrated under traffic. Deposits of loose stone were available in the chaung beds, and it was possible, by angledozing and metalling ramps from the road down to the chaungs, to collect sufficient stone to remetal portions of the road. All stone had to be broken by hand. In many cases the road ran through cuttings between shale strata, so that the water oozed up from springs in the middle of the road, and even during sunny breaks the surface never dried out ; some sectors of the road had to be remetalled four times in three months. The original side drains had long since ceased to exist and had to be redug. Cross culverts had become blocked, and a large number of new ones had to be constructed ; some of them got washed out in exceptionally heavy rain and had to be rebuilt. Two angledozers were normally at work clearing the frequent landslides, although sometimes the ground was so wet that it was impossible for them to work. Forty-five gallon petrol drums filled with earth were found to be the only practicable form of revetment. A force of several hundred infantry and pioneer labour daily augmented the field company resources. By unremitting manual effort the road was kept open throughout the monsoon.

During the monsoon months the Jap remained passive, but contact with him was maintained by deep patrols which sometimes included sapper detachments. It was discovered which features were held by the enemy and the country in between was gradually dominated by our patrols.

The constant fight against disease continued. Strict discipline kept down casualties from malaria and dysentery, but, as general health deteriorated, there was a marked increase in jaundice, whilst abrasions and cuts nearly always turned septic. As the result of constant living in wet clothes, ringworm, dhobies itch and foot rot became increasingly prevalent, and by the end of the monsoon more than 80 per cent of the brigade were suffering from one or more of these complaints.

It was a trying period, but young Indian troops were probably the best suited to the conditions. An increase in leave vacancies and a generous rum ration kept up morale. The company quartermaster-havildar was a rogue, but on excellent terms with the jemadar in the supply point, and he obtained gallons of baksheesh rum every week and a daily issue was possible. The sappers realized that the prospects of post-monsoon offensive operations were dependent on the upkeep of existing communications and they continued to work cheerfully.

## A MONSOON ATTACK

The first moves outward from the Maungdaw area were made early in September, before the end of the monsoon, with the object of surprising the enemy before he had strengthened his forward positions. These included a southward jump down the Mayu range to capture Hill 1433 and a subsidiary feature, that dominated some broken country through which the enemy might thrust across the Tunnels road and also provided excellent observation over the Maungdaw plain. An attempt to capture these features had been made by a battalion in April, with our company in support, but had been unsuccessful. The main Mayu ridge is a series of small, steep peaks connected by a narrow, knife-edged ridge and falls away steeply on both sides. Previous attempts to capture the Jap positions had been by frontal attacks along the crest, supported by artillery concentrations. The ridge was so narrow that less than one section could be deployed as the spearhead of an attack ; and guns firing from the flank were unable to reduce the Jap bunkers dug into the narrow ridge ; rounds a few yards short or over burst harmlessly well down the steep slopes. Neither had air support been able to reduce the positions. An initial night attack had jumped the first position, but all subsequent attacks had been held.

The Gurkha battalion now chosen for the task, planned to capture the two positions simultaneously by a silent dawn attack up the eastern slopes coinciding with a frontal attack. To avoid prejudicing surprise, no preliminary artillery registration was permitted, and reconnaissances, to select a forward base to the flank, approach routes from there to the forming up areas, and the lines of assault, were cautiously carried out by officer two-man patrols. A sapper assault section was placed under command of each of the attacking companies and they, on a man pack scale which included three days' lightscale rations and demolition charges, moved out to the forward base with their infantry companies, two days before the time of assault. No preliminary development of tracks forward of our normal positions had been permitted, but our company, with another field company in support, had concentrated as far forward as possible, on a man pack basis, to commence track development as soon as the attack started.

The Japs must have heard the assaulting troops as they scrambled up the steep jungle covered slopes in the dark ; at any rate they were on the alert. Although the Gurkhas attacked with determination and broke into both positions, they were driven out again with heavy casualties, but reformed in positions about 70 yds. from the enemy. A havildar, commanding the sapper section with the company attacking Hill 1433, had with one sapper accompanied the leading Gurkha platoon that got into the Jap position, and they were amongst the few who did not become casualties. That evening he was ordered to attempt to re-enter the position to reconnoitre whether any of the Jap defences were suitable for demolition. Together with a naik and a sapper carrying made-up charges, he worked his way through the undergrowth into the enemy position. Having pinpointed some Jap occupied posts, they crawled round to a basha a few yards behind. Covered by the tommy guns of the other two, the naik forced an entry into the basha through a fireplace in the rear, and discovered a considerable quantity of machine gun ammunition, grenades and a stock of rations. Having placed his charge in the centre and piled the ammunition, grenades and other movable articles around it, he lit the fuse and withdrew. As the sappers moved away from the basha they were detected and fired upon, but a moment later the demolition went off and they got away. After a few minutes they crawled forward again and had the satisfaction of seeing that the demolition had been completely successful. Our troops, short of ammunition, food and water, spent a disturbed night in which the Japs adopted " jitter " tactics, moving round their position and harassing them with grenade and small arms fire. Early the following morning the havildar and a sapper again entered the Jap position

and saw a dugout and another basha in the centre. Having sent back for more explosives, they crawled forward to the dugout, which they found unoccupied but containing a stack of medical and other stores. They prepared a charge in it, after which the sapper, covered by the havildar with his tommy gun, crept forward with another charge around the base of the two bunkers, and into the basha which contained more ammunition. He placed and lighted the charge, and although he was detected during his withdrawal, the pair stopped to light the other charge and then got safely away, in spite of grenades being thrown at them. These two demolitions were also successful. That evening the Gurkhas were relieved by another company and the sapper section withdrew with them ; before departing the havildar had requested permission to try his luck again inside the Jap position, but was refused. An I.D.S.M. and two M.Ms. were awarded to the sapper section for their determined enterprise.

The initial attacks having been unsuccessful, the Gurkhas were ordered to hold on as close as possible to the two positions and to continue to harass the Japs until they abandoned them. It was thought that this might take two weeks, and since the weather was some of the wettest of the whole monsoon, the troops on the ground had a hard task ahead of them. The two field companies worked all out for three days cutting tracks to the forward infantry positions, along which casualties could be evacuated and ammunition and supplies carried forward. Despite their efforts, it was nearly three days before the casualties from the furthest company could be got back to battalion headquarters, and even then another half day of rough mule track separated them from roadhead. The sappers cut and dug all day, and at night concentrated into company boxes at the side of the track, where they, in common with the infantry, spent cold and disturbed nights. A ground sheet and jersey were the only extra clothing which they carried, and provided little protection during the wet nights, particularly as weapon pits rapidly filled with water. Only by burning guncotton were they able to start fires in the morning to make tea. By the end of the third day the sappers were temporarily worn out, but porter tracks were through, and the following day they were able to take things more easily. By that time it was possible to get forward some blankets and field service rations, and life became less rigorous. Two days later the infantry, on putting in their morning reconnaissance attack, found that the Japs had made a get-away during the night. That morning the sappers had started work on a new track to the flank and there were at first none available to develop a track along the ridge to the captured positions ; but as each section got the news that the positions had been captured, they left their other work and, climbing up to the ridge, concentrated on their own initiative where the new track was now required. By evening a porter track was through and the captured positions strongly held by fresh troops. During the next few days the track along the ridge was improved and although the Japs kept up harassing artillery fire for several days they made no serious effort to recapture their lost positions.

The company was in fine fettle after this operation. Two young lance-naiks were found examining one of the positions on the afternoon after it had been captured. It was not a pleasant spot, as a number of decomposing corpses still littered the hilltop. However, they explained their presence by stating that they had wanted to have a close look at the Jap strongpoint, as they hoped to be included in an assault party next time the company took part in an attack.

#### BY WATER TO AKYAB

The corps offensive in the Arakan opened in the middle of December with a two divisional advance to clear the Mayu peninsula prior to the capture of Akyab. Our division was to occupy the Mayu peninsula and a West African division was to capture Buthidaung, cross the Kalapanzin river and turn south. Meanwhile another West African division, many miles to the east, was advancing down the Kaladan river. An attempt to clear the Mayu peninsula, two years before, had failed owing to the vulnerability of lengthy land communications ; but this time, with the help of air supply, land communications could be dispensed with. One brigade of our division was to advance down the sea coast, maintained by Dukws and landing craft, whilst our brigade was to move down the Kalapanzin river on a water transport basis. The Jap positions along the Mayu range were to be left isolated between the two brigades.

Our brigade had been withdrawn from the Tunnels area several weeks beforehand to re-equip, assemble its craft and train in watermanship on the Naf river near Maungdaw. The collection of a satisfactory flect presented many problems. There was only sufficient folding boat equipment to float one troop of 25-pounder guns and to provide the landing stages to offload them. There were a few boats with inboard motors to provide a mobile reserve. Some country made pontoon, rafts were allocated as floating dressing stations and casualty clearing wards, a floating I.E.M.E. workshop, and for the carriage of mountain guns. Unit transport consisted of sampans and assault boats, a percentage of which were provided with outboard motors. The Kalapanzin river was approximately two hundred yards across at Buthidaung, with a tide of several knots, and widened to over 2 miles near its mouth. It was accepted that, in general, craft could only move with the tide, that unit equipment would have to be severely curtailed, and that the majority of personnel would advance on foot, being ferried across the main stream or side chaungs where necessary. Our field company had a busy month assembling and servicing the assortment of craft and instructing other arms in watermanship. The field park company did much good work constructing superstructure, anchors and other equipment. Over three-quarters of our company equipment was dumped, and everything retained was capable of being transported by mule, or even man pack if necessary. Personal kit was carefully thought out and spare clothing reduced to one pair of shorts, socks, canvas shoes and jersey per man. One modified mosquito net and two blankets were carried per three men. Vehicles were dumped and the M.T. staff became watermen.

The offensive was to open with the advance from the Tunnels area and capture of Buthidaung by the West African division, whilst our brigade was to advance on a man pack basis to a point on the Kalapanzin river 10 miles downstream. On the occupation of Buthidaung our company, with another field company in support, was to develop launching sites for the fleet. Several hundred lorries were required to transport the craft from the Naf river 20 miles away, and it was accepted that the move and assembly of the fleet would take several days. Having completed its task at Buthidaung, our company was to move downstream and come under command of the brigade for the resumption of the advance.

Our company concentrated near Hill 551 on "D-3" day to allow for a short rest, time for briefing and for refreshing mine detector detachments, as it was known that the Japs had mined the Buthidaung area. The West Africans reached the north end of Buthidaung on the morning of 15th

December, but did not occupy the southern sector which contained our proposed launching sites. Our company therefore searched the remainder of the town and cleared the tracks of mines, but were unable to start work on the river bank until a Jap strongpoint was destroyed by Shermans late that evening. It was two years since Buthidaung had been inhabited by a civilian population and the jungle had reclaimed its own. Streets had become narrow footpaths through elephant grass and lantana, and gardens and the river bank were a mass of entangled undergrowth 15 ft. high, beneath which were hidden the remains of demolished buildings and vehicles. In three days, by the combined efforts of the two field companies with two angledozers, half a mile of river bank was cleared to a depth of 50 yds., seven slipways were cut through the high bank so that boats could be launched at any state of the tide, and traffic circuits and parking areas were opened up in the rear.

Meanwhile boat convoys loaded under the supervision of the field park company, began to roll in, and offloading and assembly of rafts had started by the evening after the town was occupied. The boats had suffered during their move over the Tunnels road, and a number of sampans were too badly damaged to be repaired; much caulking and carpentry was required to make others seaworthy. Gradually the fleet was launched and dispatched on the downtide to join the brigade, which was anxiously awaiting its arrival.

On the third day the gunner troop departed, accompanied by a sapper platoon, with F.B.E. landing bay units, who remained with them throughout the operation and assisted them to get their guns on shore where required. One week after they had entered Buthidaung, the rest of the company, their task completed, embarked on their rafts and boats and headed south. Most units were put to a lot of unnecessary work through their inadequate watermanship. Many craft, through not making an early start, failed to reach their destination before the turn of the tide, and spent a night out. Crews failed to realize that a raft or sampan made fast on a tight mooring at high or low water is liable to get its gunwale pulled under as the water level alters. Boats and rafts also sank from overloading. Our company spent a good deal of time salvaging and repairing sunken craft.

Christmas and Boxing Days were spent in ferrying infantry and a mountain battery across the main river. The latter task lasted all through the night. An approach track on one bank had to be cut through dense sea holly, and at low tide a causeway had to be constructed over soft mud in which a mule was liable to be permanently lost. Six mules were ferried at a time and the whole battery was got across, although by the end more than one raft was unserviceable and had to be abandoned.

Throughout this operation, as on numerous other occasions, the company wireless section proved itself invaluable. Normally two, and sometimes all three, platoons were detached on tasks many miles away from headquarters, and without good wireless communications it would have been quite impossible for the company commander to have maintained control, or to have moved platoons from one task to another. In undeveloped country with restricted movement, the efficiency of a field company is doubled by good wireless communications.

Air supply provided excellent rations, including fresh meat and vegetables, and on Christmas Day, roast turkey and mince-pies for British troops. It was found necessary to arrange air drops as far forward as possible, so that units could collect their supplies as they advanced past dropping areas. Otherwise units, in having to send back for supplies, were either delayed or went short. The weather was delightful; cold nights in which one wished that blankets were less scarce, and misty mornings with heavy dew, giving way to clear sunny days. A long range of jungle covered hills lay on either flank; whilst the river flowed between fields of tall ripe paddy, which delighted the hearts of the sappers, after months of living in thick jungle.

After a slowish start the brigade moved fast, and although the Japs tried to stand in places, they were evidently upset by the speed and direction of the advance and a number of prisoners were captured. Movement was often at night to suit the tide. The company continued to be fully occupied, repairing jetties, ferrying mules and men, and salvaging and repairing boats and rafts. On 3rd January one of our platoons, with the leading battalion, reached the north end of Akyab island, some 50 miles by water from Buthidaung. On that day another brigade, having advanced from Maungdaw along the coast, crossed from Foul Point and occupied Akyab. The division, untrained in combined operations, had been ordered to do this at very short notice to free another division for a future task. The operation was successful and the Japs abandoned Akyab without offering any resistance.

It took several days for our brigade to concentrate on the north of Akyab island, and our company was hard at work at its usual tasks of ferrying and jetty construction. A sudden storm and two days' heavy rain prevented movement on the main river and made everybody cold and wet. Three company sampans containing wireless sets were sunk ; but the sets were quickly salvaged and dried out, and remained serviceable. Although there were roads on the island, the company had no M.T. and for some days continued to move about by water. Later a few vehicles were recovered from other divisional units, who had been loaned them from the company dump for the move from Maungdaw to Foul Point. So ended an unusual and very interesting operation, one in which small detachments had had to make full use of their initiative in tackling unexpected situations. The company watermen had done great work, but few of them were sorry to return to their motor vehicles.

#### AMPHIBIOUS OPERATIONS

After the occupation of Akyab, our company was employed in the development of airstrips and water points until, in the middle of the month, these tasks were taken over by an army field company. Two badly mauled Jap divisions were withdrawing down the Arakan coast, and our own division was engaged in a series of amphibious operations to establish blocks across their retreat.

At the end of January our company was moved by sea down the coast to Myebon, where a landing had been made by another brigade against stiff opposition. There the company spent a busy fortnight on divisional engineer tasks. A Dakota landing strip was constructed, a large water point was established from which water containers were sent forward by landing craft to Kangaw, where a brigade was fighting a hard battle to consolidate a beachhead against fierce Jap opposition, a jetty was built so that ships drawing 9 ft. could discharge, tracks and bridges were repaired and developed, a main dressing station was constructed, and beaches were cleared of mines. Infantry working parties were provided to assist in these varied tasks. In addition, experiments were carried out in the construction of mud tracks capable of carrying vehicles across the soft black mud, which was a constant obstacle all down the Arakan coast. As at Akyab, the company was handicapped by the lack of transport, very few vehicles having been brought forward on account of shortage of landing craft.

Early on 15th February our company embarked with its brigade to take part in an assault landing near Ruywa farther down the coast. A heavy thunderstorm during the night soaked men and equipment before they embarked, but the company remained cheerful at the prospect of again getting to close grips with the Jap. The first flight, consisting of a British battalion and a sapper platoon, touched down on the assault beaches at 1030 hrs. on 16th February. It was known that the beaches were flat and muddy, and overgrown with thick mangrove and sea holly. As each L.C.A. touched down, a detachment of sappers leapt ashore and cut a way through the natural obstacle of thick, prickly bush for the assaulting infantry to pass through. Hessian, chicken wire and light bridging track had been preloaded in the L.C.As., and with these the sappers constructed a foot-track to High Water Level, 300 yds. away. One beach proved impossible to develop and had to be abandoned, and work was concentrated on the other. The remainder of the company, with two angledozers and other engineer equipment, arrived in L.C.Ms. later in the day and all set to work developing foot-track exits from the beach and constructing a ramp for " alligators." It was clear that it would be impossible to construct satisfactory vehicle tracks over the flat, muddy beach, and next day reconnaissance was carried out of another beach at Ruvwa. Meanwhile foot-track development continued and a 600-yds, jeep exit, mostly of log corduroy was constructed. Water was in very short supply and one platoon was employed for two days digging holes from which a few thousand gallons were collected. The angledozers were useless in the soft mud and it took a whole day to move one, from bridging track to bridging track, to firm ground. Although the Navy stated that the alternative beach at Ruywa would only be usable for two hours at high water, the brigade commander agreed that it must be developed for the offloading of guns and vehicles. Meanwhile, " alligators " and mules landing at the existing beach seriously damaged the light roadways and made their maintenance still more difficult. The enemy had started to shell the beachhead throughout the day. As soon as a landing craft arrived the Jap guns opened up on the beach and exits tracks. For once, the soft mud was of assistance, as it reduced the effectiveness of the Jap shelling, which did little damage to the sappers. The pioneers, whose job it was to offload the landing craft, were less fortunate and suffered considerable casualties. The bulldozers, having with much labour been got to dry land, were useful in the construction of a light airstrip for casualty evacuation. One platoon moved to the Ruywa beach on 19th February and the remainder of the company two days later. A hard ramp was built on which the guns were offloaded, another airstrip constructed and a satisfactory water point developed to relieve the water shortage. After one week of intensive work, it was now possible to give each platoon a light day for much needed rest and maintenance. Development of the beach and the road inland continued and on 26th February medium guns and Sherman tanks landed and successfully passed over the corduroy exit road. Difficulties were experienced in the development of the road inland, as the ground was rocky and damaged the blades of both angledozers. For another week the company, with two other sapper platoons under command, worked on the vehicle track inland and mule tracks to infantry positions on the surrounding hills. As usual the company was handicapped by the lack of transport, the few vehicles that had been permitted forward proving quite inadequate for the engineer tasks.

Another brigade had passed through Ruywa and were driving the Japs southwards. On 4th March, after a day's maintenance, our company marched to the Me Chaung and took up a position to cover the development of a

crossing point overlooked by a nearby Jap held ridge. On arrival the company worked through the night assisting in the repair of approaches to a ford, urgently required for the passage of brigade transport. The following day work continued on the surfacing of ford approaches with army track and commenced on the construction of a Class 5 raft, of 45-gallon petrol drums and Jap superstructure, to ferry the field guns. The landing stages were constructed of salvaged Jap pontoons and F.B.E. superstructure, and the approaches dozed and surfaced. The petrol drum raft proved very satisfactory and a similar smaller one was constructed to ferry stores. Later, a Class 12 raft was built of F.B.E. and Jap pontoons, and "alligator" ramps constructed. Although the Japs did little to interfere with work by day, they attempted infiltration tactics by night, and on two occasions established themselves between the company position and that of another unit, but did not succeed in breaking through the covering picquets. After a short exchange of machine gun and grenade fire they were driven off. On 12th March the company handed over its responsibilities at the Mc Chaung and returned to Ruywa, embarking for Akyab two days later.

#### CONCLUSION

During March, a West African division took over responsibility for mopping up the Jap remnants and our division concentrated at Akyab, prior to returning to India, to train in an assault rôle for the forthcoming campaign in Malaya. The G.O.C. inspected all units and congratulated our company on an excellent parade, stating that in drill, bearing and turnout it was the best in the brigade group.

At the end of March, after exactly one year's continuous operations in close contact with the Jap, our company embarked for India. Although they did not know it, they had finished their operational service, as the war was over before they again made contact with the Jap. After four months of leave, re-equipping and training in combined operations, the division were in the process of embarkation when the Japanese Government surrendered. They entered Malaya over the beaches that had been selected for the assault and occupied the northern states, disarming the Jap garrison. After six months of garrison duties and rehabilitation tasks the division broke up and returned to India.

Footnote.—This article was written over three years ago, before the new Dominion of India came into being. The field company remained in Malaya for two more years as an army unit; it was one of the last India Army units to return home from overseas, and one of the last wartime Indian units to be disbanded.

#### "REMPANG"

#### By MAJOR J. H. GILLINGTON, O.B.E., M.C., R.E.

This is the story of the settlement of Japanese Surrendered Personnel in Rhio Islands, from the Engineer aspect only. The many other and varied activities that went on are only mentioned in so far as they are required to explain the Engineer story.

#### INTRODUCTION

ONE of the major problems to confront the Allied Command, South-East Asia, after the Japanese capitulation in August, 1945, was the maintenance and accommodation of some hundreds of thousands of Japanese Surrendered Personnel pending their repatriation to Japan.

It has been laid down that the principle of repatriation should be based on the use of Japanese shipping only, and on the assumption that the available Jap ships could remain afloat and mobile for so long, it was estimated that it would take at least three years to complete this task.

As most of the countries in south-east Asia were overcrowded and starving, it was considered uneconomic as well as unfair to superimpose vast numbers of Japanese surrendered personnel on top of the existing populations.

As a consequence it was decided to select for this purpose some of the more or less uninhabited islands in the area, and after considerable searching of the map and some preliminary reconnaissance, the choice fell upon some of the Dutch islands composing the Rhio archipelago. The Dutch Government did not agree to those originally chosen, on the grounds that they were too good for Japs, but eventually agreement was reached and the islands of Rempang and Galang were selected.

These islands, fifty miles south of Singapore (Lat. 0° 40' N.), had been cleared and planted with gambier over one hundred years ago. When the industry failed, they were almost abandoned, and, except for one small and indifferent rubber estate on Galang, they reverted to secondary jungle. Considerable soil erosion had taken place and there was seldom more than a few inches of topsoil to be found.

Rempang was about thirteen miles long and eight miles across at its widest point, with an area of about 36,000 acres. It narrowed to about one and a half miles in the centre, where an impenetrable mangrove swamp ran right across it and for all practical purposes it had to be treated as two separate islands ; north and south Rempang. To the south of it, across a strait varying from a quarter of a mile to a mile across, was Galang. This island was about eight miles by seven miles with an area of about 19,000 acres. There were various small islands in the straits and round the coast.

The coastline was very irregular and, except in the straits between the islands, entirely surrounded by coral. This extended varying distances from 20 yds. to 200 yds. out to sea and either dried out or was a few feet deep at low water. The tide range was about 10 ft. and it ran in the narrows at 4-5 knots. There were a few poor beaches and the coast was almost equally composed of wooded hills rising straight from the sea, and, where streams ran out or the ground was flat, thick belts of mangroves.

Inland the country was hilly and irregular rising to about 450 ft., with no rivers but many small streams. It was covered with thick secondary jungle with many small trees and a few large ones. Except for a few miles of derelict track through the rubber estate there were no roads and few jungle paths.

#### THE BEGINNING

By the Laws of War, surrendered personnel differ from prisoners of war in that they retain their unit identity and are responsible to the Victorious Power through their own H.Q. for looking after themselves. A Japanese advance party was therefore landed on Rempang in October, 1945, and told to prepare to receive the main body. Rations were dumped for them but, unfortunately, not in the same place ; the first task of the advance party rather a hungry one—was tracking down the dump. The main body started arriving in November and their disembarkation was supervised by a British staff of one naval officer and one army officer stationed there in a L.S.T. It soon became evident that the Japs could not look after themselves unaided, or, in the early stages anyway, live on the country, so the British Liaison Staff, Rempang, was formed in January, 1946, to supervise and assist them.

This staff consisted of A.Q.M.G. (whose duties were almost equally divided between G. and R.E. !), D.A.Q.M.G., D.A.D.M.S., and D.A.D.S.T., with an establishment of transport of four harbour launches and four chargers. There were four clerks, four wireless operators and six boats crews—all British other ranks. Later, when shipping activity became intense, two Staff Captains (one "in," one "out") were added to handle the traffic ; a Staff Captain (Medical) came to sort out the Jap medical stores, and, owing to shortage of British man power, the boats crews were replaced from the Japanese Navy. The staff assembled during January and installed itself, electric light, refrigerators and plumbing into the only buildings in the islands, which were the abandoned bungalow and godown of the rubber planter, meanwhile getting down to making a plan.

#### THE PLAN

The Liaison Staff's brief was :

- (a) To receive by mid 1946 and accommodate, for up to three years, 300,000 Japanese surrendered personnel.
- (b) To make these personnel self-supporting as fully as possible and as early as possible.

The full scheme, as will be seen, did not come off, but the plan was made and for the first four months carried out on this brief.

The major problems were, in order of importance, water, food, hospital accommodation, communications, storage and living accommodation. Of these, by far the greatest problem was water.

The original reconnaissance party had reported " ample water for 300,000 men." On what grounds this report was based was never discovered. It was fairly certain that if there was a dry season the streams would dry up and it was already known that the water level in wells sank rapidly after a few days without rain. Meteorological information was urgently requested from all and sundry with most unsatisfactory results. The Resident of Rhio thought that there was a four months' dry season but didn't know when ; a book in Raffles Library in Singapore offered drought from April to July, and nobody else had any ideas at all. The key plan had therefore to be based largely on what was known of the local water supply and had to make provisions for emergency measures.

Food was only a long term problem as there were ample surplus stocks in Singapore to tide over the interim period, and adequate Jap shipping to deliver it. Tapioca was selected as the main crop, as it is very hardy and quick. Fish was to supply the proteins, of which tapioca has almost none, and a large selection of miscellaneous vegetables were added for variety. Accommodation was all of "basha" type made from local materials except for roofing which could not be found locally in sufficient quantities. Eventually all hospitals and godowns were roofed with "bithess," which was in ample supply in Singapore.

In consideration of these and other factors a key plan was evolved giving :

(a) Allocation of areas to formations. This was based largely on what was known of water supply and land suitable for agriculture and was, in outline:

North Rempang-Navy, Andaman-Nicobar Army.

South Rempang—South Malaya Army and miscellaneous details. Galang—Iava and Sumatra Armies.

- (b) Layout of ports, stores and communications. Ports were fixed by the nature of the coast. As most transport was by water, all big depots were automatically situated at ports. Units were mainly up country where the water supply was best and the roads more or less laid themselves out.
- (c) A phased programme of work. The main targets were, for the end of 1946 :--
  - (i) Water storage for 300,000 men for 30 days.
  - (ii) 5,000 acres of land under cultivation, of which two-thirds would be tapioca.
  - (iii) 10 tons of fish per day.
  - (iv) 8,000 beds hospital cover, with full ancillaries.
  - (v) 100 miles of fairweather road (motorable).
  - (vi) Storage for 45 days' supplies and medical stores for 300,000.

(vii) Cover of sorts for 300,000 men at about 20 sq. ft. per man.

The work to be done under every head, month by month, was worked out in detail, increasing steadily each month according to the estimated intake, with its corresponding increase of labour force. From this, estimated stores and tools requirements were produced and in many cases the original plan modified according to known availabilities or shortages, or shipping capacity for stores or the ability of the Japanese workshops to produce tools. Japanese dumps in Singapore were the main source of supply and Japanese coastal craft the only means of moving them. As food was first priority, shipping space for everything else was limited and lower priorities had to be carefully considered.

Eventually a plan was made, with monthly targets for every activity, periodical stock requirements to be reached, phased stores demands placed for such few stores as could be demanded—there was considerable and natural reluctance to issue serviceable British stores to Japanese—and in general with a precise statement of what was to be done. It was fully realized that a lot of sporting guess-work had taken part in making it, but it was felt that as every known factor had been considered the unknown would not be too bad. The great point was that either we did what we intended to do or found the reason for failure.

Very considerable use was made, in planning and in the final issue of the plan, of marked maps. These had two great advantages. Made on tracing paper, they were used as overlays in the planning period to ensure that the phasing of the many different jobs was co-ordinated, and there was no opportunity for misunderstanding with the Japanese when they had a map marked with what they had to do by a certain time. As a point of interest, the only map available during our stay in the islands was the Admiralty chart. A very good 1-in. O.S. map was produced by 1 Fd. Survey Coy. R.I.E. from air photos, showing all the improvements up to April, but was not issued until after the islands had been evacuated.
#### EXECUTION OF THE PLAN

#### Command

The Japanese chain of command was maintained throughout, from Army to platoon level. Orders were given to the Japanese G.H.Q. by the British Liaison Staff, generally verbally and confirmed in writing afterwards. All orders were issued through "G" channels except for S.T. and Med., which had their own service Generals at Jap G.H.Q. and their own service channels.

Although there were various Engineer units there was no Engineer representative at Jap G.H.Q. and the situation was only made possible by a Major "G.S." on G.H.Q. staff who had had engineer training.

It was up to the Japanese to pass on and carry out the orders, but the officers of the Liaison Staff were constantly on tour to see that the work was being done and done properly: quite often it wasn't, and action was then taken by orders issued on the spot, confirmed by a "raspberry" to G.H.Q.

#### Labour

There was almost unlimited unskilled labour, which was not so extremely unskilled. The Jap soldier showed himself ingenious at improvisation and could do wonders in the "stick and string" business. In that climate and on short rations, about six hours a day was about all the useful work one could get out of the average man, but labour was never a limiting factor.

Skilled tradesmen in any trade could be found but never very many. The record probably was when the doctor, bored with surf board riding, wanted water skis : a ski maker was produced within two days.

The availability of labour in the force was roughly :---

- (a) Regimental guards and duties, and sick: 30 per cent or more. Regimental duties, particularly before roads and transport got going, were considerable, consisting mainly of carrying rations. For a unit up country, ration carrying took 30 per cent of the strength for ten days every three weeks. The sickness rate was always high, mainly with malaria and amoebic dysentery, and varied noticeably with the previous stations of units. The former garrisons of the Andaman and Nicobar islands had a sickness rate alone of 30 per cent until they were given special treatment.
- (b) Specialists permanently employed: 30 per cent. These were all gainfully employed in fishing and netmaking, workshops, sawmills, salt manufacture and the like, but except in emergency could not be taken for general work.
- (c) Available for works: 40 per cent maximum. This scems extremely low, but was frequently checked and found to be about correct. It would probably have improved later, but as troops poured in long before the place was ready for them, the overheads were bound to be enormous.

#### Transport

At first, transport within the islands was by sea, in Japanese landing craft which were mostly in poor condition but well handled by men of the 2nd Imperial Guards Division, so roughly treated in Malaya in 1942 that it had been converted into a L. of C. formation, and had never fought again. There were also some steel naval landing craft in better condition. There were never enough craft to go round and our D.A.D.S.T., having been frustrated three times in two days by the Japanese system of letting craft go on an unplanned "first come, first served" basis, kept the allocation under his control.

Later, when the country was opened up a bit, motor transport and pack ponies, ex-Japanese army and all in shocking condition, were brought in. The lorries were tied up with string and went somehow; the ponies, to the



Photo. L-Water Supply !



Photo 2 .- A typical pier

## Rempang 1,2



Photo 3 .-- Normal accommodation and half-cleared jungle



Photo 4 .- Double storey construction

# Rempang 3,4

annoyance of the Japs, were put off the road for two months and even then not used until each one individually had been passed fit by the A.Q.M.G. A number of hand carts were produced and were very useful when the tracks had been widened and improved.

#### Local Resources

Small timber, hard and soft, was available in great variety and unlimited quantity: in fact there was too much of it. Timber over 10 in. diameter only occurred in the more inaccessible parts of the islands. Aged power saws were found in the Singapore dumps and made to work and a certain amount of squared timber and shingles was produced. Palm and bamboo existed, but were both scarce.

Decent stone was non-existent. There was some soft laterite and that was all, and if stone had to be used coral was collected off the reef.

A small amount of clay occurred here and there and was used for bricks and pottery.

#### Water Supply

As already stated, this was the most urgent problem and it is doubtful if it was ever properly solved. As long as it rained nearly every day, which in January and February it did heavily, there was no trouble, but no one knew when it would stop. Immediate action was taken to increase supplies and to form small unit reserves of water. Up country the streams were dammed at every suitable point, storing up probably seven days' rationed supplies for the units located there. Medical opposition to these ponds as mosquito breeding areas was shot down on the grounds that the British had mepacrine and the Japs all had malaria anyway. On the coast, where the streams had disappeared into the mangroves, it was more difficult. Wells were dug to three times the number normally required and every available container, mainly 44 gal. drums, was used for catchment and storage. Medical wrath was again roused by the curious way in which many units dug their reserve wells immediately down hill from their latrines. When ordered to fill them in and dig them again elsewhere, they did so, but never really understood why.

The Japanese attitude towards water supply was so peculiar (see Photo 1 which shows the average stream and the normal use made of it) that the A.Q.M.G. gave a personal reprimand to the Jap C.-in-C. on the idleness of his formation commanders. The C.-in-C. replied that in Japan there were many lovely and beautiful rivers and they weren't used to this water business. On being told that even the more lovely and beautiful rivers of England would not stop him being thirsty in Rempang, he issued an edict starting "By instruction of the British Liaison Staff, it will stop raining on 1st April, 1946." Fortunately, it didn't.

The longest dry spell was ten days and the situation was becoming acute when it was saved by a gigantic thunderstorm and cloudburst, which filled everything up again.

Later, galvanized tanks and piping became available, and also a 4,000 ton dumb barge for bulk storage. The latter was never used, which was just as well as it was a quarter full of petrol when it arrived and no one knew how to de-gas it.

#### Harbour Works

This rather high sounding heading comprises mainly "stick and string" piers. As all outside communication and most internal communication was by sea, piers were of great importance and eventually there were fourteen round the islands. The main harbours were in the strait between the islands which formed an inner anchorage which most coastal craft, bringing stores from Singapore, could use. The most ambitious pier was a pontoon, based on an armoured coastal motor boat and two unserviceable landing craft, connected to the shore with a miscellany of Jap bridging equipment and the usual enormous quantity of string. This could work small ships alongside at all stages of the tide. The next could also take coastal craft provided they did not mind grounding for an hour or so at low water.

All other piers were made of a mixture of hand driven round piles and trestles (Photo 2). The length varied according to the coral, the longest being 140 yds. Piles were usually started by jumping a hole in the edge of the reef at low water, and then driven by relays of men going on and on and on with a section of a tree with four dogs knocked into it as handles. Decking was almost always mangrove, which was the easiest to get. It did not last very long but was easily replaced : there was more than enough of it. All this sounds very primitive, but in fact neither heavy storms nor careless seamanship ever damaged a pier sufficiently to put it out of action. Careful inspection during construction and steady maintenance can keep the most comic looking structure serviceable.

Quite a lot of work was done, mainly by the Jap Navy, establishing and maintaining beacons and buoys as aids to navigation.

#### Roads

Roads were essential to open up the country and to get men on to useful work and away from the appalling job of carrying stores on their backs up jungle tracks.

Owing to the lack of stone no attempt was made to make all-weather roads and no surfacing was done except in a few bad patches. No ruling gradient was given as there were no instruments with which to measure it, but a certain amount of control was exercised by eye. To start with, roads followed the jungle paths, which were originally made by wild pig, and enlarged by Japs plodding along them. It was surprising how often the pig was right as to the best way to go, but sometimes he failed and some abortive work, followed by a fresh survey, took place. The lack of an accurate map made road planning difficult.

The three points insisted on were drainage, maintenance, and traffic discipline. Drainage was fairly easy in the undulating country as there was normally a stream at the bottom of each dip into which drains could discharge and which had to be bridged anyway. Culverts as such were seldom needed. For maintenance, the roads were divided into unit sections, marked by signs on the road so that an inspecting officer could identify a culprit quickly. The main tasks were keeping the drains clean, inspecting bridges and filling in potholes, and after heavy rain the roads swarmed with men working. The last, traffic discipline, consisted of two negatives—not to drive during or immediately after rain, and not to knock the shoulders of the road into the drains.

Bridges were invariably made of "stick and string" construction in round timber. They were meant to be Class 9 and all took a Class 9 load, though in some cases it was difficult to see why. Their main characteristic was light main members with a multiplicity of bracing in every direction.

#### Accommodation

Accommodation was really a minor problem. The only difficulty was getting the right stores into the right place according to priorities, against the rather natural and very subtle opposition of the Japs, who all felt they would like to build their own house first and then go on and build a hospital or whatever it was. Typical accommodation is shown in Photos 3 and 4, the latter being a source of great pride as the only two-storied building in the islands.

Indiscriminate cutting for building was not allowed. Timber was extracted from areas to be cleared according to the general development plan and sometimes had to be moved quite a distance.

#### Agriculture

The finer points of tropical agriculture, such as distinguishing between six-month and nine-month tapicca or which way up to plant sweet potato, will not be dealt with here, although they were found to be most interesting. From the engineering point of view the three matters to be dealt with were jungle clearance, drainage and irrigation, and prevention of soil erosion.

Jungle clearance without power tools or explosives is the most heartbreaking and backbreaking job. Felling and removing trees is easy, but one is then left with bush and tree stumps, both of which have to be removed. If the bush was burned, it left charred stumps on which no grip could be got ; if the stumps were pulled first the bush all round them had to be cleared by hand. Extracting the stumps was a fiendish job. Each one had to have individual attention of a combination of digging, levering and pulling with tackles, and the result, however one did it, made the place look like the scene of a major battle. The whole area then had to be dug over as deep as the soil permitted before agriculture proper could start. In certain areas, in the interests of speed, the bush was burnt and cleared and the stumps left in : even in the short time we were there, this showed itself to be agriculturally unsound.

The only drainage done was to prevent flooding in low-lying areas. All the main crops were sufficiently hardy not to need special irrigation and specialities such as gourds were watered by hand.

The failure to consider soil erosion before starting work on agriculture was probably the biggest mistake made in the islands. The clearing of areas and felling of trees had been planned from the water supply aspect, in that trees on high ground and in certain catchment areas had been preserved, but what had not been taken into account was that in cleared areas, unless positive action was taken to stop it, such little soil as there was would be washed into the streams and away as soon as we started pulling the crops. A Chinese agricultural expert very kindly lent by the Malayan Government for a couple of days burst into tears when he saw the horrors and soon laid down the prevention and the cure. Prevention is by terracing. This was not as easy as it sounded, as most of our crops were on sides of hills with extremely little soil to start with. Little could be done to terrace land already planted, but all further land for agriculture was selected so that terracing was possible. Cure is by sowing ragi or some similar corn, either in belts or intersown to hold the soil together when the root crop is harvested. Unfortunately we were not left long enough to see either the full horrors of our mistakes or the efficacy of our preventive efforts. It was, however, clear that a lot of extra work was caused by not thinking of erosion to start with.

Protection of crops against wild animals was a problem that was never properly tackled owing to shortage of time. Fairly heavy losses were caused, particularly by monkeys and pigs.

A point that must be mentioned as one of great importance, though scarcely an engineer one, was soil fertilization. The two main means used were human manure and vegetable compost. Human manure, widely used in China, was tricky to use in the islands owing to the prevalence of amoebic dysentery. All latrines were, however, designed so that it was easily accessible and the decision as to areas in which it would not be used was left to the doctor. Every unit maintained compost heaps and all vegetable scrap and such animal manure as there was went into them. It was clear from the start that unless something was done the soil would pack up after a few crops, and this was one of the few things approved by our Chinese visitor.

#### Hygiene and Sanitation

A malaria survey of the islands was one of the earliest jobs on the medical side, and the usual frightful forms of anopheles were found all over the place. Orders were issued about keeping streams flowing and cutting undergrowth but, as already stated, these took second place to the water supply instructions and were frequently over-ruled. A special supply of mepacrine was authorized from British sources for the Andaman-Nicobar force on the grounds that a decent working strength for that formation would not be reached unless something was done about it. For the rest, the usual Jap practice of no prevention and quinine as a cure went on quite happily.

The problem of an epidemic was also considered in the early stages and an isolation hospital was one of the first to be built. Fortunately it was never required and the only "epidemic" was oedema—a form of beri-beri, caused by unbalanced rations at the end of 1945, before the Liaison Staff was working, and this was very quickly got under control by vitamin tablets and correct food.

Water purification, except for hospitals, was left to units with unit equipment, such as it was. The normal Japanese practice of drinking someone else's bath water, or more accurately bathing in someone else's drinking water (see Photo 1 again), could not be stopped and appeared to hurt no one. For hospitals, special purification sets were installed and also distilled water was produced from stills, locally made out of ration tins; these stills were never found producing anything else but water, but in view of the saki (rice spirit) cups and bottles made as a priority job by the pottery, it is reasonably certain that occasionally something better than water came out of them.

Latrines were a peculiar local design. In order not to foul the water supply and also to give casy access for manure, they were built up deep trench type, with the bottom of the trench on ground level or not more than 2 ft. down and built up to give a minimum depth of 10 ft.; they were generally the most imposing structure in the unit lines. A timber frame was used, with a clay or mud covering and given reasonable maintenance they were completely sanitary.

Although the Jap individual standard of hygiene was high and he kept himself very clean, unit hygiene unless chased was awful. The D.A.D.M.S. of the Liaison Staff, with the fear of an epidemic in a confined community always in his mind, inspected every unit once a month, awarding prizes in pigs from the farm to units doing well and sacking commanders where they were not. This tour, travelling as fast as possible by boat, horse and foot took a minimum of ten days. In addition, all other officers of the Liaison Staff on tour invariably inspected unit hygiene. To this regular inspection the very low death rate in the islands can be mainly attributed. When the population was between 70,000 and 80,000, the death rate averaged seven a week, of which at least half were accidental, by drowning, falling trees, hurricanes, eating the wrong sort of shellfish and the like.

#### Fishery

The catching of fish is scarcely an engineer problem, although the use of explosives for the purpose was requested by the Japanese and turned down by the Liaison Staff as unsporting. Allied to it, however, were a net manufacture and repair unit, working entirely by hand; several blacksmiths making hooks and spears; an extensive boat repair organization which applied ration tin patches caulked with locally produced rubber to anything which might float, and finally several hundred men producing salt from sea water and sun drying fish.

#### Farming

A central farm was established, concentrating mainly on pigs. It was intended to breed sufficient stock to allow an occasional issue of meat as a treat: there was no hope of making pork a basic part of the ration. It was very soon found that the pigs, if they were to thrive, required a much higher standard of accommodation than the troops.

#### Miscellaneous Industrics

There were a number of minor industries which are worth a brief mention. The pottery was a very flourishing concern, starting mainly with simple crockery. After long experiment a quite reasonable black glaze was produced and they became more ambitious. The show piece was a lavatory pan, which

was much too precious to be used. The affiliated brickworks was a failure as sufficient effort could not be put into it to produce enough bricks to build anything.

The metal workshops was also a busy place, particularly the tinsmiths' sections where most unexpected things were constructed out of ration tins.

#### Mechanical Equipment

The offer of mechanical equipment to the extent of two D4 bulldozers was made by Singapore and after careful consideration refused. There was considerable work for them to do, particularly road making and root extraction. It was however decided that the saving in time and labour which mechanical equipment would have given would not offset the damage it would cause to roads required only for Class 9 traffic and to the pitifully thin top soil which would have been churned irretrievably into the clay or laterite underneath. There is little doubt that this was one of the few occasions, which still arise from time to time, when the use of mechanical equipment is wrong and when man used in quantity is still the most efficient engineer power plant yet produced.

#### THE END

About the middle of May, 1946, the plan was completely reversed. General MacArthur had released a number of Liberty ships and all Japanese surrendered personnel were to return to Japan as quickly as possible. Since many Japanese surrendered personnel were engaged on rehabilitation work in Malaya and elsewhere and could not be spared immediately, Rempang and Galang moved suddenly from the bottom of the priority list to the top. Engineer work, except maintenance, stopped and a slight spirit of boathappiness spread through the islands.

The situation then was :---

Population

Hospital cover Covered storage Living accommodation Motor roads Agriculture Livestock 80,000 with more pouring in daily from N.E.I. (110,000 passed through the islands). 3,000. 45 days for 150,000.

100 per cent at a moderate standard. 65 miles.

1,500 acres planted.

120 pigs. 360 chickens.

200 ducks.

200 ducks.

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An experiment in improvisation thus came to a sudden end, without having gone on long enough to be really conclusive. From then on, until the islands were clear towards the end of July, the jobs were movements, disposal and backloading of stores and the other usual businesses of a withdrawal and do not come within the scope of this article. In passing, however, the record day must be mentioned. In twenty-four hours three Liberty ships were victualled and embarked 3,500 each and at the same time two shiploads of about 1,000 each from Java were disembarked, screened and searched. Quite a day, in which traffic control on land and sea played a large part.

#### CONCLUSION

When we started, none of us had any experience of converting almost virgin jungle into a self-supporting colony. We learned a lot and the main lessons, most of which are obvious, were :--

- (a) Get LOCAL specialist advice on any technical subject. We started agriculture with textbooks from Singapore—which assumed quite wrongly that one did not make elementary mistakes and were therefore too technical for the novice—and with advice from Japanese farmers who, although no doubt first class in Japan, were almost useless on the Equator. Only when the Civil Government discovered that we were actually producing food and sent us a local expert did we really know what we were doing. Similarly we started by chasing fish in the wrong place at the wrong time with the wrong equipment.
- (b) Make a broad overall plan quickly and, within reason, stick to it. The Japs before the Liaison Staff arrived tended to tell formations to get on with the job and use their own judgment. This, in such poor country, would have wrecked the place. The plan must be fully co-ordinated to cover all branches of activity, and to ensure that one enterprise does not interfere with another, but, if possible, helps. As an obvious example, timber for building must be felled in areas due to be cleared for agriculture and not somewhere else just because it is easier.
- (c) Get the roads through. Living and working in front of roadhead is difficult and wasteful.
- (d) Have an efficient medical adviser and, having studied carefully what he says, incorporate it in the plan with reasonable and not undue weight. The human frame will frequently stand quite easily up to much more than a doctor thinks it should.
- (e) Keep your labour force, whoever they may be, reasonably contented. Outstandingly good work, particularly work against time, was always rewarded, usually by extra rations, and this paid a good dividend. Similarly it was accepted that when hungry men are employed on the production of food, wastage is bound to occur. A special " rake off " for food producers was authorized, consisting of certain minor vegetables and all shell fish, with the result that the main production came in relatively complete. An exceptionally foul brandy, confiscated from one of the Java ships, was used to put a jerk into Headquarters Staffs after any particularly trying time.

Administrative Staffs must not be forgotten in the issue of rewards, as they invariably get most of the blame when things go wrong.

And last but by no means least :---

(f) Water. This was the only permanent worry in a very enjoyable and interesting six months' attempt at pioneer colonization.

#### BOOK REVIEWS

#### SAPPERS AT WAR

#### By ANTHONY ARMSTRONG

#### (Published by Gale and Polden Ltd. Price 3s. 0d.)

Most people will agree with the late Engineer-in-Chief when he says in his foreword to Sappers at War that it is not easy to answer the question : "What do you Sappers really do in war?" It is a difficult question; but Anthony Armstrong (who was himself once a Sapper officer) makes a good shot at answering it in the nine chapters of this book. The illustrations are by Raff.

The chapters are devoted to the principal R.E. activities : field, airfields, airborne, plant, works, transportation and stores. Field rightly gets three chapters—demolitions, bridging and sabotage—against one chapter to each of the others. In each chapter the author describes an imaginary adventure with the sappers in that particular branch of the Corps.

They certainly are adventures. You get shot up on a train ; you encounter Japs on an airfield ; and you have hair-raising adventures bridging, parachuting, and so on. Even stores reflect a glint of romance ; and the C.R.E. (Works) becomes a positive super-man. You may say that nothing like it ever happened in real life ; but there you will be wrong. Every story is founded on real events ; events which some readers will recognize. The stories are selective.

You cannot please everyone all the time and there will be some who will not be pleased with all that is written here. It will probably make its best appeal to schoolboys; though most of us being still schoolboys at heart, will get some enjoyment from it. When our grandsons say, "What did you do in Hitler's war," most of us will be able to point to one of these chapters and say, "I did something like that "; adding if we are truthful, "but not nearly so well."

That is just what a book for schoolboys should be. It is, as one would expect, well written, light and sincere. It is not the sort of book a Staff College student would turn to, but he might well give it to his son who was wondering whether to join the Corps or not. It would be an equally suitable gift to the gardener's son, for it is an "all-ranks' book." Both boys would, one feels, take a more romantic view of the sappers. For this reason the book has a good recruiting value; and as such should be widely read by those contemplating for the first time the call to arms.

The stories may also give ideas to those responsible for producing R.E. "turns" at military displays, tattoos, and so on.

The best advice about this book is to buy it, read it (it only takes about an hour) and then give it to the kind of boy you would like to see wearing a sapper cap-badge.

M.C.A.H.

#### THE WAR IN MALAYA

## By LIEUT.-GENERAL A. E. PERCIVAL, C.B., D.S.O., O.B.E., M.C.

(Published by Eyre & Spottiswoode. Price 16s. 0d.)

General Percival's book, The War in Malaya, makes gloomy reading. It is a tale of unpreparedness and disaster. There are only two redeeming features in the story: the devotion to duty of many men and women, and the chivalrous spirit of the author. He writes without rancour and one feels instinctively that he epitomizes the best qualities of an English gentieman. (One also sometimes feels that it were better had he been more of a buccancer and less of a gentleman.)

He writes with great authority. He was a student of the Imperial Defence College, and a G.S.O.1 in H.Q. Malaya Command from 1936 to the end of 1937. During this time he saw much of the theory and planning of the defence of Singapore. He returned as G.O.C. Malaya in May, 1941, and remained as such till the capitulation of the fortress on "Black Sunday," 15th February, 1942.

He makes no attempt to whitewash himself nor anybody else. He sticks to a factual account which goes into great detail. It is the product of both memory and careful research since the events.

The task of defending Malaya was never an easy one. The constitutional organization of Federated and Unfederated States fettered the high command. The mixture of races was an added complication. The vast distances, poor communications and enervating climate would daunt all but the most resolute. And the Colonial Office policy "that the output of rubber and tin was of greater importance than the training of local forces" tended to sap what resolution there was outside the profession of arms. Added to all this, the collapse of France and the war in the West upset the whole balance of power in the Far East. The defence of Singapore relied on airpower (which did not exist) till a fleet (which could not be spared) arrived.

When the first attacks came we were outnumbered in the air, at sea and on the ground. We had no tanks. The enemy were trained troops, picked troops indeed. Many of ours were unequipped. The 3rd Cavalry, for instance, "consisted of three squadrons of dismounted men . . . with little training and no vehicles and equipped in Malaya with a few unarmoured trucks." On one formation "the divisional commander had expressed his opinion that it was unfit for service overseas."

The author discusses dispassionately and, in general, concurs in the decision to withhold air and naval reinforcements in favour of the Middle East and Russia; to send the *Prince of Wales* and the *Repulse* in December, 1941; and to send the 18th British Div. in early 1942. "The trouble," he says, "goes right back to those pre-war days when, in spite of all warnings, our leaders would not really face the dangers . . ."

Later, General Percival writes, "I have nothing but admiration for the way in which all ranks courageously faced the situation which was prejudiced from the outset . . ." And the reader, when he reads the detailed story, will agree. The conduct of "The British Battalion" (a composite battalion of the Leicesters and East Surreys), the Sikhs' charge at Kampar and the Australians in the Battle of Muar are but three examples of Commonwealth forces at their best taken at random from the book.

Space here forbids even a summary of the long story of withdrawal, infiltration, outflanking and further withdrawal. The account of the last day of fighting and of surrender is mercifully brief. There is a chapter on Captivity ; a chapter of Retrospect and finally Dawn, when the author was present when his old opponent General Yamashita surrendered the Japanese forces in Manila ; and when a Japanese delegation signed the formal surrender of Japan in the U.S. battleship *Missouri*.

What of the manner of presentation? The tale is simply told. There are plenty of maps, and anyone wanting to know what happened will find the answer here. Whether we shall ever learn from the experience remains to be seen. M.C.A.H.

#### AFTER MY OWN FASHION

#### By RAIBEART ELDER

#### (Published by Longmans, Green & Co. Price 8s. 6d.)

This novel, the title of which is presumably taken from Dowson's poem, tells the story of a Sikh sepoy of the Indian Army who was captured during the retreat from Burma, and of the mental agony which he suffers as a result of conflicting loyalties. When captured, Kurnail Singh's loyalty to his regiment and the British Raj was unshaken, and he joined the Japanese sponsored Indian National Army, as I.O.Rs. were at one time officially instructed to do, simply in order to escape to India and return to his battalion. Eventually the I.N.A. unit in which he was serving is sent to Kohima, and there is an opportunity for him to surrender to the Indian Army and escape from the misery of life with the I.N.A. rabble whom he so despises. But he develops a deep friendship for a young Sikh, Gurdial Singh, whose nationalistic fervour is genuine, and on his account he delays his surrender. He is captured by a British unit, fails to convince the authorities of his intention to give himself up, and is sent to a J.I.F. detention camp. 'Here he meets Gurdial Singh and together they escape, but in doing so he kills a British N.C.O., and finds himself court martialled for murder and the hero of the Nationalists. At first he feels nothing but contempt for both leaders and members of this movement, but gradually he comes to see them as his compatriots, actuated by genuine love of their country. His loyalty to his regiment is driven out by the more fundamental loyalty to his soil, with which Gurdial Singh has persuaded him to identify the Independence movement. The story ends with his dismissal from the Army and his return to his village, bewildered by the events of which he has been the victim, and sure of nothing but his overriding love for his home.

The story is vividly and convincingly told, in a simple prose style which is easy to read. Conversation is effectively rendered into English, though remembering how sensitive the I.O.R. is to "gali" one wonders whether N.C.Os. do in fact abuse their men quite so freely and consistently as shown here. The author served during the war in the Indian Signals, and reveals a deep sympathy for the men whom he portrays. So much history has been made in India in the last few years, of which most people outside that country are largely unaware, that one hopes for more books of this sort, giving either in factual or in novel form some sidelights on the momentous events which have taken place.

It is an interesting epilogue to the story that members of the I.N.A. have not in fact risen to high rank under the new governments of India and Pakistan, which for their administrations have compounded the best of the old independence movements with the remnants of the British service, but in their armed forces have relied on those who remained true to their salt.

D.C.S.D.

#### THE FREEDOM OF NECESSITY

#### By J. D. BERNAL, F.R.S.

#### (Published by Routledge & Kegan Paul Ltd. Price 18s. 0d.)

Professor Bernal is not only a scientist but also deeply concerned with the relationship of science to society. It follows that he is also concerned with what society should be, and he makes abundantly clear that his prophets are Marx and Engels. Whatever one's philosophy, there can be no denying that Marx's "Dialectic Materialism" is a most powerful factor in thought and action of the present day, and for those who have never studied Marxism this book presents a good opportunity, to be taken, it is suggested, by reading the last section first, since the philosophy therein expounded colours all that goes before.

The book consists of essays, nearly all of which appeared in various journals dealing with scientific and social questions ; their dates range from 1929 to 1946, and in his preface the author himself confesses that if some were rewritten now they would be unrecognisable. He claims, however, that they would lose their value as historical expressions of the impact of world events on the mind and work of a scientist. This may be so, but the majority of readers would probably prefer his present views to studying their growth. Also, it does not fortify one's regard for the author to read his vehement criticism in 1942 of failure to open a second front by that date. There is no evidence that the criticism is based on any but ideological grounds, and it does not improve matters that he abuses the nation's then leaders not only for their decisions but for their supposedly " reactionary " motives.

Professor Bernal was directly concerned with the scientific study of the D-day beaches, and impressed at least one sapper officer not only with his vast scientific knowledge but also with his sense of the practical. The naval and military difficulties of the invasion of Europe cannot altogether have been lost on him; one wonders how he himself now views his reference to the second front. However, it should be said that only in a few instances is the book seriously dated; the great majority of it is extremely relevant to present problems.

The author shows his sense of the practical in dealing with science and architecture, in two very readable essays. Likewise, he has much of interest to say about the teaching of science with particular reference to the social implications of scientific knowledge. In his view, it is impossible to divorce the teaching of science from social theory, but need the science class-room become so much of a political husting as the Professor appears to imply?

Though the book covers a wide field, its central theme is science in relation to society. The author argues the need for the direction of scientific effort now in the same way as the circumstances of war brought about a unification of researches and their application, though of course the objects are now different. He points to the U.S.S.R. as the only country where science has been properly directed under a "strategical" plan for the betterment of the masses, and there is an uncomfortable measure of truth in this. He believes that such planning is not incompatible with freedom for the scientist, but the actual freedom now enjoyed by scientists in that country is a matter on which one would like some hard facts. Perhaps it is analogous to the freedom of the "Russian wives." Though well expressed, these essays are by no means light reading, but they are an exposition of ideas which cannot be ignored by those who really do think about the world today and in the future. It should be remembered, too, that Dialectic Materialism is essentially a philosophy of action.

R.E.B.

#### DESIGN AND CONSTRUCTION OF REINFORCED CONCRETE BRIDGES

By A. W. LEGAT, G. DUNN, AND W. A. FAIRHURST

(Published by Concrete Publications Limited. Price 30s. 0d.)

This is another of the "Concrete Series" Books on Concrete and Cement, and like the other books published by Concrete Publications Limited, it is designed for both the practical engineer and the designer.

The three engineers who wrote the book and who were individually mainly responsible for various sections of it, all have their own opinions and this tends to give a well balanced survey of good practice as applied to modern bridge design.

Most of the illustrations and the design examples are from work actually carried out by the authors and this lends a pleasant note of authenticity to the whole book.

The first three chapters, covering The Ideal Bridge, Survey, Location and Site Investigation, Bridge Types and Choice of Type, deal with the general considerations before design is even attempted. Thirteen types of span and five different cross sections are shown in diagrammatic form which gives the normal and minimum span for each type. Examples are also given to illustrate the method employed to select the ideal bridge for three different sets of circumstances.

Chapters 4-9 inclusive, deal primarily with the theoretical design of slab and girder bridges, portal bridges, considerations of rectangular sections reinforced equally on two faces (a very neat approach to the problem), design of arches and foundations. Again examples are used to great effect to illustrate the theoretical considerations. The problem of combined thrust and bending on reinforced sections is not difficult to solve (provided the reader can solve a cubic equation !), but it is a long and tedious labour to arrive at a truly economical section. Graphs have been included which do materially assist the designer, in that if any two of the three variables, breadth, width and steel percentage, are known, the third can easily be determined without the necessity of solving for any subsidiary quantity, such as the position of the neutral axis. Foundations are illustrated from actual designs used in Scotland and include considerations of ground pressures, cofferdams, piling, mass and cellular abutments.

"It is seldom that a good engineer is an equally good architect." How true ! The chapter on Bridge Architecture will, however, go a long way to ensure that the appearance of bridges preserves the amenities of the sites on which they are quite often the dominant features. Of recent years the details of all important works have had to be submitted to the Royal Fine Arts Commission for approval and comment, the Commission, however, cannot do more than suggest general improvements or reject a really bad design. In this respect concrete, partly because of its great strength which permits slender sections with elegant lines and partly because of the wide range of possible surface finishes, is an ideal material to ensure the best aesthetic answer to a purely engineering problem. The strengthening, widening and realignment of existing bridges is an ever present problem which is seldom covered in normal textbooks; this is the exception, and an adequate exception too. The chapters on Office Practice and Estimating are again uncommon, but should prove very useful. The estimating is based on London prices in 1939 and is admitted to be out of date by the authors, an appendix is included, however, giving the prices on which the Estimating Graphs were based, hence it is not a difficult computation to derive a factor which, when applied to the graphs, will give the approximate costs for any bridge, at any time to suit local conditions.

The practical section of the book, construction methods and equipment, staging, centering and shuttering, reinforcement, concrete and concreting, supervision of construction are all briefly but adequately covered, obviously by practical engineers, and prove quite a refreshing relief after the very necessary but rather "ugly" monetary considerations of estimating.

The final chapter Special Features covers a miscellany of important small points as well as some of the latest trends of design, and has obviously been designed to "tie up the loose ends," which it does most successfully.

To young practising engineers the appendices will be extremely valuable as they cover the "dry" side of engineering, Conditions of Contract, Specifications, Typical Bills of Quantities and the short résume on the 1939 London prices and wages.

In the last appendix examples of reinforced concrete bridges of some of the types mentioned in the book are each illustrated by a photograph, a longitudinal section and a short explanatory note, an excellent conclusion to a well thought out book which, though a little advanced for the beginner or student, will be invaluable to the engineer. E.E.P.

### "REPORT ON PRESTRESSED CONCRETE"

#### CEMENT AND CONCRETE ASSOCIATION

This paper is in two parts. Part 1 is a Digest of a Lecture "Recent Developments in Prestressed Concrete" by K. W. Mautner and Part 2 a Report by A. R. Collins, P. G. Bowie and B. Boothby, all members of the staff of the Cement and Concrete Association, on a visit to France to study French technique and application of prestressed concrete.

Part I begins with a statement of the early history of prestressing and the arguments of the theory. These latter are not too clearly set out and would be difficult to follow for anyone not completely familiar with the common theory of bending in beams. There then follows a detailed description of the two main techniques—with bonded steel and unbonded cables—the former most suitable for factory production of small members (sleepers or small structural parts), the latter for site work such as bridges and hangar roofs. This portion is very well illustrated with clear photographs and simple diagrams that make it a pleasure to read. Part 1 concludes with a description of some special methods devised for peculiar problems, the one of particular interest to military engineers being that adopted at Orly airport where a 6-in. slab on poor foundation has withstood 130 tons on an area 3 ft. 4 in. in diameter.

Part 2 is also profusely illustrated with excellent photographs and describes a wide variety of structures and the technique of their erection and also gives some interesting details of factory methods. There is a very good summary of the conclusions drawn from the tour and it is made quite clear that the energy and courage of French Engineers have made of prestressed concrete a structural material of the highest importance. H.C.G.C.-T.

#### CODE OF PRACTICE FOR SIMPLY SUPPORTED STEEL BRIDGES

#### (Published by Institution of Civil Engineers and Institution of Structural Engineers. Price 3s. 6d.)

This Code, prepared by the Joint Committee of the Institutions of Civil and Structural Engineers and published by the Institutions, is not one of the new series of British Standard Codes of Practice, although several of the eminent Engineers who prepared it were on both Committees.

The Code is intended to apply to fixed girder railway and road bridges of spans up to and including 300 ft.; it is of course, only a *recommended* Code and is designed to present good British Practice as interpreted by the Committee. They cover, in varying detail and in varying degrees of dogmatism, Loads, Stresses, Details of Construction, Girders, Materials, Inspection, Weighing and Shipping. The chapter on Loading, the Appendices which give Standard Unit Loadings for Railway and Road Bridges, including considerations of Abnormal Loading and Impact on Railway Bridges are of very great value to the Military Engineer, who has a true appreciation of "potted" information.

There are, however, several unfortunate features of the Code ; the use of different symbols from those incorporated in CP 113 ("The Structural Use of Steel in Buildings"), the use of words, such as one, one hundred and eightieth, in lieu of figures in some places in the text, and the use of 9 tons per sq. in. as the working stress for mild steel as opposed to the 10 tons adopted by CP 113: This change in working stress is based on the reasoning that conditions in bridges are much more severe than in buildings ; this may be true, but the conditions in buildings are generally considered more complicated and difficult to analyse. In all fairness, however, it must be stated that this Code, although published in 1949 (after the CP 113) has been in preparation since 1936 was interrupted by the war, and the Joint Committee naturally had many changes in its composition during this long period.

Despite these small points, however, this is a Code which is well worth studying, and will be of great assistance to all Engineers.

E.E.P.

#### ELECTRICAL SERVICING OF THE MOTOR VEHICLE

#### By E. T. LAWSON, A.M.A.E.T., A.M.I.M.I.

(Published for the "Motor Trader" by the Trader Publishing Co. Ltd. Distributed by Iliffe & Sons, Ltd. Price 8s. 6d.)

1. The title of the book leads one to expect the whole aspect of servicing, from the day-to-day maintenance, simple testing and servicing which the car owner can carry out, to the complete overhaul in a garage, to be covered.

In this respect the book is disappointing in that it is written solely for the service man in a garage who would be expected to have the necessary equipment described at his disposal.

2. The author in his preface states that the object is :---

- (a) Helping and guiding the service man, in the wisest choice of equipment for the scope and nature of the work to be undertaken.
- (b) To show the basic principles of testing and test appliances so that the auto-electrician can understand the manner in which the results are obtained and thus appreciate the significance of them.

This object is admirably achieved in respect of the ignition system, dynamos, starting motors, and batteries, but neglects the many other pieces of electrical equipment and its allied wiring. A chapter on this latter equipment would have been a useful addition.

3. Parts I and II deal with the simple electric circuit. The principles of action, the construction and choice of ammeters, voltmeters and ohmmeters required for vehicle testing.

Part III covers very fully the various aspects of the ignition system. What is required of the ignition system and the test results that should be expected. It then goes on to describe the various apparatus available for carrying out the tests from a simple spark gap to the testing of condenser by cathode ray. No attempt is made to describe the more complicated electrical apparatus, but the reader is left with the thought that a greater knowledge of electricity is necessary than is indicated by Parts I and II. Fig. 51 would be clearer if the contact breaker earth was shown.

Part IV then describes the layout of typical test benches, commencing with a simple layout that could be built up in any workshop, to a more complicated one which is capable of carrying out a wide range of tests including armature fault locating. In each case the author clearly states the limitations of the bench, its advantages and disadvantages.

Part V concludes with a reference to modern pieces of apparatus such as the electric tachometer and the adjustment of carburettors to a very accurate degree by means of a Carburation Analyzer, which depends on the measurement of carbon dioxide content in the exhaust gas on the Wheatstone Bridge principle.

4. This is a very useful book for one about to set up a garage or repair workshop, many of the pieces of apparatus described being no doubt available in R.E.M.E. Workshops. Owing, however, to its very limited scope it is not a book which will have much interest for the average R.E. officer.

D.A. •

#### THE MODERN DIESEL

#### By DONALD H. SMITH

#### (Published by Iliffe & Sons Ltd. Price 7s. 6d.)

The eleventh edition of this book consists of three parts—a historical survey, the theory of the engine, and a catalogue of vehicle and marine engines.

The aim of the book is "to present the subject in such a way as to be within the grasp of the average operator or mechanic, without distressing the susceptibilities of the designer or engineer." The theoretical part of the book falls between the two stools—many of the explanations will horrify the engineer, whilst the diagrams and text will not be sufficiently explanatory to be understood by the mechanic. Examples of the former are the frequent references to combustion of a mixture of fuel and air, and of the latter, the explanations of two stroke operation, the Gardner governor and the Ex-Cell-O injection pump, where lack of adequate diagrams makes understanding impossible.

The catalogue gives photographs and a short paragraph on the main features of the various makes of vehicle and marine engines. There are also

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chapters on railway and aircraft engines. No mention is made specifically of industrial engines (though some of these naturally appear in their vehicle and marine versions), and so no slow speed horizontal engines are included.

Some American engines are described, but it is strange that the International and Caterpillar are not mentioned.

Useful tables of vehicle and marine engines are at the end of the book, and they include the maximum B.M.E.P. figures for comparison.

For units equipped with Diesel engined vehicles, this book might prove useful for instruction up to M.T. Sergeant level, provided that the instructor had sufficient knowledge to amplify the obscure points.

R.F.E.

#### SLAVONIC ENCYCLOPAEDIA

#### Edited by JOSEPH S. ROUCEK, PH.D.

#### (Published by Philosophical Library, New York.)

This book, which is stated to be the first Slavonic Encyclopaedia to be printed in the English language, is intended to give to the English speaking peoples some facts and figures regarding the development of the Slavonic nations. Having been written and published in America, comparisons are mostly made on American standards and conditions.

The book contains 1,445 pages and within this space it manages to cover a vast variety of subjects, including, amongst others, articles on History, Geography, Politics, Army and Navy, Education, Philosophy, Sociology, Drama, etc., together with what will perhaps be considered by some as the most interesting, entitled "Misconceptions about Slavic Europe," which occupies 12 pages.

Besides these articles on general subjects there are the normal paragraphs dealing with many distinguished persons, places, etc.

At the end is a very useful Appendix giving details of the Constitutions of Bulgaria, Poland, Soviet Russia and Yugoslavia.

Although published this year (1949) the book went to print in 1946, so facts stated are as at that date, and there have been certain important historical changes since then.

So little is known these days about the countries behind the "iron curtain" that this book should be of special value in providing general information about them, although it would be well to remember that the information given has been compiled in America and by members of the Slavonic races who are not at present living in their own countries.

C.C.P.

#### TECHNICAL NOTES

#### TIMBER PILE RENEWALS AT THE PORT OF MELBOURNE

(Article by J. B. O. HOSKING, M.C.E., B.Sc., M.I.C.E., M.I.E. (Aust.), printed in *The Dock and Harbour Authority*.)

This article describes piling which has been used in the river and bay of the port of Melbourne to provide a support for wharves and piers over the silt and mud which extends in places up to depths of 100 ft.

On such poor foundation cradle piles have been extensively used in the past to utilize the bearing value of the silt. This type of pile incorporates an inverted timber platform secured about 20 ft. from the toe of the pile and driven with the pile 10 to 15 ft. into the mud. The latest development has been to drive piles of sufficient length to reach the underlying clay to increase the bearing capacity of the piles. This has been done by splicing two lengths of timber, using a tubular steel sleeve which was found to develop 75 per cent of the transverse strength of a continuous log.

One feature of interest is the use of inexpensive local timber for the lower length of the piles, and more durable turpentine or concrete for the upper length above mud level where the piles would be subject to attack by marine insects or fungoid growth.

Reinstatement of hardwood piles, placed in 1915 and badly affected by teredo, has been made by cutting out the defective section attacked above the mud line, and replacing with a new top length, jointed by means of a tubular steel sleeve.

Metal sleeves were chosen for the splices, after it had been verified that little deterioration takes place on metal if buried below the mud line.

#### LIGHT GAUGE SECTIONS FOR ECONOMY IN STRUCTURAL STEELS

#### (Article from a Special Correspondent in The Times Review of Industry, March, 1949.)

This article brings to the fore the economy in steel that can be achieved in light structures such as roof trusses, by the use of cold formed light gauge steel sections, in lieu of the conventional hot rolled standard channels, angles and flats normally employed.

The principal advantage with cold formed sections is the variety of shapes available which makes it possible to dispense with gusset plates, and to avoid eccentric loading which can account for 60 per cent of the total stress in conventional angle struts.

The disadvantage inherent in all thin walled sections is the necessity to provide adequate protection against corrosion.

American investigations into the resistance of existing light gauge structures to corrosion, is stated to have produced some reassuring evidence as to their behaviour.

The latest development in light gauge sections is the employment of high tensile steel strip which, with a yield stress of 21 tons per sq. in. and four to six times the corrosion resistance of mild steel, represents a big step forward.

It is estimated that in light roof structures a weight saving of from 50 to 60 per cent of steel should be possible.

#### CORRESPONDENCE

#### ROYAL CANADIAN ENGINEER MEMORIAL SCHOLARSHIP TRUST

#### Department of National Defence, Army, Ottawa, Canada. 9th June, 1949.

DEAR BRIGADIER PHIPPS,

I am enclosing as a suggestion for an article in the R.E. Journal, a draft which will be published by the Engineering Institute of Canada in their monthly journal,

I hope that this will be of sufficient interest to readers of the *R.E. Journal* as a whole to merit publication, as I am sure that the Royal Engineers will be interested to learn the results of this project.

Yours sincerely,

H. W. LOVE, Colonel,

Chief Engineer.

1. The announcement of a R.C.E. Memorial Scholarship Trust was recently made by the C.E. at Army H.Q., Ottawa. This puts into effect a plan conceived by Brigadier G. Walsh, C.B.E., D.S.O., M.E.I.C., when, as Chief Engineer of First Canadian Army in North West Europe, he initiated the collection of voluntary contributions from all ranks of the Royal Canadian Engineers overseas and in Canada, for a Memorial to their fellow Sappers who lost their lives in the Second World War.

2. When first proposed the fund was described only as a "Memorial," and all ranks were invited to suggest the form in which the Memorial could most suitably be created. The opinions received were overwhelmingly in favour of some sort of educational grant to deserving individuals rather than any physical Memorial such as a monument or building which would receive only rather localized attention. Recommendations as to how this could be implemented were divergent, however, and it was decided to wait until after the war to assess all the implications and establish the fund on a sound basis.

3. The Military Engineers' Association of Canada was asked to make recommendations to assist in reaching a decision. This Association is composed of ex-officers of the Corps, Reserve Force Officers, ex-R.E. Officers resident in Canada, and members of the engineering profession in Canada who are associated with the Army. Ultimately the question was referred back to the originator, Brigadier Walsh, the Honorary Colonel Commandant, Brigadier J. L. Melville, C.B.E., M.C., E.D., M.E.I.C., and the Chief Engineer, then Colonel H. L. Meuser, O.B.E., M.E.I.C., with two main alternatives from which to choose :

- (a) To establish an educational fund to assist selected deserving cases among the sons of Sappers in obtaining an engineering degree, when this might otherwise be beyond their means.
- (b) To establish widespread Scholarships on a long-term basis.

4. In the first alternative, because the fund is relatively small, it was thought that only a very few of the candidates eligible for financial assistance could be assisted and such assistance could only be a small portion of the cost of higher education. Further, even on a limited basis, the fund, and with it the Royal Canadian Engineer Memorial, would disappear in about 15 years. The second alternative was therefore selected as most truly accomplishing the original intention for which contributions were made and, within the capacity of the capital available, will provide a long-term, widely recognized Memorial. Each Scholarship will be approximately \$125.00 and on this basis the Memorial will endure for about 50 years.

5. The Scholarships are to be offered annually in the following universities and colleges: Nova Scotia Technical College, Halifax; University of New Brunswick, Fredericton; Laval University, Quebec City; McGill University, Montreal; Queens University, Kingston; University of Toronto; University of Manitoba, Winnipeg; University of Saskatchewan, Saskatoon; University of Alberta, Edmonton; University of British Columbia, Vancouver; Royal Military College, Kingston.

6. In the Royal Military College it is available to Cadets in their graduating year, in all other cases to students in the year before graduation, who are members of the Canadian Officers' Training Corps and enrolled in an engineering faculty leading to a degree of Bachelor of Applied Science or an equivalent in the field of engineering. After selection Royal Canadian Engineer Memorial Scholars must present certificates of enrolment in their final year of university training to signify their intention of actually achieving a degree. This provision is applicable to R.M.C. graduates who are selected, as well as to those scholars selected from the universities.

7. The selection of scholars is to be done initially by the universities and is to be based on academic standing, qualities of leadership as evidenced by activities in the C.O.T.C. and student affairs generally. Applications are open from students in any branch of the C.O.T.C. but, in the event of equality in the prior two main characteristics, preference will be given firstly to the sons of former members of the Corps of Royal Canadian Engineers, and secondly to those enrolled in the R.C.E. Wing of the C.O.T.C. In the case of R.M.C. this condition is determined by the Cadet's choice of the R.C.E. for his commission upon graduation.

8. The universities are required to submit three choices in priority to a Corps Committee consisting of the Honorary Colonel Commandant as Chairman, the Chief Engineer, and one former Chief Engineer of the Corps as Members. In the first Committee, Brigadier G. Walsh, C.B.E., D.S.O., will be the second Member. Final selection will be made by this Committee once annually and arrangements will be made in consultation with the universities for appropriate presentation ceremonies.

9. The Royal Military College cannot qualify any R.C.E. Memorial Scholars until the spring of 1952, when the first post-war class will graduate. It is hoped that the announcement was made in time to select Scholars from the current class of most, if not all, of the selected universities, so that awards can be made late in 1949. In ensuing years announcements of the winners should be possible at the Convocation ccremony at each university.

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