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CANADIAN MILITARY HEADQUARTERS

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Contributions of Canadian Tunnelling Companies to the War Effort in the British Isles, 1942-43.

1. This report deals with the activities of 1 Cdn Tun Coy from August 1940 till December 1943, when they were awaiting call to service in the Mediterranean theatre, and of 2 Cdn Tun Coy from their return from GIBRALTAR in January 1943 till December 1943. Reports, Nos. 80 and 105 dealt with the activities of 2 Cdn Tun Coy and the special detachments of 1 Cdn Tun Coy in GIBRALTAR. The Preliminary Narrative, History of the Canadian Military Forces Overseas, discusses the formation of 1 Cdn Tun Coy and their activities up till August 1940 (Chaps. 3 and 6).

2. The material for this article was obtained chiefly from the following sources:-

(a) War Diaries of 1 and 2 Cdn Tun Coys and of Special Detachment "B" 1 Cdn Tun Coy.

(b) C.M.H.Q. files -

55/3840/1 - "DRILLING AND PIPE PUSHING GENERALLY"
55/3840/9 - "DRILLING AND PIPE PUSHING REPORTS"
55/3800/11 - "DRILLING AND PIPE PUSHING GENERALLY"
55/3800/1 - "TUNNELLERS GENERALLY"
6/1 DRILL COY/1 - "ORGANIZATION AND ADMINISTRATION - NO. 1 DRILLING COY" (formerly 6/1 TUN COY/1)
6/1 TUN COY/2 - "DESPATCH OF PORTION OF NO. 1 TUN COY"
6/2 DRILL COY/1 - "ORGANIZATION AND ADMINISTRATION - NO. 2 DRILLING COY" (formerly 6/2 TUN COY/1)
1/DRILLING/2 - "POLICY OF ORGANIZATION AND TRAINING OF 3 CDN DIV FOR ASSAULT".

(c) First Cdn Army file -
PA - 5 - 0 - 11. (In custody of Hist Sec C.M.H.Q.)

(d) A collection of reports and documents held in War Diary Sub-section, Historical Section, C.M.H.Q., marked as Appendix "A" to W.D. 1 Cdn Tun Coy June 1943, hereinafter referred to as "Special Report, etc."

EARLY OPERATIONS AND INCIDENTS

3. During the months February to August 1940 the officers and men of 1 Cdn Tun Coy were occupied with experiments to determine the value of diamond drills and pipe pushers to Military operations, and in the construction of various defence works in South England. During this period it became

evident that many of the Company possessed not only technical skill but high personal courage, while others did not fit in at all well with the pattern of English life under war conditions. On 17 Aug a German bomber apparently damaged over London, was finished off by smart Lewis Gun fire from two sappers and the remainder of the detachment "raced up the hill and celebrated around the burning plane which was (still) firing" (W.D. 1 Cdn Tun Coy, 17 Aug 40, and Report No. 106, Historical Officer, C.M.H.Q.). On 17 Aug 40 Tpr. Knight, attached as a driver to 1 Cdn Tun Coy, was driving a truck loaded with 2½ tons of gelignite through the town of REIGATE when a bomb exploded some 40 yards behind him, a splinter actually embedding itself in one of the boxes of gelignite. "Although shaken up Tpr. Knight drove on and did not stop until clear of buildings" (W.D. 1 Cdn Tun Coy, 17 Aug 40). For this display of fortitude he was later mentioned in despatches. Less favourable publicity was incurred by an N.C.O. and a Sapper who were required to place their respirators at the alert by an officious air raid warden. The War Diary of 31 Jul does not detail the events from that point in the argument but concludes:

> It took nearly 15 police and A.R.P. workers to take them in and 2 police cars were damaged. They made headlines in the Canterbury papers.

4. By the end of August H.Q., 1 Cdn Tun Coy moved from CANTERBURY to MICKLEHAM HALL which was to be the base of operations for some months. Here they settled down to the problems of living in billets rather than in barracks. Various civilian buildings were allotted, widely separated and all requiring adaption to the needs of the Army. The Company seems to have been very fortunate in their civilian landlords, for there is little record of the complaints which often arose when Canadian expediency and English tradition clashed. At MICKLEHAM harmony seemed to prevail. To quote the War Diary of 27 Aug 40:

> A start was made on getting settled, the Orderly Room was straightened out and an officers' mess started. The kitchen was not large enough and it was decided to get coal stoves and put them in the tiled courtyard and roof that over for a kitchen..... Mr. Clark and his daughter were around and showed the officers the building, (inviting them to a cocktail party on Sunday)..... It was decided to put up outside ablution stands and showers and to dig slit trenches. Tents were put up to relieve congestion and into which to unload stores. The old wells and cess pits were investigated with interest.

5. From these headquarters detachments were sent out on a wide assortment of works for the various Commands of the South Coast, and later for the Ministry of Supply. On 7 Sep Secs 3 and 4, under Lieuts. B.T. Trenouth and D. Taylor respectively, left for duty. Lieut. Taylor went to GLENEYRE ROAD north of SOUTHAMPTON to mine approaches to the bridges leading from the beaches to the city. Lieut. Trenouth was to do a similar job on the approaches to PORTSMOUTH BOULEVARD, HAYLING ISLAND and THORNEY ISLAND. "All these jobs will require skill and accuracy as they are through concrete, brick work and built up ground and they must avoid pipes and mains under the

roads". (ibid., 7 Sep 40) On 14 Sep Lieut. Trenouth's detachment had completed the job at PORTSMOUTH, reporting that "the going had not been easy on account of loose fill and cement and changes of tide, enabling only short hours at low tide to be worked on some jobs." (ibid., 14 Sep 40.) More time was needed at SOUTHAMPTON and the detachment there was not finished till 20 Sep when Lieut. Taylor returned to H.Q. to report that his "section was visited by Major-General Eastwood, G.O.C. 4th Div., 5th Corps, who congratulated and thanked him and his men for the work being done." (ibid., 20 Sep 40)

BOMB DISPOSAL

6. In September the Company received a request to co-operate with the civil authorities on methods of bomb location and disposal. Much of this work was turned over to Capt. J. T. Wilson who had taken part in the early experiments with Dr. J.H. Jones, geophysicist of the Anglo-Iranian Oil Coy. in location of drill holes by sound ranging. They had met little success in calculating the position of the drill head by ground waves due to the varying speed of sound in layers of different kinds of rock and at 700 ft the distance error was found to be from 11 to 31 feet but "the direction is not very precisely determined". (For details see Special Reports, op. cit., Wilson to Campbell, 22 Apr 40.) With such experiments to guide him, Capt. Wilson took a special detachment of 13 O.Rs to the R.A.F. station at CRICKLE DOWNS where various test bombs had been dropped to provide experimental material with known detonation systems. They tried washing out the path of the bomb by pressure, suction or a combination of both, but they often encountered soft mud, boulders and bomb fragments which led to false conclusions. The path of the bomb was very often irregular and special flexible pipes had to be used. It was hoped that a device based on the principle of a galvonometer might indicate the approximate position of the bomb and that a hole or, if one failed, a pattern of holes could be drilled down towards the bomb. Dr. W. L. Bragg, F.R.S., of Cambridge, produced a "probe" which would indicate the presence of a bomb at 2 feet and if this probe were lowered down the holes the position of the bomb might be exactly and safely determined. The prospect of any type of jet or drill striking the detonator of a bomb was necessarily to be avoided. If the bomb was located by one of these methods they experimented on the size and shape of charges needed to detonate the bomb. The general finding was that the charge in a drilled hole was not adequate even when one end rested on the bomb. The solution was to place a small charge at the bomb and explode it to produce a camouflet or cave which was next filled with sufficient gelignite to detonate the explosive in the bomb.

7. All these experiments were of great value and carried out at considerable risk, for they soon tried out their methods on German bombs that could well have been delayed action. When experiments were broken off for any time heavy wire torpedo nets were drawn over the craters in hopes of minimizing damage by fragments and blast. Actually this was a period when everyone was "delayed-action conscious" and on one occasion an A.R.P. warden showed the tunnellers one of their own test augur holes as a bomb-crater. (For the subject of bomb disposal see W.D. 1 Cdn Tun Coy., 12 Sep 40 and 4 Oct 40 and Special Reports, etc.) For further study of this subject Capt. Wilson and H.25209 Sgt. E. Nicholas were attached to a bomb disposal school in LONDON and did operational work there till their return to the unit as noted in the War Diary of 17 Jan 41.

OPERATIONS FROM MICKLEHAM

8. Meanwhile the tunnellers kept busy on the normal

routine of administration and the setting up of a special store and workshop at BETCHWORTH. Trade testing was carried out through the personnel on hand and it was found that the scarcity of equipment had led to the experienced drillers handling the machinery almost exclusively so that no new drillers were being trained from among the miners. (W.D. 1 Cdn Tun Coy, 24 Oct 40.)

9. On 31 Oct however, great news was broken - a detachment of drillers was to be sent to GIBRALTAR. The men and equipment were specially picked in an atmosphere of deepest security. Said the diarist on 4 Nov 40:

> "It is very secret when and where the men are going but the word has leaked out from Corps H.Q. The Doctor for example found out from the D.D.M.S. before the officers in the unit knew."

The party entrained 12 Nov and the remainder of the Company saw them off "rather sadly". (For further information on this detachment see Report No. 80, Historical Officer, C.M.H.Q.)

10. With the New Year 1 Cdn Tun Coy acted as hosts to the newly formed 2 Cdn Tun Coy who were being organized for service in GIBRALTAR (see Report No. 80, Historical Officer, C.M.H.Q. and paras. 39 - 40 below). When the latter unit left ENGLAND they took with them Special Detachment "A" of 1 Cdn Tun Coy composed largely of diamond drillers and led by Lieut. J.B. Kirk, a former Sergeant of the Company, who had just completed his qualifying course at a British O.C.T.U.

11. No. 1 Coy were inspected on 4 Jan by the Hon. C.D. Howe, Minister of Munitions and Supply, Canada. It is recorded that he took a keen interest in the equipment. This by now required more maintenance than the original organization had supplied so a new sub-section was set up at H.Q. to concern itself solely with the various machines and vehicles brought into the garage at BETCHWORTH. (W.D. 1 Tun Coy, 1 Feb 41.) At this period H.Q. Section were at MICKLEHAM. The rest of the Company were stationed as follows:

(i) Lieut. J.F.B. Davies and 35 O.Rs at FRAMLINGHAM with 15 and 42 Divs, 11 Corps.
(ii) Lieut. W.F. Burgess and 34 O.Rs at CROMER with 2 Corps.
(iii) Lieut. J.D. Whittaker and 32 O.Rs at HYTHE with 12 Corps.

(ibid., 17 Feb 43.)

EMERGENCY TANK BLOCKS

12. On 5 Feb41 the Company was requested by the G.O.C. Canadian Corps, to put on a demonstration of surprise road blocks formed by the explosion of pipes placed in position by pipe-pushers. Some work had already been done in testing the resistance of the static blocks that by this time were obstructing all roads leading to LONDON. This was an excellent opportunity to improve their efficiency. A surprise obstacle blown just in front of a static obstacle was more than an additional hindrance. Even if the tank could navigate the ditch, it would never get up sufficient momentum to crash the permanent block. (Special Reports, op. cit.) The demonstration was held on 21 Feb 41 and in the presence of Lieut.-General A.G.L. McNaughton, G.O.C., Cdn Corps, Lieut.-General Sir Guy Williams, G.O.C., Eastern Command, Lieut.-General B.C.T. Paget, G.O.C., South Eastern Command, and others, two road blocks were blown.

> Both made good obstacles in one of which a tank was successfully bogged. The tank was pulled out and the craters filled by 2 Road Construction Company, the overhead telephone lines were repaired by the Corps signallers as their part of the demonstration.
>
> (W.D. 1 Cdn Tun Coy, 21 Feb 41 and Special Reports, Appx "N")

13. A further use for tank traps was now found in the neighbourhood of DEAL. "There are great flat areas there where surprise tank obstacles are being laid out at right angles to the shore to canalize any attacks made by landing parties and to prevent them from spreading out sideways." (ibid., 4 Mar 41.) This job was given to Lieuts. F.G. Maloney and H.T. Palfrey with 37 O.Rs. The latter had just completed his O.C.T.U. training successfully but his military career was doomed to a sudden and tragic end. On 20 Mar H.Q. learnt of his death in a mine explosion at DEAL:

> During lunch time the members of the mess of 260 Fd Coy, R.E., were examining a small mine that had been found floating by the beach. The detonator and fuse had been removed and the mine was being examined in the mess when it blew up, killing all six present. As all were killed the reason for the explosion is not known.
>
> (ibid., 20 Mar 41.)

Lieut. Palfrey was buried in the Canadian Officers' plot, BROOKWOOD CEMETERY. The job at DEAL was completed by the survivors under Lieut. H.G. DeMorest.

TUNNELLING OPERATIONS IN SCOTLAND

14. On 15 Apr Major Campbell held a conference at C.M.H.Q. with officials of Balfour, Beatty and Company, regarding the use of some Canadian miners to help in the construction of tunnels for a power plant which the above Company had contracted to complete. The story of this operation will appear as a separate section. (paras 54-66 below)

UNDERGROUND FACTORIES

15. In the same month another interesting job was turned over to the Tunnelling Company. The Ministry of Aircraft Production had planned underground factories in case of increased enemy bombing. It was necessary that these factories be constructed near centres of trained population and in areas where the geological formation made large scale excavations economical and effective. Below KIDDERMINSTER there was a soft sandstone formation and the Company was asked to provide the equipment for exploratory drilling. (ibid., 23 Apr 41.) Lieut. H.G. DeMorest and 8 O.Rs went to KIDDERMINSTER to carry out this drilling but returned on 6 May with the word that the sandstone was so soft that -

> it could not be cored without a core barrel much larger than any we have. Nevertheless the information was of some value.

(No further information about this project is available at time of writing.)

16. In May a similar project was under way with Francois Cementation Co. at BIRMINGHAM where the Ministry of Aircraft Production was preparing underground chambers for the Austin Motor Works. A detachment of 14 O.Rs under H.39225, Sgt. Illesley went to BIRMINGHAM with Capt. H. Watson who reported as follows:

> Our men are mucking at underground assembly lines for aircraft factories. They would have been much more useful two months ago as there was a shortage of skilled men to drive the headings. They were asked for then but it took two months for the request to reach us through the usual channels. There are several parallel drifts each 400 ft. or so long, interconnected like a grid iron. Each drift is 14 ft wide and arched to 9 ft high. They are in very soft sandstone at a depth of 90 ft below surface.
>
> (ibid., 18 May 41.)

DEMOLITION OPERATIONS

17. Shifting from construction to destruction a small detachment was sent to DOVER to drill a test hole in the concrete docks there to make preparation for rapid demolition in case of emergencies (ibid., 31 May 41.)

18. At this time, 19 May 41, the Company embarked on a large scale project of preparing airfields for demolition. Capts. Hall and Wilson laid down the following specifications:

> Proposed to lay pipes 60ft long at one in 12 slope with 15ft interval between pipes, the maximum runway to be left in any direction [illegible] to be 150 yds long. Square and hexagonal patterns were studied. These were not to be connected up until ready to blow, lest setting off of one pipe by bombing should blow the rest.

The first aerodrome prepared in thismanner was at SHOREHAM. This was chosen because -

> It lies in flat low ground with a swamp all around it and with the water table very close to the surface. If any of it were blown up it would be difficult to repair. The trial is to push pipes for a test and connect them with cordtex but not load them. Landing conditions and instruments would then be tested over that part of the aerodrome.
>
> (ibid., 3 June 41.)

A small area was prepared and on 20 Jun a demonstration was held before Brigadier C.S.L. Hertzberg, C.E., Cdn Corps. The system of 1 Cdn Tun Coy was tried and operations of 1 Cdn Fd Coy with camouflet equipment were demonstrated. "This show was very successful; Air Marshal Shalto Douglas congratulated Major Campbell on the rapidity and effectiveness of our methods." (ibid., 20 Jun 41.) Subsequently many other aerodromes were prepared in this fashion, most of the work being done by personnel of No. 1 Company.

FURTHER OPERATIONS, WINTER 1941-42

19. Many of the charges which had been laid by 1 Cdn Tun Coy had now been in the ground for a year and deterioration had naturally taken place. Recharging of the holes necessitated some safe and effective method of removing and disposing of the weathered charges. Lieut. G.P. Cameron and Mr. Ward of Imperial Chemical Industries were despatched to CANTERBURY to experiment and develop a safe procedure. (ibid., 2 Sep 41.) The results of their investigation appear in a report, Appendix 3 to Provisional Manual of Pipe Pushing (pp.31-32 of C.M.H.Q. file 55/3800/1). The methods recommended were "fishing" with a pronged spear and "water-flushing" when the cylinders of explosive were badly decomposed. The War Diary of 1 Cdn Tun Coy, 6 Apr 42, refers to a school held at CANTERBURY where the latter method was taught.

20. An interesting sidelight to these experiments appears in War Diary entries during September. It is first noted that Lieut. Cameron "recommended that these explosives be disposed of by the detonation of small quantities at a time", later "Lieut. Cameron reported some damage had been done to the ceilings in a number of houses in the vicinity of the spot where he had been disposing of old explosives by detonation", and finally that "Capt. Hall was a member of a Court of Inquiry at CANTERBURY to investigate the damage done to a number of houses by blasting carried out by Lieut. Cameron". He had learnt the wisdom of "small quantities" the hard way.

21. It will appear that the duty of H.Q. at this period was largely supervision. The normal situation was that of a number of practically independent detachments performing technical duties while the Commanding Officer and 2 i/c hastened over England on tours of inspection noting progress, giving advice, technical instruction and, when necessary, reproving idleness or inefficiency. While the latter situation was apparently the exception the following quotation from the War Diary of 16 Sep 41 may be of interest: "Major Campbell with Capt. P.B. Hall and Colonel Graham, R.E. visited a number of jobs under South Eastern Command. The necessity for a proper and regular inspection was very apparent." These inspections however were often mixed with pleasure since on another occasion, 16 Oct 41, "Major Campbell returned from SCOTLAND and reported a very enjoyable trip. The hunting had been very successful ... any doubts as to the story were dispelled by the meat brought back.

22. In November further experiments were made with 1 Cdn Army Tk Bde to test the efficiency of the Company's tank obstacles against Churchill tanks. A demonstration was held on LUDSHOTT COMMON where rather light and sandy soil was encountered. Pipes of varying sizes were planted at different depths and the tanks endeavoured to cross the resulting craters. The Report observes:

> The 2½" pipe blew a rather poor looking but in reality a very effective trench. The tank when endeavouring to cross this trench had a bearing only in each end of the trench and this reduced traction gave the tank little chance of going either forward or back. The portion blown by the 3" pipe was an effective obstacle with a sharp vertical lip. The tanks were stopped but were able to back out. The 4" pipe blew a wider crater than either of the other sizes but owing to the increased width the Churchills were able to move back and forth in the obstacle and had fascines been thrown in ahead of the tank a rapid crossing might have been effected. (W.D. 1 Cdn Tun Coy, 15 Nov 41.)

23. Christmas Day 1941 was marked by the "getting together of the largest number of members of the unit at any one time". Christmas festivities were still on a high note but it is significant that Major Campbell used the afternoon of Christmas Day for a meeting of the officers "to decide on the personnel required and the method of completing the various jobs". (ibid., 25 Dec 41.) It was decided to move the Company to 1 C.E.R.U. for a brief refresher course and a group of N.C.Os were sent ahead to brush up on the subjects in which they were to instruct.

24. Before the party could move to C.E.R.U. two unfortunate incidents occurred. On 2 Jan B.29204, Spr. D.C. Flesher and B.5823 Spr. N.J.O'Brien were killed at WESTHAMPNETT airport where they were engaged in preparations for demolition. A Spitfire collided with their power unit. Next day B.83099 Spr. A. Boudreault while driving through DORKING had the misfortune to kill a young lad who fell under the wheel of his vehicle just as traffic control motioned Boudreault forward. (ibid., 2/3 Jan 42.)

THE SNAKE AND THE SAUSAGE

25. While the O.Rs were reviewing their military training at C.E.R.U. Major Campbell and his technical staff, in co-operation with Brig. (subsequently Major-General) F.F. Worthington, commanding 1 Cdn Army Tk Bde, were conducting experiments with a new device first called the "Worthington Wiggler", later known as the "Snake". This was a method of pushing lengths of pipe charged with a high explosive in front of A.F.Vs to demolish wire entanglements or road blocks and to neutralize minefields. In effect it might be called a mobile Bangalore torpedo which could be placed and fired without exposing personnel to enemy small arms fire. The first demonstration was held at LUDSHOTT COMMON on 8 Dec 41 and an improved model was demonstrated on 13 Feb 42 when the following details of its construction were given. The "Snake" consisted of -

(i) A rounded and up-curved head.
(ii) 22 ft of sand-filled pipe to protect the loaded pipe from detonation by mines contacted by the head.
(iii) 80 or more feet loaded with gelignite.
(iv) 20 ft sand-filled to prevent blast back to the tank.
(v) 40 ft of empty pipe.

The charge was fired electrically from within the tank. Wire obstacles were removed and mines were detonated over a path 60 ft wide. (ibid., 13 Feb 42).

26. A third demonstration was held at HANGMAN'S RANGES on 12 Mar 42 with the "Snake" in competition with other devices for the same purpose. Here the "Snake" again proved its efficiency through a field of Mk. IV mines but failed to detonate the new Mk. V mines which were sometimes actually blown to pieces but not detonated. Other devices tested at the same time included Bangalore torpedoes fired from a discharger on the tank and cordtex nets fired by rockets.

27. At the end of the period of training at 1 C.E.R.U. a number of detachments were sent out to assist the Ministry of Supply in developing deposits of useful war minerals. These included -

(i) A fluorspar mine at MATLOCK in Derbyshire.
(ii) Drilling to open up deposit of Hematite ore at WHITEHAVEN in Cumberland.
(iii) The opening up of tin mines in Cornwall.
(iv) Diamond drilling to open up an old manganese iron ore working at RHIW, Wales.
(v) Diamond drilling and mining construction at a zinc deposit in TEESDALE, Durham.
(vi) Development of a Wolfram deposit (Tungsten) at CARROCK MINE in Cumberland.

(W.D. k Cdn Tun Coy under the following dates: 17 Mar 42, 30 Mar 42, 3 Apr 42, 15 Apr 42, 18 Apr 42, 19 Apr 42, and 13 Jul 42.)

28. The operation of the tin mines for the Ministry of Supply was an interesting sidelight on the global nature of this war. When the Japanese occupied the Malay Peninsula with its vast surface tin mines, the British were forced to find other sources of this valuable metal. The ancient tin mines of CORNWALL which had attracted attention even prior to the Christian Era, had long been worked out as a business proposition but it was still hoped to acquire some quantities of ore. Various detachments of 1 Cdn Tun Coy were despatched to these mines where they did exploratory drilling and opened up old shafts for the complete exploitation of all remaining deposits. Figures of production are not available here, but the work of the Canadian miners was much appreciated by the civilians employed on this vital project. The following letter may be quoted as evidence of their appreciation:

13 Oct 42.

Col. the Hon. Colin Campbell
Canada House,
London, S.W.1.

Dear Sir:

As Chairman of the Cornwall Advisory Committee, I am asked by the Committee to write to you and stress the particularly fine work that Lieut. Ames, Royal Canadian Engineers, has done in connection with Tin Mine in Cornwall. Under his leadership, ably backed by Sgt. McKinnon, his men have worked splendidly. Lieut. Ames' mining knowledge has been invaluable.

My Committee and I, wish to thank you very heartily for the co-operation and help that Canada is giving to Cornwall.

Yours faithfully,

C.M.A. Bolitho.

(Special Report, etc.)

While the War Diaries of the detachments on these works are available they are strictly technical and did not provide much material to the narrator. The extent of operations may be noted from the progress report of the week ending 19 Aug 42, presented as App. "A".

29. On 24 Jun 42 Major Campbell was promoted Lt.-Colonel and appointed C.R.E., 2 Cdn Corps Tps,and Capt. H. Watson took over as Acting O.C., 1 Cdn Tun Coy. Lt.-Col. Campbell continued to keep in very close touch with the Company and carried on further experiments of a technical nature. In July Capt. Watson and Lieut. Kirk demonstrated a device known as the "Sausage", for the destruction of wire obstacles:

> a canvas tube filled with ammonal or 808 with a line of cordtex running through the centre. Primers are strung on the cordtex every few feet. The Sausage is thrown over the wire and detonated by safety fuse. The experiment proved very successful.

(ibid., 25 Jul 42 and photographs, appendices ibid for 14 July 42).

At the same time experiments were undertaken to make the "Snake" sea going, i.e., to launch it from landing barges against mined beaches. Special couplings were made so that sections carried on the T.L.C. could be assembled and the combined "Snake" pushed out on to the beach. Trials were held at HAYLING ISLAND from 1/4 Jul 42. It was found that the "Snake" could be pushed on to the beach most effectively by manpower with a simple one to two block system and 1½" rope. With the ramp up it was found that explosions from 40 ft had no ill effects on personnel in the landing craft. (Appendix 1 to W.D.1 Cdn Tun Coy, July 1942).

The latest available reference to the Snake is S.D.(W) Engineers report No.256, Demolition Series No.51, 29 Mar 44. Therein the Snake is mentioned in substantially the same form as reported in para.26 above as one of the "methods which have proven satisfactory for clearance of anti-tank minefields using only equipment which is or will be at the disposal of field units". (55/3400/11 (S.D.8)).

WORKS AND TRAINING

30. On 29 Aug H.Q. were moved from MICKLEHAM HALL to BETCHWORTH where the garage had already been set up. (W.D. 1 Cdn Tun Coy, 28 Aug 42)

31. During the fall of 1942 the normal routine of the Company was practically uninterrupted. Appendix "A" gives an impression of the extent of the Company's operations showing the disposal of personnel over a typical week. (ibid., August 1942). The War Diaries for this period mention the problems which the detachments met and the action taken to carry on the work. Christmas passed with a slightly reduced scale of rations and the New Year brought in a series of training schemes wherein reinforcements were instructed in the various duties of a tunnelling company. Some of the detachments turned over their jobs to 2 Cdn Tun Coy which had returned from GIBRALTAR at Christmas but all ranks were never at any one place at any one time.

32. Early in June 1943 an interesting job was taken on by a detachment under B.5804, Sgt. C. Denny, who moved a 4-ton compressor up a 35° grade to a ridge 2500 ft high with the delightful name of GREISEN LENS ON SGURR COIRE NAN GOBHAR in MALLAIG in SCOTLAND. This work had seemed so difficult to the Ministry of Supply that a special reward in the form of a presentation of wallets was made to the members of the expeditition, (ibid., 21 Jun 43, 23 Jul 43, and a letter from Lieut.-Colonel Campbell to O.C. 1 Cdn Tun Coy, appendix to War Diary July 1943).

33. Those who remained in H.Q. followed a formal training syllabus which included the usual items of small arms, route marches and toughening exercises over a special assault course that the engineers built for themselves. Gradually the training was extended into larger scale and more technical activities, particularly in bridging operations which were carried out against the unusually realistic background of a flood on the THAMES. Many of these schemes were carried out at night. (ibid., January to March 1943.

34. An interesting break in training was provided by the gathering in of personnel entitled to the Gibraltar Key. Some days were spent in preparation for this event in which both Companies took part. Many of No.1 Company had been to Gibraltar as special detachments and all felt a deep interest in the award, which while not an official military decoration was the first recognition any group of Canadians had received for overseas service. In para. 57, Report No.105, Historical Officer, C.M.H.Q., it was stated that the cost of producing the Keys had been borne by the War Time Mining Association. According to information supplied to the Historical Section, C.M.H.Q., by Mr. Banks, Overseas Representative of the Canadian Department of Munitions and Supply, this was done personally by Mr. J. Y. Murdoch, President of Noranda Mines Ltd., and of the above-mentioned Association which had been responsible for equipping the first "Special Section" of 12 Fd Coy, R.C.E. (Preliminary Narrative, Chap.3, paras.46-49).

FINAL TRAINING

35. In April authority was received to turn over all works to 2 Cdn Tun Coy and to put the whole of No.1 Company on a training schedule. (W.D. 1 Cdn Tun Coy, 2 Apr 43.) This programme was an extension of the H.Q. syllabus of February and March and comparison of the syllabi shows only a greater emphasis on larger scale operations and tactical exercises with transport. (ibid., April and May 1943) In June various detachments were again out on works but some type of training was continuous for the personnel at H.Q. who were not on fatigues or special duties regarding maintenance and equipment.

36. Signs were not lacking that the Company was nearing the end of its long period of training and works. On 17 May orders were received for the formation of a special detachment for overseas service. Although the War Diary of that date mentions Lieut. A. M. Cormie as the Officer i/c Detachment, the party was commanded by Lieut. A. O. Ames when it finally left H.Q. on 29 May 43 "destination unknown". Several communications from Lieut. Ames are to be found as appendices to the War Diary for the remainder of 1943 and they tell briefly of the part the Detachment played in Mediterranean operations. A second group led by Lieut. W. F. Burgess were notified on 16 Jul and left 27 Jul "for parts unknown". Then the remainder of the Company received orders to leave their long established quarters and move into FLEET in ALDERSHOT District.

37. Although no special orders for overseas service are quoted it is possible to sense from the formal items of the War Diary a feeling of eagerness and expectation as men and equipment were made ready for any emergency. The tunnellers who had achieved their more brilliant successes by improvisation with material at hand must have been something of a problem to the British military authorities at ALDERSHOT who were thoroughly versed in the intricacies of the military mill whose wheels ground surely but not fast enough for the impatient Canadians. The latter were busy on the construction of a set of boxes to house all their GI098 equipment for mobile operations but -

> completion is held up for lack of scrap iron for fasteners. We are having the usual trouble procuring this. These continual delays in obtaining material put a brake on doing anything efficiently. It is not a matter of shortage of supply but of red tape. Materials are available; it is the paper work that holds things up.
>
> (W.D. 1 Cdn Tun Coy, 7 Oct 43.)

Later the Garrison Engineer and his electrician made some pointed remarks when they discovered that the Canadians had installed lights in their garages themselves - a job for which emergency requisitions had been sent in a month previously. Said the Diarist, "their complaints were hardly justified unless they expected us to stop everything pending their convenience". (ibid., 8 Oct 43.) It may be assumed that the War Diary sometimes acted as a safety valve and that actual relations were friendly; for the British engineers eventually went away promising to send the supplies " to do the work as per regulations" (ibid). When the Company left FLEET a very complimentary letter was received from the D.C.R.E., Ewshott and Wellington Lines-

> I wish to express my appreciation as to the way you maintained the quarterings occupied by your Unit during your stay in Fleet. Much time and labour must have been spent in decorating and general repairs. It was a pleasure to note the condition of the quarterings on marching out.

(Appendix No.7 to W.D. 1 Cdn Tun Coy, 4 Nov 43).

The improved mobility of the unit was proved by a rapid move to CHALEHURST which took place on 18 Nov 43. The War Diary reports much less delay and an efficient convoy system.

38. Finally the long expected Movement Order arrived 12 Dec 43, and all last minute preparations were made. Final issues of stores were now made available with pleasing speed: "the words TIMBERWOLF IV, the title of our Movement Order, seems to have a magical effect". (ibid., 17 Dec 43.) Packing and repacking, inoculations and hardening route marches became the order of the day and finally the unit moved to No.1 Cdn Base Staging Camp at COBHAM (23 Dec 43). Although they had not had time for embarkation leave, all ranks waited for the next move which was to take them to scenes of combat beyond the seas. The unit is now serving with 1 Cdn Corps in Italy.

FORMATION OF 2 CDN TUN COY

39. When the Second Division was being organized in Canada, General Odlum, who was interested in the work done in England by the tunnelling section of 12 Cdn Fd Coy, R.C.E., endeavoured to enlist similar personnel in one of the companies of his pioneer battalions. He conferred with Mr. P. B. Hall on 11 Jul 41, when the latter returned from England and after consulting with his senior engineer officers, decided to enlist 71 specialists into Divisional Engineers for future emergencies (W.D. "A" & "Q" 2 Cdn Div, 15 Jul 40 sought authority to enlist 5 drillers and 66 machine operators.) In this connection two telegrams may be of interest. The first dated 19 Jul 40, read:

> Your views requested regarding desirability or otherwise for the formation of a Tunnelling Company R.C.E. for Second Canadian Division along lines of that now being organized in England for First Canadian Division.
>
> (G.S.0506, DEFENSOR to CANMILITRY)

In a reply of 22 Jul 40 Lieut.-General McNaughton stated:

> 1 Cdn Tunnelling Coy is a non-divisional unit and is fully adequate to carry out the work contemplated on a corps front STOP This unit can use up all the explosive likely to be allotted to a corps under present conditions STOP The War Office are organising similar units for which Colin Campbell is providing instructors STOP Having regard to other far more urgent shortages such as light anti-aircraft artillery I consider that the Tunnelling Coys now under organisation are sufficient for the present - ENDS.
>
> (G.S. 789, CANMILITRY to DEFENSOR)

40. In Report No.80 it is explained that when the British Government requested the assistance of special tunnelling personnel at Gibraltar, 2 Cdn Tun Coy was organized from miners or potential miners already on the strength of units in England. The first group of 2 officers

and 40 O.Rs. assembled at MICKLEHAM, H.Q. for No.1 Cdn Tun Coy, on 30 Dec 40. Major C.B. North, D.S.O., M.C., arrived 4 Jan 41 and various reinforcements and transfers arrived during early January. When the unit moved to ESHER on 26 Jan 41, its strength was 7 officers and 167 other ranks. This report is not concerned with the story of their operations at the "Rock", which are described in Reports Nos.80 and 105. The story of the unit's operations in U.K. is now continued from January 1943.

41. When the Company returned to ENGLAND from GIBRALTAR they had a serious problem of adjustment to solve. Not only were they engaged on new work in new surroundings but their hours off duty were spent in a very different atmosphere and it would have been easy to relax a little on discipline with the excuse of such a long and arduous tour of duty behind them. No such laxity was allowed. As soon as the leave granted on landing was completed the Company was moved to ALBUHERA BARRACKS in ALDERSHOT, 14 Jan 43, where they at once started on a two weeks' training schedule in which were concentrated the essentials of the six weeks course for reinforcements at 1 C.E.R.U.

42. To add to their difficulties there was the normal extra work involved in a change of command; Major C.E. White taking over as C.O. and a new establishment being adopted which necessitated the training of transferees and reinforcements. (W.D., January and February 1943 and C.M.H.Q. Administrative Order No.17, para.2(f), C.M.H.Q. file 6/2 Drill Coy/1.) There was also new equipment to collect and organize into units for transportation if the Company were to establish its mobile role. No sooner had they completed their two weeks refresher than they were moved, first to PANGBOURNE for a bridging course, 31 Jan 43, and then to LEIGH, Surrey, 25 Feb 43, where they hoped to settle down "in order to have everything straightened out and in a mobile condition". (W.D. 2 Cdn Tun Coy, 28 Feb 43.)

43. Although the War Diary speaks with approval of the rations compared with those at GIBRALTAR "where fresh milk and cream was impossible and eggs next to impossible", (W.D. 2 Cdn Tun Coy, 6 Mar 43), the men seem to have felt that some further supplements to rations might be provided and there were a few incidents that concerned disappearing of chickens, turkeys and fruit, and miners' rubber boots being offered for sale. Most incomprehensibly the cadaver of a chicken was recovered as evidence but a full kit inspection showed everyone possessed of the rubber boots issued to him, so any commercial enterprise must have concerned boots that "the men had ..... appropriated elsewhere" (ibid., 10 Mar 43).

44. When their training schedule finished, the Company set to work on the problem of building up the new establishment with transfers from No.1 Company and reinforcements from C.E.R.U. For a time they suffered from inadequate transport, borrowing from No.1 Company until their requirements were met. Meanwhile they took over two jobs - diamond drilling at EUTHERHOPE FELL, Cumberland, and drifting at ROBINHOOD MINE, Gloucestershire -

thus releasing some of the personnel of No.1 Company for training (ibid., March 1943 and para 31, above). On 27 Mar 43 they joined in the ceremonial and received their Gibraltar Keys (see para.34).

45. By the end of March a second privilege leave was due and the Company officers further tightened up on discipline by insisting that only those who had three months free of crime could qualify. Soon the pressure of work taken over from No.1 Company relieved the situation and H.Q. was left with barely enough men for fatigues and maintenance. The jobs undertaken were the same or of the same nature as those described in para.27 above or in Appendix "A", but a new one appeared in a job at SENNYBRIDGE ARTILLERY CAMP where Lieut. Kirk and a detachment were put to work quarrying rock for road construction over that mountain morass. Not only had the rock to be provided in a hurry but it had to comply with certain specifications as to size. (ibid., 12 Apr 43.)

TRADES PAY FOR MINERS (M AND D)

46. An unfortunate situation arose at this point in regard to trades pay. The new War Establishment provided some changes in the number of tradesmen who could be carried on strength and there was delay in setting up testing boards for Miners (M and D). Even though trades pay was retroactive from passing trades test back to the date of the new establishment, this delay could be a serious financial problem to the drillers, many of whom had made large assignments on the basis of their past trades pay. (ibid., 8 Apr 43.) The situation was further complicated by a Routine Order (O.R.O. 3411, para.7), which disclosed that trades pay can only be granted subsequent to the date of qualifying tests. "For the most part our M and D men are qualified miners but no mentio of them being allied with the trade, Miner M and D, is shown in the Order so that they may draw trades pay". (ibid., 12 May 43.) The situation was finally cleared up by a further Overseas Routine Order (O.R.O.3553) which announced that the trade of Miner M and D had been allied with that of Miner "which will permit us to pay trades pay to qualified miners. This permits a total of 135 men who can have 50¢ a day trades pay, which is more than we can take care of until the Trades Test Board decides on many of our new men. This additional trades pay dates back to 6 Mar 43 and means a tidy sum". (ibid., 23 Jun 43)

47. When No.1 Company went into their unit training programme No.2 Company were again largely occupied with field operations, and training was discontinued until June when enough men were in from the field to make a programme worthwhile (ibid., 13 Apr 43). There was extra work caused by the arrival of the long awaited G 1098 for the Company. It was now possible to make out lists of deficiencies and to shelve stores for packing on a definite plan for movement (ibid., 2 Jun 43). Many of the men helped on

the neighbouring farms where wages from one shilling to two shillings per hour were being paid to soldiers ready to do a little haying after duty and on Sundays (ibid., 27 Jun 43). In July the Company moved out to FLASHETT CAMP for a week of bridging operations which seems to have been the last large scale training for the year. With No.1 Company being groomed for overseas service No.2 Company bore the load of works and their Weekly Progress reports on Engineers Services and Works show increasingly larger programmes carried out.

48. H.Q. Section still had its problems. The War Diary makes constant reference to the difficulty of obtaining properly qualified reinforcements and of obtaining the return of personnel struck off strength by virtue of illness or administrative detail and held in C.E.R.U. The following quotation may be a rather extreme presentation of the drillers' side of the story but it is worth noting here:

> Those responsible in the selection of men for this unit apparently do not understand the necessity for highly trained men in the mining and drilling. We are endeavouring to have our men return to this unit after coming out of hospital but it is apparent that apart from confirmed N.C.Os, efforts are being made to keep our men and send them to other units where their mining experience is useless.
>
> (ibid., 16 Jul 43.)

49. On 28 Jun the tunnellers lost their original commander. Lieut.-Colonel Campbell was moved to 4 Div as C.R.E. and there was much real regret noted in the diaries of both Companies to say nothing of subtle reference to several complimentary banquets in his honour. A reader of the War Diaries is bound to picture Colonel Campbell constantly on the move, from conferences with scientists and senior officers to experimental camps, to his subalterns at their detached duties and back to Company H.Q. to get through office routine, while finding time for many scientific reports and the constant direction of the policy, discipline and administration of the engineers under his command.

50. With field work increasing there was little activity at H.Q. worth of report. Several moves were made with the normal confusion arising from administrative problems and the equally normal criticism of the efficiency of higher commands. The following may serve as an illustration: "Received a Movement Order from Army H.Q. informing us we are moving yesterday but fortunately we have already planned the move for tomorrow and could not get out today" (ibid., 18 Nov 43). Experiments were not neglected especially in regard to transport. The unit was trying out the 10-ton medium artillery tractor as a carrier for the drilling equipment and a report states that "with the aid of these tractors one to each section and two to HQ Section, the Company should come pretty close to being mobile" (ibid., 1 Sep 43 and report on use of abovementioned tractor appearing as Appendix to War Diary of September 43).

51. In September the H.Q. Section put on a demonstration of a water supply scheme for Lieut.-Colonel I. Fraser, C.R.E. (Works) in the presence of Lieut.-General J.R.E. Charles, K.C.B., C.M.G., D.S.O., Brigadier J.L. Melville, (C.E., H.Q. First Cdn Army), and Colonel D.H. Storms of Cdn C.E. Works. The equipment was found satisfactory -

> all the various pumps and motors ticking over with no trouble... One of our worst fears might be confirmed in that Colonel Storms was so impressed that he is starting talking about the Company running a school for the remainder of the R.C.E. Some fast talking will have to be done to avoid this, as orders have already been given that we cannot tear down the water point.
>
> (W.D.2 Cdn Tun Coy, 17 Sep 43.)

The tunnellers had no desire to be tied down as instructors. Their interest in overseas action is shown by constant war event entries in the Diary and nothing would be welcome that threatened in any way their participation. The "fast talking" must have been successful for no further reference is made to the school and the equipment was soon packed for another move.

52. During the autumn of 1943 various activities pointed to preparation for active service and were gleefully noted in the Diaries. Drilling in blackout conditions was carried out successfully on 24 Sep; a crating system to move all equipment was set up by 11 Oct; and on 21 Oct special instructors came from 1 C.E.R.U. to introduce the Bren gun and PIAT, both new weapons to the tunnellers (ibid., 24 Sep 43, 11 Oct 43, 21 Oct 43.). In December they received a R.C.E. Technical Directive which gave the organization and operational role of a Canadian Drilling Company;

> The new name while not too expressive, designates us more truly. Our role is now extensive and varied; in addition to tunnelling, rotary drilling, pipe pushing, diamond drilling, grouting, quarrying and pipe-line installations are now part of the work we may be called upon to do. The Company will be entirely mobile, something that has always been worrying us because of our heavy equipments.
>
> (ibid.,28 Dec 43.) (For authorization of new name and organization see G.S. 360, 5 Feb 44, CANMILITRY to DEFENSOR, 6/1 Drill Coy/1/2)

An interesting item of unfinished business for 1943 was an experiment on ship to shore pipe lines which was to be carried out at BRAMLEY. At date of writing no reports on the progress of this experiment were available. (W.D. 2 Cdn Tun Coy, 28 Dec 43.)

53. To complete this survey of the work of No.2 Cdn Tun Coy, the writer can do no better than to quote the War Diary of 31 Dec 43.

> The last day of the year finds the Company as follows. No.2 Section unloading, cleaning and returning to stores equipment from the Dorchester job. No.4 Section on fatigues and general duty.

H.Q. Section doing its usual work. Nos. 1 and 3 Sections at WARCOP on quarrying job, Lieuts. Pitcher and Smith in charge. A small detachment under Sgt. Williams on pump repairing work near ANDOVER. Work on the new 1098 is progressing, separate lots of material are being made out for each section. Work on packing boxes is fairly well advanced. The year ends with very heartening news and everyone feels that 1944 will bring a decisive turn to the European part of the war.

LOCH LAGGAN DETACHMENT

54. Report No.30 covers the story of the LOCH LAGGAN TUNNEL up to 17 May 41. It contains a sketch showing the extent and nature of the project and an explanation of the method of drilling adopted by the miners. An excellent personel narrative was prepared at C.M.H.Q. by Lieut. (now Capt.) H.A. Hosking for the series "Historical Episodes", now being proceeded with by the Government, and the writer of this Report had several informal discussions with Capt. Hosking which provided an interesting supplement to the War Diary of the Detachment. Capt. Hosking admits that the pressure of many other duties made the War Diary a prefunctory matter and his personal diary has unfortunately been destroyed. His personal account written for "Episodes" is attached to the present Report as Appendix E.

55. On 17 May the drillers had not managed to advance more than 85 feet in one week and were still behind the record set by civilians. There had been many problems to overcome. Equipment was unfamiliar and there were numerous breakdowns, one in the 85 ft week holding up drilling at least a day (W.D. Sp Det "B", 1 Cdn Tun Coy, 11 May 41), and it was only started after "the Officer and Sergeant worked all night with the men to get it repaired". Two weeks later it was the slusher that broke down and experts from Balfour, Beatty & Company were called in. Again "the Officer and Sergeant worked nearly all night in the tunnel". (ibid. 26 May 41.) If the men needed any further incentive than the example provided by their leaders it was offered by Mr. Balfour who visited the job and promised the men a special banquet if they broke the existing record of 114 feet. Steadily the footage increased but bad working conditions lead to increasing sickness and Lieut. Hosking sent regular calls to Major Campbell for more men and more suitable clothing. Then came a Wednesday when the footage cut reached 121 feet, soundly breaking the record and the banquet was enjoyed the more thoroughly by being honestly earned (ibid. 11 Jun 41.).

56. The next day tragedy struck the Detachment. Fire broke out in the powder house and an explosion followed which wrecked the camp and caused serious casualties. Cpl. Hendry and Spr. Stuart were killed and Spr. Blow was rushed to hospital at FORT WILLIAM seriously wounded. The other wounded were treated on the spot.

> "Cpl. Hendry distinquished himself for bravery before he was killed, trying to put out the fire at the risk of his own life at the same time warning his fellow workers to get away from the powder House. He could easily have saved his own life but he tried to save the plant from certain disaster."
>
> (ibid. 13 Jun 41)

Cpl. Hendry received the George Cross posthumously. Work was held up until 25 Jun while a new Powder House was built, repairs effected and the necessary Courts of Inquiry held. Lieut. Hosking took advantage of the break to send a part of the personnel away on hard-earned privilege leave.

57. Not all the drillers were heroic or industrious. The Diary seldom passes a Monday without record of a miner overdue from pass or unable or unwilling to go to work. One sapper had to be bailed out of the local gaol by Lieut. Hosking, another decided to return to H.Q. instead of to the Detachment; he got 20 days field punishment and lost 34 days pay (ibid., 7 May 41, 6 Aug 41). A great deal of extra work fell on Lieut. Hosking's shoulders when he went before a local Magistrate and got one of his sappers remanded to military authority on charges of sheep stealing and creating a public disturbance. Then the ungrateful fellow refused to take his punishment and Lieut. Hosking found himself saddled with the unfamiliar paper work of a Field General Court Martial. Fortunately the Detachment was visited at this time by Lieut.-General McNaughton who was quick to realize the load carried in this detached administration. In the report of that inspection a staff officer noted Mr. Hosking's problems in preparing a summary of evidence with a Mining Engineer's certificate but no M.M.L. and recommended that some help be sent. Major M.S. Dunn, O.B.E., E.D., D.A.A.G., C.M.H.Q., made the first of his visits to KINGUSSIE and Mr. Hosking now had someone to advise him (ibid., 8 Jul 41, 19 Jul 41, 23 Jul 41, and Appendix "B"). The ungrateful Sapper got 60 days detention and was returned to 1 C.E.R.U.

58. Realizing that the pay-day search for recreation was almost certain to lead to trouble, Lieut. Hosking put on a drive for unit entertainment. He obtained some help from the ladies of Kingussie who put on a supper followed by games and a sing-song which was voted "a good success" (W.D. 1 Cdn Tun Coy, 19 May 41). For a while the men were welcome in the local R.A.S.C. NAAFI but differences of opinion lead to a fist fight one pay night and the Canteen was put out of bounds (ibid., 17 May 41). To provide a place for the men to spend evenings when there was no programme he obtained two Nissen huts and arranged for a NAAFI canteen in one and a reading and writing room in another. The erection of the huts was done by the men themselves off shift and timber was provided from trees around the camp site with the kind permission of Mr. Wilkie, clerk of the ARDVERIKIE ESTATE. (ibid.,29 Jun 41). For a while these canteens were too popular among the local girls, the miners who were operating at the other end of the tunnel and the Newfoundlanders in a nearby Forestry Camp, and some restrictions had to be made; but on the whole the programme seems to have been followed by a decrease in pay day disorders. (ibid., 29 Jun 41, et seq.)

59. Next to more men the greatest need of the Detachment was always more food and proper clothing. There were many sound reasons for this request. The men by profession in Canada were hearty eaters, their vigorous exertions demanded replacement of energy, their shift system demanded extra lunches and snacks at odd hours and the rations of the Canadian Army while larger than those of the British were still necessarily reduced by the German submarine campaign. Within 4 days of his arrival at KINGUSSIE Mr. Hosking was at CRONDALE to see the O.C., C.S.D. about getting extra rations. He was allowed extra bread and tea

for haversack lunches, but he also put in a request for extra meat, sugar and margarine (ibid., 26 Apr 41). When the miners supplemented their meat ration from the rabbits that abounded in the area, they aroused the suspicion of the gamekeeper who feared for the security of the ARDVERIKIE deer which often came to drink from the Loch directly below the camp. (See Report No. 30, para 15.) Not all the food that was supplied was of good quality for on one occasion a complaint of mouldy NAAFI meat pies was investigated and found to be only too true (ibid., 21 May 41.).

60. Meanwhile Lieut. Hosking's application for extra food had been passed through the usual channels. The Canadian Forestry detachments in SCOTLAND were receiving a larger ration issue and it was decided to put the tunnellers on this issue. In a letter to the H.Q. Scottish Command 11 Jun 41 Brigadier J.H. MacQueen said that "in view of the arduous work and the conditions under which this Unit is working it is considered that this ration scale should be provided." (6/1 Drill Coy/1). At the same time it was carefully noted that all ration expenses were to be charged to Balfour, Beatty & Company. (6/1 Drill Coy/1, telegram from AAQMG (ST) CMHQ to S & T., H.Q. Scottish Command, 21 Jun 41). This increase was not immediately available but on 11 Aug Major D. Douglas, O.B.E., Assistant Director, S & T, of C.M.H.Q., accompanied Mr. Hosking to CRONDALE to interview the Officer Commanding the R.A.S.C. detachment there and next day the War Diary reports that the extra rations were now available (W.D. Sp Det "B", 1 Cdn Tun Coy, 12 Aug 41). On 14 Aug a special conference was held with representatives of Balfour, Beatty & Company, where rations even greater than those issued to the Forestry Corps were agreed upon (6/1 Drill Coy/1). There is no reference in the War Diary to this second addition; it is possible that the arrangement of 12 Aug may have slightly anticipated the result of the conference. On 19 Jul Lieut. Hosking was given the powers of a Commanding Officer which facilitated his arrangements for supplies and increased his disciplinary powers (ibid., 19 Jul 41).

61. To obtain the extra clothes needed by the miners, Lieut. Hosking obtained permission to draw clothing from the Quarter stores of the Forestry Detachment where Canadian issue battle dress and miners boots could be obtained (ibid., 28 Jul 41). This was authorized by a letter to Lieut. Hosking from C.M.H.Q., 18 Aug 42 (6/1 Drill Coy/1). Even without this letter as authority Lieut. Hosking was able to obtain "practically all the clothing required by the Detachment" on a personal visit to CRONDALE on 16 Aug 41. Excellent dental service was supplied by Capt. Lloyd Davis, C.D.C., who in 10 days did a very thorough job and a much needed one (W.D. Sp Det "B", 1 Cdn Tun Coy, 7-21 Aug 41, and Appendix "C").

62. Throughout the summer the Canadians regularly increased their footage. Balfour, Beatty & Company were highly pleased not only with the speed shown by the Canadians but also with the increase in the efficiency of the civilian drillers at the other end of the tunnel whose energy had been somewhat increased by competition with the Canadians. Mr. McTaggart, the Manager of this project, realized that the 121 foot record had been achieved by a special drive which would be maintained for a week by carrying out only essential repairs and neglecting some administration. For example the switch at the end of the railway would serve for a week but eventually would have to be moved up at the cost of several house labour. A bonus was to be

paid only if an average footage could be maintained over 4 weeks and on a basis of 10/- per 60 men per week if 100 feet was maintained, 15/- for 105 feet and £1 for 110 feet. Appendix "D" shows footages obtained and starting 4 week perio on 13 Aug, bonuses would be 10/-, 15/-, 20/-, 20/- for each successive period. Balfour, Beatty & Company also agreed to pay 50% trades pay to all those whom Mr. Hosking recommended, regardless of the establishment (Details supplied by Capt. Hosking at CMHQ, Mar 44).

63. In spite ot these improved conditions Lieut.Hoskin still found troubles with personnel who were insubordinate or inefficient. Study of Part II Orders show increasing severity in his treatment of men up for office but the more severe sentences were only handed out to those who had been given a chance on all three mining shifts and the day shift and had been turned in by their Corporals. When it is realized that the absence of one man from a drilling team usually meant the loss of 6 feet of progress for that shift and 5/- off the bonu for the week, the severity of punishment is not extreme. Ther was healthy competition between the shifts and military punish ment was resorted to only where pressure brought to bear by fellow miners had failed (W.D. Sp Det "B", 1 Cdn Tun Coy, 5 Sep 41, and interview with Capt. Hosking at C.M.H.Q., 18 Mar 44). On the other hand it is noted that when the men set up the record of 132 feet in one week they were given a day off and transport was provided to take them to FORT WILLIAM (W.D. Sp Det "B" 1 Cdn Tun Coy, 1 Oct 41, 4 Oct 41). It was still an unpleasant place for duty: two new miners arriving from H.Q. "on looking over the place voiced the opinion that the location of the unit would be a good place to erect a detention barracks" (ibid., 29 Oct 41).

64. During October the tunnel entered an area of softe rock and work progressed at steadily increasing speed. By the end of the month a new record of 440 feet in 4 weeks was obtained and progress was so satisfactory that it was considered safe to blast the outfall which had not been opened for fear of high water flooding the lower end of the tunnel. The rock had been removed through an adit or supplementary tunnel that entered the hill above the high water level and joined the main tunnel about 150 feet from the outfall. The outfall was now cemented up by civilians working close behind the drillers and smaller blasts had to be used to avoid cracking the cement. When the outfall and adit had been joined the crew returned to the main face. In November the record for a week was raised to 142 feet and the men were rapidly approaching the civilian end of the tunnel. On 15 Dec "the afternoon shift hit the pilot hole of the tunnel driven from the other end and it was found to be direct centre" (2" out according to Capt. Hosking).

65. Arrangements were now made for a formal completion of the tunnel. The date was set for 20 Dec 41. Official visitors included Major-General P. J. Montague, General Sir Ronald Charles, Brigadier C.S.L. Hertzberg, Major Campbell and Company officials. Pictures were taken and a banquet of "turkey, Christmas pudding and varied liquid refreshments" was provided for the drillers. Forty-four members of the Detachment were now allowed 14 days leave with orders to report at H.Q. MICKLEHAM. The remainder of the Detachment worked throug Christmas moving equipment hoping to be free for New Year's leave but this was found impossible. Major Campbell and Lieut Hosking remained with the Detachment until 10 Jan 42 when the remainder eligible for leave were despatched and the rear party returned to Headquarters.

On the last day of operations 10 men removed 2300 ft of 30 lb rails which amounted to a dead lift of 10,000 lbs per man and a push of 3,300 feet.

66. The appendices to the War Diary of No.1 Drilling Company for December 1941 and January 1942 contain various letters of praise for the work of the Detachment. A brief excerpt from one of these will serve as conclusion: "Balfour Beatty & Company have been extremely pleased with the progress made by the Canadians. If it had not been for the impetus the latter gave to the work the tunnel would not have been finished in time to catch this winter's rain fall" (1/Eng Sp Tun/1 Report No. 46 of S.D.5, Sp Tun Series No.2).

THE SHETLAND ISLANDS DETACHMENT

67. One of the interesting tasks taken on by the tunnellers during their stay in the British Isles was the mining and drilling job in the SHETLAND ISLANDS. While neither as spectacular nor as urgent as the LOCH LAGGAN job it presented the same problems of military administration coupled with technical direction of mining operations.

68. As often happened this job seems to have been started in a hurry. Major Campbell was called to a conference, had the situation explained and at once departed on a reconnaissance of the actual task. On his return he presented a memorandum in which he explained the nature of the job and outlined suitable arrangements. This memo in part ran as follows:

> Para 1. The work involves the proving up of a magnetite deposit. No experienced civilian miners are available and the local labour which is inexperienced make such slow progress that it was necessary for the Ministry of Supply to ask for Canadian tunnellers to aid them in the development of this deposit....
>
> Para 3. - Equipment
>
> (a) Diamond Drilling. 1 surface drill and accessories .... will need to be supplied by 1 Cdn Tunnelling Company, R.C.E.
>
> (b) Mining. All equipment required for mining work will be supplied by the Ministry of Supply....
>
> Para 7. - Transport
>
> No transport is available on the island, so it will be necessary to supply one 3-ton lorry and one 15-cwt lorry from No.1 Cdn Tunnelling Company.
>
> Para 8. - Administration
>
> It was agreed that the most practical method was to attach the detachment to H.Q. Shetland Defences for all purposes. Shetland Defences are a part of Scottish Command.
>
> Para 9. - Movement
>
> Movement to the Shetlands by boat is confined to twice per month. The next ship leaves Invergordon

on 5 May 1942 and Leith 6 or 7 May.

(C.M.H.Q. file 55/3800/1 - this memorandum has no date of submission but states that the Recce of the work was done 25 to 27 Apr 42).

69. In order to get the detachment to the Shetlands as soon as possible, an Administrative Order was issued for the move embodying Major Campbell's suggestions (No.96 of 1 May 42, ibid.). Certain other matters had to be settled - chiefly, who was to bear the expense. Major Campbell "thought that the employment of specialists from 1 Cdn Tunnelling Company on such operations for the Ministry of Supply is being carried out at the expense of the Canadian Army" (Lt.-Col. W. B. Wedd for D.A.G. to B.G.S., 2 May 42, file 55/3800/1), but there had been special arrangements made when detachments worked at Gibraltar and Loch Laggan whereby part of the expense was borne elsewhere. Lt.-Col. P. Kelly, C.P.M., was consulted and stated:

> In my opinion and equitable arrangement would provide for pay and allowances to be the responsibility of Canadian Government and that any expenditures which are in addition to those which would normally be incurred were employment continued with the Unit, would be the financial responsibility of the British Government.
>
> (C.P.M. to A.A.G. (Org), C.M.H.Q., 7 May 42, ibid.)

Further correspondence on this topic is not available at time of writing.

70. Correspondence between C.M.H.Q. and the War Office followed and the following letter from D.S.D., War Office, to H.Q. Scottish Command - May 42 "received C.M.H.Q. 14 May 42 was eventually despatched

> Please place this Detachment under comd H.Q. Shetland Defences for the purposes of local administration. Such Canadian administration as is applicable to the Detachment will continue to be executed from C.M.H.Q. and technical arrangements will be undertaken by Officer i/c Detachment in conjunction with the Ministry of Supply (55/3800/1).

71. On 4 May 42 Capt. Taylor and 25 O.Rs entrained at LEATHERHEAD; embarked next day on the "Lady of Man"; and landed at LERWICK at 2200 hrs. There they were met by three open trucks and in pouring rain set our for camp. The driver was confused and it took two hours to get to NORTH VOE Camp, a journey of about 4 miles. There they found all preparations made for them by "D" Company, 2 Bn, Royal Scots, who provided quarters until a camp could be built near the mine. "The strangest feature was that although the journey was made between 2300 hrs and 0100 hrs it was still daylight. It is going to be hard to get used to these nightless summer nights" (W.D. Sp Det B, 1 Cdn Tun Coy, 6 May 42). This was under double summer time.

72. The first task was preparing a camp, setting up the Nissen huts and pouring concrete floors. A special feature in their construction was that the ends had to be covered with felt "on account of the almost continuous high winds in this part of the world" (ibid., 9 May 42). A small group started to work in the mine and two of their number collapsed. A medical check up found that their indisposition was due to a practical investigation into the edible qualities of local clams rather than any condition in the mine, and work was not halted. On 19 May transport arrived and two days later Lieut. F. J. Stephenson landed to take over command. The detachment moved out of NORTH VOE Camp and took up their quarters at JOHNNY MANN LOCH 24 May. Two shifts were put to work and when Brigadier Philips and the C.R.E., Shetland Defences, arrived to inspect the job they were reported as "much impressed with the work being done" (ibid., 29 May 42).

73. It is unfortunate that the War Diary for Sp Det "B" is not available after May 1942. Lieut. Stephenson has returned to Canada at date of writing and most of his detachment are on special duty. It is therefore necessary to rely on the War Diary of No.1 Cdn Tunnelling Company. A set of photographs appearing as Appx 16 to W.D. No.1 Cdn Tun Coy, Aug 42, are of interest in showing the bleak nature of the camp site. In the War Diary for July 1942 the following letter appears without context but presents an interesting sidelight on the problems of a detachment commander. Capt. Watson, O.C., No.1 Cdn Tunnelling Company, writes to C.R.E. 2 Cdn Corps Tps on 20 Jul 42 -

> Para 3. With reference to the letter: Mr. Stephenson - Mr. MacGregor re bonus. This letter was written on the request of Mr. MacGregor following a conversation relative to the above-mentioned subject, as a suggestion of suitable amount and to be something which Mr. MacGregor could submit with his recommendations to the Director of the Home Ore Control.
>
> Para.4. Lieut. Stephenson realizes the very serious lack of judgment shown on his part and is emphatic that his action was entirely an endeavour to better the position of his men in order to keep up their enthusiasm and speed up the work. I have impressed Lieut. Stephenson with the fact that his action in this instance may have lowered the standing of this Unit with the British Government and that any question of bonus, extra rations or the like is entirely a matter for the Ministry of Supply to decide and must under no circumstances be initiated from an officer of this Unit.

74. On 28 Sep 42 the Diary states:

> Major Watson returned from his trip to CARROCK MINE via SHETLAND ISLANDS. He seems to have found everything running, whether smoothly or not he did not say.

The value of such a non-committal statement may be questioned but the absence of any adverse criticism can perhaps be accepted as approval. The Detachment returned to H.Q. on 23 Oct 42 and the Diarist states only that "his crew have been in the SHETLAND ISLANDS since last May. Most of them did not seem at all sorry to be back. They were on the train for two days and had not had a warm meal since Wednesday. There was quite a reunion for all in the Pub in the evening". Next day the miners were off on privilege leave for a short break until the next job should be assigned.

75. This report was prepared by Captain L.A. Wrinch, R.C.A.

L.A. Wrinch Capt RCA

for (C.P. Stacey) Lieut.-Col.
Historical Officer
CANADIAN MILITARY HEADQUARTERS

APPENDIX "A"

REPORT OF NO.1 SPECIAL TUNNELLING COMPANY
FOR WEEK ENDING 19 AUG 42

Appendix to War Diary 1 Cdn Tun Coy, August, 1942.

LOCATION	OFFRS	O.Rs.	WILL COMPLETE	OPERATION
Mickleham, Surrey	5	63		H.Q.
Middleton, in Teesdale		13	2 weeks	Diamond drilling for Zinc Ores under supervision Non Ferrous Metallic Ores, Min. of Supply.
Carrick's Mine Weadale, Durham	1	6	2 weeks	Home Ore Dept. Iron & Steel Control, Min of Supply.
Rhiw, Carnarvon-shire		10	2 weeks	Diamond drilling for Manga-nese under supervision Home Ore Dept. Min.of Supply.
Shetland Islands	1	30	3 weeks	Developing Magnetite deposit: Iron & Steel Control, Min. o Supply.
Liskeard, Cornwall	1	30	7 weeks	Development of tin vein unde supervision Non Ferrous Me-tallic Ores, Min.of Supply.
Carrock Mine	1	37	8 weeks	Reopen diamond drilling work for development Wolfram unde supervision Non Ferrous Me-tallic Ores Comm.Min.of Supply
Robin Hood Mine, Gloucestershire.		5	9 weeks	Diamond Drilling underground for Iron & Steel Control, Min. of Supply.
Rochester Aerodrome	1	15	2 weeks	Preparing aerodrome for de-molition G.H.Q. Home Forces.
Taplow		6	3 weeks	Drilling well for Director o Engineer Services.
St.Agnes, Cornwall.		17	2 weeks	Sampling Ore Dump Non Ferrou Metallic Cres Comm.Min. of Supply.
Gravesend Aerodrome	1	7	2 weeks	Preparing aerodrome for demo lition G.H.Q. Home Forces.
New Florence Mine, South Moulton, Devon	1	18	5 weeks	Home Ore Department Iron & Steel Control, Min.of Supply.

APPENDIX "B"

LETTER OF 11 AUG 41 FROM MAJOR W.B. WEDD, A/AAG (Org), CMHQ to AJAG:

The D.A.G. sympathises with Lieut. Hosking in trying to carry on the administration of military law with the aid of a graduation diploma in Mining Engineering and if you have not received a direct application for aid from this office, it would be well to arrange to give him what assistance you can.

I would be glad also if you would instruct P & S at Acton to send him any manual you consider necessary.

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APPENDIX "C"

ADDS 5.2

CANADIAN MILITARY HEADQUARTERS

Officer Commanding,
No.1 Cdn. Tunnelling Coy.,
R.C.E.

Dental Service to Special Detachment "B"

The Dental Officer detailed for this service has submitted a report of his stay with this unit.

2. Of the seventy-three men, all were inspected and all but one required and received treatment. All cases were completed with the exception of artificial dentures for seven men. Arrangements have been made for these to be inserted, when completed, by the Dental Officer attached to the nearest unit of the Cdn Forestry Corps.

3. Dental work performed by Capt. Davis for this group included 25 extractions, 184 silver fillings, 229 cement fillings, 44 silicate fillings, 49 prophylaxes, 99 treatments and thirteen denture cases, (plus denture cases mentioned in para 2).

4. Capt. Davis had the highest praise for the co-operation received from Lieut. Hosking and his men. This is gratefully acknowledged as it conserved the time of one of our best operators.

5. In his Progress Report, Capt. Davis emphasized the impressive effort of your detachment "B". This is so gratifying that it is being fully reported in our unit War Diary.

(Sgd) (W. G. Trelford) Lt.-Col.,
A.D.D.S.
Canadian Military Headquarters.

APPENDIX "D"

FOOTAGE PER WEEK, LOCH LAGGAN TUNNEL, 1941

	Feet	Inches
30 April	67	
7 May	68	6
14 May	85	
21 May	82	6
28 May	80	6
4 June	90	
11 June	121	6
18 June	24	
25 June	--	
2 July	68	
9 July	100	
16 July	97	
23 July	86	
30 July	117	
6 August	52	
13 August	105	
20 August	97	
27 August	100	
3 Sept	101	
10 Sept	84	
17 Sept	109	
24 Sept	99	
1 Oct	132	
8 Oct	94	
15 Oct	107	
22 Oct	100	
29 Oct	118	
5 Nov	104	
12 Nov	100	
19 Nov	118	
26 Nov	136 - 142	
3 Dec	110	
10 Dec	150	
15 Dec	82	
TOTAL	3167'	

OUTFALL FOOTAGE 150'

Figures from W.D. Spec Det B 1 Cdn Tun Coy. The figure for 26 November is a correction by Capt. Hosking.

Appendix "E"

THE LOCH LAGGAN TUNNEL

by Capt. H. A. Hosking, R.C.E.

In 1773 Macdonell of Collachie, Macdonell of Aberchalder, and Macdonell of Leek gathered a number of Highland soldiers whose regiments had been disbanded and led them across the ocean to the new world. They settled in the Mohawk Valley, New York State and after the Revolutionary War became United Empire Loyalists and trekked to Canada where land was provided for the, to which they gave the name "Glengarry". Shortly after the birth of the nineteenth century they were joined by another band of pioneers from Inverness-shire, brought to Upper Canada by the "Warrior Bishop", Rev. Alexander Macdonell, who later became the first Roman Catholic Bishop of Upper Canada.

Now, over a hundred years later, Canadian soldiers have crossed the ocean and in that same Inverness-shire from which these Highlanders came, have served the Empire. And, strange to relate, some of them were Gaelic-speaking Highlanders.

The year is 1941 and Great Britain is at war, a new type of war, a war which for the first time is being fought in the air over London, the heart of the British Isles. Each war that comes brings with it new problems that have to be solved before the main battle can be proceeded with and won. The War of 1914-18 presented a static defence in the form of trenches which were overcome with steel, in the form of ships, tanks, guns and ammunition from our foundries. This time a new menace has arisen, air warfare, blitzes on our cities and factories: an additional different cry is heard through-out the country ; a cry for planes, good planes, light-weight fast fighters and light-weight long-distance heavy bombers. To build these, aluminium was of vital importance and it was imperative that every means to produce this now precious metal should be exploited to the fullest extent.

In the British Isles, the British Aluminium Company had a plant situated at Fort William, Scotland at the base of Ben Nevis the highest mountain in these islands. The waters which fell as rain on this and other adjacent mountains were used to drive huge generators treating the large stocks of bauxite which had been accumulated from other continents in the early months of the war. This plant, the largest of its kind in the British Isles, depends entirely for its source of power on catching the rain which falls on the high land and mountains in the north of Scotland, where with traditional British thoroughness it is stored in reservoirs at high altitudes and directing its return to the ocean through turbines. These turbines are turning out 85,000 H.P. but it is not enough. More rain must be collected and put through the turbines to increase the production of aluminium. The Consulting Engineers who designed and controlled the construction of these works were Sir William Halcrow and Portness and they have also been in charge of all other hydro-electric projects carried out in the Highlands of Scotland up to the present date.

* Figures amended by Mr. Roberts of Sir Wm Halcrow & Portness.

Now it is time to look at sketch figure 1 and see how efficiently this plant collects and stores the rain which falls and how it holds it at high altitudes until it is conducted to the power plant. The area surrounded by the hatched lines is the basin used to catch the water. It is a large umbrella covering 303 sq. miles and the height, although varying, never drops below 800 feet above sea level. Now it is easy to see that there is a fall created here over four times as high as our Niagara. No, the people of this island do not go there for their honeymoon because there is no fall or river to be seen; here, every drop of water flows in tunnels in place of the river and in huge steel pipes in place of the falls.

In order to study this scheme closer let us trace the course of a raindrop from the time it falls until it reaches the ocean. If it falls on one of the mountains south of Loch Laggan, may be 2,000 feet above the Loch, landing on the steep stony face with very little soil and only the heather clinging tenaciously to the crags, we observe there is no place for it to linger. The first second and it is away on its trek to the Loch gathering speed and companions all the time. Certainly in this area it will be into the Loch in less than 36 hours unless it is destined to be sucked up to make sap for the heather which is the principal form of vegetation (the only trees growing there are due to reforestation schemes). It would then reach the ocean in two days. In Canada the same cycle would occupy several months.

A dam 170 feet high and 900 feet long of mass concrete, incidentally one of the largest of its type in the British Isles built at the outlet to Loch Laggan controls this rapid run off, and has superimposed on the Loch's placid surface a reservoir of 1,500 million cubic feet. Here the drop with its billions of tiny companions is stored over the dry season. This season is not usually very long because the rainfall is about 70 inches a year. Yes, take a few minutes to comprehend these figures and we see that there is going to be a layer of water 5'10" deep covering 303 sq. miles to be passed through the power plant in an average year.

We will imagine that the drop of water which we have had under observation has now worked its way down the Loch till it has reached the Laggan Dam. Here it changes its direction and enters a 3 mile tunnel. It is a large tunnel 16 feet excavated diameter, blasted from solid rock. It is lined with concrete to reduce the friction on the water. We could well imagine that this drop would pass through this tunnel without acquiring new companions but this is not the case. Take another look at sketch No.1, and you will see that streams, or "burns" as they are called in Scotland, cross over the tunnel and in order that this additional water be also utilized, openings or "shafts" in the dialect of the miner, have been made from the tunnel to the surface and the raindrops from the burns are caught and made to join the one whose course we are tracing.

The drop has now entered Loch Treig which is another storage basin of 7,800 million cubic feet. There is not such a large dam on this Loch but the storage is made available by having the outlet tunnel from this loch 104 feet below the normal loch surface. Thus when the season is dry the surface of Loch Treig reservoir is lowered about 125 feet. After floating around Loch Treig for a while our rain drop will find its way to this last tunnel which is 15 feet excavated diamter and smooth lined for its complete length which is fifteen miles. Again, every burn running over this tunnel is caught, as shown on the map by 11 shafts varying in depth. Eventually our rain drop will arrive at the surge chamber over the power plant at Fort William and take its 800 feet vertical drop down one of the huge steel pipes feeding the turbines. After having helped generate some of the 85,000 horse power it is discharged to the open air a few feet above sea level.

Now take another look at sketch No.1, and see the area marked with double hatched lines north of Loch Laggan which is drained by the River Spey and its tributaries, and on the extreme west which is drained by the Mashie, also a tributary. This is the basin for the head water of the River Spey and at this time any rain which falls on these areas flows to the North Sea, not to the Atlantic as is the water from Loch Laggan.

A tunnel was being driven by the Contractors Balfour, Beatty & Co. Ltd. from Loch Laggan to Loch Crunachdan which when completed with storage dam as noted on sketch, figures Nos 1 & 2, would divert the head water of the Spey to the Laggan system and contribute another 15,000 horse power to the power plant at Fort William. The Minister of Aircraft Production, Lord Beaverbrook, wanted this completed as soon as possible to increase his aircraft production. Balfour, Beatty & Co. had been working at this 2 mile tunnel for a year but their crews were depleted by the call-up of men for the Army and although they had priorities to get replacements they could not procure good miners in sufficient quantity to complete the job. Possibly it was because Lord Beaverbrook was a Canadian and knew there were thousands of Canadian miners in the Army held in England, or perchance because he knew Major, (now Colonel) Campbell, at that time O.C. No.1 Canadian Tunnelling Coy; at any rate the proposal was made that a detachment of Canadian engineers should drive one end of the tunnel and thus allow Balfour, Beatty & Co. to concentrate their crew on the other end.

Mr. McTaggart, Managing Director of Balfour, Beatty & Co., must have had some anxious moments when he agreed to allow a detachment of Canadian soldiers to take over this job, especially when his company had to agree to foot the bill for their maintenance which consisted of pay, allowances, rations, extra clothing and travelling cost. His commitments were heavy and all he could do was trust that Lord Beaverbrook's judgment was correct and hope that the detachment would produce

the desired results. The tunnel was being driven from both ends and it was decided that the Canadians should drive the out-flow and that Balfour, Beatty could then take the two crews they had and amalgamate them to make one good crew to drive the in-take.

The out-flow end started at Loch Laggan and the bottom of it was 14 feet below the surface of the storage basin when the reservoir was filled, but as the plant at Fort William was capable of taking more water than was falling as rain, unless there was an unusual rainfall the surface of the storage basin was kept below the out-flow. Obviously during heavy rains the tunnel would be flooded if it were started when the Loch level was in its highest position. Take a look at the picture of the out-flow No. showing the cement structure at the junction of the tunnel to Loch Laggan and you will note a lintel around the top which is roughly the level of the water when the reservoir is full.

In order not to have the workings flooded if the Loch level rose, a temporary adit was started. The bottom of this was well above high water level and only once did we have trouble when some high rolling waves washed in. This adit was necessary to take in pipe lines carrying (a) compressed air for operating the pneumatic air drills, (b) a water line carrying water for the laying of dust when drilling was in progress, (c) a discharge line to carry seepage and waste drilling water back out again, besides electric power lines used in lighting the tunnel. It also had a 2 ft gauge railway line which was used to remove the broken rock from the tunnel. An electric motor driven by storage batteries (much like the ones you see running around our larger railway stations only rather larger) ran on these tracks and was capable of pulling ten cars each of one ton capacity.

If you look at the pictures you will see that the hills tower above the in-take and out-flow and through this solid rock the tunnel was being driven. On the rugged side of one of these hills facing Loch Laggan the blacksmith shop, hoist house, steel sharpening shed, battery charger station, machine workshop, compressor house covering two 750 cubic feet compressors and a camp for 70 men was situated. All this plant had been erected by Balfour, Beatty & Co. and had been in operation for about a year.

This was the scene which greeted Major Campbell and I when we were escorted to the site by Mr. Brown, Agent for the Laggan-Spey contract of Balfour, Beatty & Co., when we arrived to make our reconnaissance of the project. A close study was made of the living quarters, condition of equipment, and the present working conditions, and it was felt that by working 7 days a week 24 hours a day that the job could be taken over successfully.

The footage being made per week averaged 70 feet and we decided that with a party of 65 men if the job went well we would make over 80 feet per week, if it went very well we would make over 90 feet, and if an exceptional effort was produced over a 100 feet per week could be obtained.

We returned to the Unit and Major Campbell collected a party of 45 men to do this work. I was rather fortunate in having 18 men of this group who had worked for me in civilian life, and also my driver, Spr Matkovich who was an American of Jugoslavian descent who had come to Canada to enlist when Belgium and Holland were over run. He was a marvellous mechanic and was more happy when repairing my car than when driving it. I wanted to keep him with me because he could do anything to which he set his mind. Incidentally he is now a First Sergeant (Technical) in the American Army, having transferred on the completion of the tunnel. Of course he had the traditional "line" with the typical ever ready answer for every situation.

Major Campbell arranged an advance party to precede the main body to draw rations, beds and bedding, etc., under the command of Sgt. J. M. McKinnon. The advance party drove to the site with a truck, station wagon, and motorcycle, all of which were necessary on the project and I arranged to have Matkovich included as I thought it would be wise to have him along knowing that if there was bed and bedding in Scotland, he would have it for us when we arrived. He drove Sgt. McKinnon in my car and by the time they arrived McKinnon had had the experience of his driving and he had experienced the brunt of McKinnon's wit and command of the King's English.

When the main party which travelled by train arrived at Kingussie, a village of some 2000 people, we were still some 18 miles from the Laggan tunnel. The sun was shining brightly but there was a cold south-east wind blowing over the snow-covered Cairn-Gorm mountains. The snow was lying at about elevation 1500 and formed a perfect contour line of white across the grey-brown heather on all the hills. As the months passed we watched that contour line go higher and higher and in August it disappeared and by that time the lower area of the hills had turned purple as the heather was in full bloom.

Sgt. McKinnon had arranged transport to take up to camp. By 1200 hours on the 23 April 1941 we arrived at Loch Laggan to take up the quarters which were to be our home for the next 10 months. This camp nestled at the east end of the Loch surrounded on three sides by mountains as high as 3000 feet. One of these mountains supplied the camp with good quantities of very soft snow water stained a dusky whisky brown by the peat it had filtered through before it percolated to the surface from a crag about 200 feet above the camp where it was trapped and piped for our use.

There was the old General Wade bridge with its high stone arch over the tiny burn which separated our camp from the garden of the Loch Laggan Hotel, an Inn famous as a stopping place when the stage coach used to make its run from Fort William to the southern part of Scotland. Incidentally, the keeper of the grounds of this Inn was reputedly a poacher of some fame. The Estate factor had wisely given him the job in the sure knowledge that he would never catch him poaching, because, while working for the Estate, his Scottish sense of honour would effectually prevent further nefarious activity. This Estate is one of the

largest of the British Isles and is owned by Sir John Ramsden, famous in the rubber industry. Most of the area shown on the map, No.1, is on this Estate and it abounds with deer and rabbits of which there will be more told later.

This would be considered a desolate area to anyone not of Scottish descent with only a few Aspens and Evergreens, and here and there a crofter's house amongst the heather housing the shepherds who cared for the thousands of sheep which grazed on the grass in the valleys and the tender shoots of heather on the hillsides. Very few people travelled the sixty mile stretch of road between Fort William and Kinguissie. Owing to the gas rationing which was in effect guests at the hotel only numbered about twenty five during our stay. It was very comfortable and we enjoyed to the full the hospitality of a Scottish proprietor and its own individual lighting system. The lighting and power for the camp was supplied by a 11,000 volt line taken eleven miles over the hills from Dalwhinnie where it tapped the 33,000 volt main of the Grampian Company.

Yes, it was a lonely spot but there were more people there than would appear at first sight as we realized later on.

Balfour, Beatty's men had moved off the morning we arrived so it was decided that we would start working in the tunnel at 1700 hrs. The men were divided into four groups of ten each, three of which were to work in the tunnel and the fourth to do odd jobs outside. It was decided to run the shifts from 0900 hrs to 1700 hrs, and from 1700 to 0100 hrs, and from 0100 hrs to 0900 hrs, being called respectively Day, Afternoon and Graveyard shifts. Then came the first difficulty of the job and was caused by the War Establishment of the Company which allowed half the men to be paid 50¢ a day trades pay, some of the others to be paid 25¢ a day and some were to receive none at all. I had to decide which men would receive the various rates and tell them. It was arranged that the men working at the face running the pneumatic drills and the slusher would receive 50¢ per day, the men working at the other jobs in the tunnel would get the 25¢ rate while the men doing odd jobs on the surface would not receive any. As soon as the lists, showing which men were working on which shifts, and the job they would have, were posted up on the door of the Orderly Room, (which was destined for the duty of Notice Board to the end of the job,) there was a feeling of dissatisfaction. Every man claimed to be a driller and wanted to receive 50¢ a day. It must be remembered that this was the first time in this war thay any Canadian soldier had worked underground in this country and the Sergeant and I had spent great care and time in getting the men into what we believed was their proper position. In about 15 minutes most of the men not getting 50¢ per day had had their case reviewed and all but three decided to give the job the once over: that was the time I was glad that there were some men in the Detachment who knew me; they saved the day and the job of telling the complainers that I would be fair to every man and that if any man produced and someone else did not that I would change the rates at once. Then also there was one other

fact which helped to control a bad situation. There were about fifteen men in the Detachment who came from the Engineers Reinforcement Unit and had been trained under Colonel Barnes: they had nothing to say, they were soldiers and would do what they were told without question, and so the first shift started at 1700 hrs under the command of Cpl. Hendry who later was posthumously awarded the George Cross for gallantry and devotion to duty.

Sgt. McKinnon then paraded in the three men who were still dissatisfied and I told them the story of the importance of the job, as I had heard it - which was as follows. The increasing of production of aeroplanes and improvement in design depended entirely upon the supply of aluminium and that the 45 Canadian Engineers plus reinforcements which would follow could, I believed, do a job in nine months which was calculated to take a year and by so doing would advance the 15% increase in British aircraft production by three months.

Their answer to this was still that they felt that they should have 50¢ a day trades pay as they had been promised or be returned to the main unit. Sgt. McKinnon then showed his fine spirit. He asked them why they joined the Army if they had no desire to help produce planes to protect London from the bombing that they had seen it receive; if they would not like to think they were doing something so that our soldiers would never have to endure again the dive bombing they had endured in Belgium, France and at Dunkirk; if they would not like to make some contribution towards protecting our Navy so that it would not have to endure the bombing that they had seen our destroyers receive when they were stationed at Dover in April 1940. I knew then that I had a real Sergeant and a man to help me and that with this kind of determination there could be no doubt about the success of the project. He never changed his attitude about the importance of the job and no matter what happened, he carried that same fire right until the job was completed. The three men were returned home and the remainder carried on. These men's behaviour hurt me keenly but I had found an ideal Army Sergeant, a soldier who would be guide, philosopher and friend of every man in the detachment, and at the same time a tower of strength to me, his Commanding Officer. In every sense a man's man, it was evident that Sergeant McKinnon had the rare gift of not only handling men doing a job of work but also of influencing their lives and thoughts. Contact with this natural-born leader in either work or recreation must make men, better soldiers and finer Canadians. With his type of honour and manliness he would exercise a wise, firm and yet friendly control over their conduct so that the reputation of the detachment throughout the whole area would attain and maintain a high standard. I felt that I had gained in this one man much more that I had lost in the other three and it proved to be correct, for as the months passed, in this part of Scotland a soldier who wore the red diamond patch containing the blue initials R.C.E. emblazoned on his battle dress was accepted as one who had a high code of ethics and whose conduct and manners were always above reproach.

The next two weeks were important ones in the tunnel. It is interesting to consider some of the problems, the solution of which had an effect on the success of the project. There are twenty one shifts of eight hours in a week. If one shift drilled off the twenty two holes as shown in sketch No. and blasted them (which is a shift's work, by Army standards, when doing demolitions) and the next shift moved the seventy tons of muck or broken rock (which is actually a two shifts task for the number of men we had employed) then we would have driven 72 feet in a week which was just a little better than the previous average of 70 feet. That was not good enough. Secondly the tunnel had to be straight and on proper grade with always an area of 95 sq. feet and no pieces of rock projecting more than six inches into the area as shown on the sketch No. We were allowed to be off line by six inches in two hundred feet and the same for the grade which was set at one foot rise in two hundred feet advance but the error had to be corrected and a return made to proper position by the next two hundred feet. That was all we had to do - get footage and drive the tunnel to a size, grade and line.

There were two slushers, one in use and the other for a spare, weighing 5-tons which ran on the two foot gauge track with cables and a scraper for loading the muck into cars. These were both over ten years old but Mr. Brown took one of them into his repair shop and overhauled it, making a splendid job. When it was returned we had just the routine troubles which one expects with a machine doing this type of work. As there were seventy cars to be loaded after every blast there had to be a loop made in the track so that the empty cars could pass the full cars. This loop had to be kept close to the working face in order that the men would not lose too much time switching the empty cars to the mucking machine. It consisted of two switches and a hundred feet of track and had to be moved forward after an advance of a hundred and twenty feet had been made. Every twenty feet advance meant installing a set of rails, a four-inch diameter length of air line, a two-inch diameter water line and an extension to the electric lighting system to keep them the proper distance from the face for efficient operation.

If we were going to make a success and surpass the record of our predecessors, we had to work to a system of each shift cleaning the broken rock off the track, near the face when it commenced work, moving the slusher close up to the broken rock pile left by the previous shift and securing it solidly. This had to be completed in one hour. Then in the next hour the drillers would get their gear (machines, hoses, bars, arms, etc.) moved up to the face while the muckers with the help of the slushing machine, cleaned the broken rock from the face making room for the drillers to set up their machines and go to work. For the next four hours the drillers set up their machines and drilled the top 18 holes as shown in Sketch No. Ten foot steel was used in drilling the cut and we aimed to break seven feet a round. At the same time this work was going on, muckers with the help of the slusher, loaded the remaining broken rock. In the nest hour the slusher, its job for the shift completed, would be moved back fifty yards so it would not be damaged by the blast and the bench would be moved back, the drill holes loaded and the charge exploded making a seven-foot advance if we were lucky, six for an average or may be only five

if we had had bad luck, but always leaving a muck pile for the next shift to deal with. The last operation this shift did as they left the tunnel was to turn on the valve in the air line thus blowing in 1500 cubic feet per minute of fresh air to clear the smoke left by the last blast. Twenty minutes after the explosion we aimed to have the next shift start this cycle all over again, in terms of a miner that is "taking out a round".

That was our aim. In the first week no shift took out a round in 8 hours. Some of the men knew it could and should be done and they tried hard. Churchill's phrase of sweat and toil was put into effect here. Someone had calculated that if a shift of men took out a round in 8 hours they had helped our cause to the extent of one and a half planes. The good men, and there were many of them, lost weight. By the end of three weeks our M.O., a British Colonel, ordered that four men be not allowed to enter the tunnel because they were run down and ten pounds under weight. They were my best men and I had to find some means of drawing adequate food for them. I made representations regarding the need for sufficient rations to every one I saw: first to my O.C., Major Campbell; then Major Dunn, Colonel Bennet and Colonel Douglas when they arrived to inspect the work. All agreed and promised to give what help they could to increase the ration. The two latter gave great aid as well by helping me to procure woolen underwear instead of cotton, rubber boots and gloves. A pair of rubber boots would only last about two weeks and many men were working with wet feet for weeks at a time, though they would not quit work. It had been impossible for me to draw these articles in the quantities we required.

One day Brigadier A.B.P. Pereira, D.S.O., D.D.S.T., Scottish Command, while driving past the job saw the rock dump with soldiers working on it and stopped to have a look and stayed for lunch with me at the Inn. We chatted of the last war job he did in Egypt with his tunnellers and he asked if he could go in and see the men working. He was greatly impressed. When we came out he said "Now what troubles are you having. What can I do to help you?" Here was a friend who had been won by the grim determination of the men to get on with the job regardless of the hardship. I mentioned shortage of rations and the extreme difficulty in securing telephone communications with my H.Q., sometimes waiting as long as thirty six hours for a call of only three minutes duration. He walked to my telephone, told the operator who he was and asked her to contact his office in Edinburgh. The telephone was immediately put on priority A1. From then on if I had to get some spare part for a broken machine shipped to me on the next train from London I never had to wait more than four or five minutes for the call to go through. A letter came two days later instructing the Army Service Corps Unit to issue me one third extra ration per man of bread, tea, milk, sugar, meat, jam and butter. The ration question was at last settled satisfactorily. I understand that this was the first time that any unit had received

such an increase in the Army. Since my return to England I have worked on several jobs where I have seen this scale put into effect and have often wondered if any one realized the trouble it had been to establish the precedent, or the historical significance that it was first granted to Canadian hard rock tunnellers at Loch Laggan.

To relieve the ration situation strong efforts were made to procure the establishment at the camp of a canteen under the auspices of the Navy, Army and Air Force Institute. The Canadian Auxiliary Services, considering the detachment too small, had refused to provide a canteen although their help in other respects was generous in the extreme. There was no accommodation for a canteen but the British came to the rescue with two Nissen huts. The men cut out sites for them from the side hill, cemented the floors and erected them in their spare time. Mr. G.R.J. Vicks, Area Supervisor for the NAAFI, sent three women operators who did a grand job with their cooking, frying bacon and eggs, potato chips and baking buns. Of course there was trouble in finding suitable billets for them in the district but these were overcome with the co-operation of the Estate and the NAAFI staff were very comfortable and happy during their stay at Laggan. The other hut was made into a recreational room. Capt. A. McIsaac of the Canadian Auxiliary Service supplied the unit with musical instruments and as well as the several moving pictures. A band was created under the command of Sgt. Denny, whose official job was chief fitter for the Detachment and who was an expert on the drums. Mr. Vicks gave us battleship linoleum for the floors. Mr. Brown of Balfour Beatty, had the walls painted a cream colour and Mr. Vicks supplied a piano which was moved back and forth from the canteen to the recreation room. Incidentally Miss Cameron, the grey haired Manageress, was an excellent pianist, and it was a treat to hear the boys coaxing her to play while they sang so that she would forget to close the bar at 10 o'clock. When the rumour went round that girls would run the canteen the men spoke of them as "heart throbs" but when they arrived and were found to be not dimpled flappers one could fairly hear the sighs. Later, when their capabilities in cooking had been tested the wisdom of the authorities was recognised and they won the approval of everyone. When we held a dance at our camp, which we tried to do weekly, girls had to be imported from Kingussie by truck because there were only three or four living near the camp. This was done without mishap and with great success several times before the Detachment left Loch Laggan.

The rations were helped in another way which caused me a lot of explaining before it was adjusted to everyone's satisfaction. The camp area was overrun with rabbits and sheep while grouse flushed from the heather in droves and I have seen as many as forty deer come to the Loch for a drink not two hundred yards from the tunnel mouth. In order to maintain peace with the estate owner we had had a kit inspection before we left the Unit and collected all the ammunition (we thought) but the first few days the barrage was terrific. Every hour a shot would ring out to echo and re-echo throughout the glens. The chief stalker of the estate, Findlay MacIntosh, collected his assistants and ghillies to catch the

poachers. The men had been warned what would happen to them if they shot stags or hinds so he was never successful. I often thought that he was more annoyed at not being able to catch them shooting a deer than he would have been had he found them in the act. He had a feeling that he was being out-smarted and out-stalked which really hurt in a tender spot. He come to me and complained. I told him the men would not shoot his deer but that it was pretty hard to stop them from shooting rabbitts. He did not believe me. He appealed to Sir John's daughter, Mrs. Feilding, who was living at Ardverikie, to come and interview me to try and discover, as she told me afterwards, if I were the arch-stalker of them all, much too clever to be caught. After we had been there about a week I had some visitors, all of whom were anxious to locate the suspected stalkers. First the local police arrived; a little later in the day the British North Highland Area Military Police came in the form of a captain and a sergeant. That evening I received a visit from the Canadian Military Police stationed at the Forestry Corps, and the next morning a representative from C.M.H.Q. Military Police as well as a telephone call from my Commanding Officer. By this time I was rather annoyed, but Major (now Lt.-Col.) Dunn from C.M.H.Q. arrived. He accepted my story and I felt relieved. However, Mrs. Feilding came again and I sensed once more the feeling of frustration they were enduring at not being able to catch the culprits. I assured here there were none and that as I had the confidence of my cook, I was certain no venison was cooked in our camp. I would have collected the rifles, only I was afraid if the men felt I had lost trust in them they might start to poach behind my back because there were plenty of rifles they could have borrowed without my knowledge. That evening I saw Sgt. Denny come from across the Loch in a boat loaned to me from the hotel. He had two grand rabbits, and hardly had he passed before Findlay, complete with telescope, rode up on his bicycle. He could hardly speak because of his anger. He said "Your men are shooting deer.. I saw one of them shoot right in the sanctuary" (an area which the estate has for feeding the deer in the winter and no staf or hind is ever hunted there). I had had enough so I told him that if he ever saw any of my men shoot at the deer that he could be certain the deer was dead and if he could produce the deer I would take satisfactory action against the culprit. He hurried to the boat and returned to sit crestfallen on a stool in the Orderly Room saying he was very sorry there was no deer there. When I told him the story of Sgt Denny and the rabbits he went away and I had a feeling he still wished Denny had shot a deer so he could have caught him.

Sgt. McKinnon realized how much I had endured over this poaching situation so he called a parade without my knowledge and told the men the story of my visitors. He said he did not think it was fair to allow me to endure any more abuse. I never heard another shot for the next two weeks.

Mrs. Feilding came again to thank me and to invite me for tea and for some on their private loch and after that as the months came and went she was always willing to help in every way. I was taken stalking and shot several stag at different times, and the men had venison as a gift from Sir John. Many times during my leaves I have returned to enjoy at Ardverikie the hospitality and friendship which was created in those early months and which I shall treasure all my life.

There is a legend that Queen Victoria tried to buy Ardverikie from the former owner, Cluny McPherson, whose loyalty to the memory of Prince Charlie was so great that he would not sell to British Royalty, but may be the sixty-five inches of rainfall of the Ardverikie area compared to the thirty-five inches of Balmoral had something to do with which estate was purchased.

There are incidents which happened in Kingussie that should be mentioned to draw attention to draw attention to the exemplary behaviour of the men. The picture house operated four evenings a week, one evening it was used as a dance hall and one evening for whist drives. The hall was very small for a dance and would accommodate only a hundred couples so the tickets were rationed out, 15 to each of the two Forestry companies in the district, 15 to the R.A.S.C. unit stationed there and 15 to the townspeople. At the start we were allowed 7 but before we left the ration was lifted and any of the men who wished tickets could have them. The Colonel who was in charge of the medical unit which ran the dances told me one time when I returned on a leave that he wished the tunnellers were back again, because while they were there he did not have a complaint about any of the men, in his own, the Forestry Corps or the R.A.S.C., but it was different now, there were always fights. Fortunately the tunnellers had exhibited the gentlemanliness and training that Sgt McKinnon had inspired in them to good effect.

There were many jokes played and McKinnon was a master at it. One evening at the dance in Kingussie the friendly feeling between McKinnon and Matkovich created on the trip to Scotland came to light. I noticed McKinnon edging his way towards Matkovich and a girl who had been very much attracted by his personality and intriguing overtures. I judged something was about to happen so I kept an ear open. I had received a letter that day from the solicitors of Murray, Beith and Murray of Edinburg, and most likely Matkovich had seen it and passed some comment on it to McKinnon who had decided to have a joke at his expense as well as teach him to mind his own business. I heard McKinnon saying "I think it was a mean trick of the solicitors, Murray, Beith and Murray, to write to the Officer about you." You could see Matkovich knew he should keep quiet but he could not resist his curiosity so he said "What was that?" McKinnon replied, "you know, about the girl in Surrey, (that was where we were stationed

previously) who is sueing you for support". His girl friend coloured up and Matkovich was speechless but only for a moment, then he said "It is not true, I will get my officer, he will fix this". He dragged me over to clear him and I pretended not to have heard the story so he had to re-tell it. When he had finished I explained to him that I would have to use one of his own stalk answers when he wanted to avoid the issue, that is to say it was a military secret and I was not allowed to talk. He went away calling me a traitor and accusing McKinnon of having turned me against him. It looked as though the episode had ended but the next week he came in with a little girl of about five who walked shyly across the floor to McKinnon and who looked up cutely and said "I did not know you were going to the dance tonight Daddy".

After a while the telephone at the camp became pretty busy with local calls from the men's girl friends. McKinnon decided he would put a stop to this, so for about a week every evening he answered the telephone personally and when some sapper or other was asked for he would say "Yes, I will try to get him but the last I saw of him he was with his blond going down to the beach for a swim". It was very seldom that the caller would even wait for anything further and it was not likely that they ever called again. I have heard the men accusing him of doing this. He would just laugh and tell them, "You are too smart to let a little thing like that disrupt your operations, be resourceful my man". The men liked and respected him. He was always ready to give a hand, yet no man could take liberties with him.

The jokes that one shift pulled on another about the work in the tunnel could be pretty cruel. I have seen the men on one shift in the latter months, when every shift made its round unless there was a serious breakdown, measure the former shift's work and when they were standing around in the canteen in the evening one driller would get talking about breaking a seven foot round. At once one of those on the other shift would say, "That is all very well to tell us about that up here but we measured your last round and it was just five feet, six inches. But it is all right, there are always two kinds of miners, some miners in the tunnel and some beer parlour miners: you know which one you are".

The men were not the only ones who took a ribbing, I remember well the first time Mr. McTaggart of Belfour, Beatty and Company came. It was during the fourth week of our sojourn at Laggan and their footages for the previous week had been 67 ft, 68 ft and 85 ft respectively. We started on the tour of inspection and as we approached the job from the Orderly Room the rock dump came to view and there was a train unloading muck on it. He took one look and turned to me and asked "Is that where you are dumping your much and where did you find that train load?" I stammered and stated it came from the tunnel and that we were just carrying on from where his men left off. He replied "Idid not think you would be having any lumps in your muck, it surely must be all dust from the amount of powder you use and I did not think there would be that much from the footages you have been getting". We came

to the steel shop where they were sharpening the drill steel. He asked "Whose steel is that? I did not think your steel would need sharpening because you could not have blunted that much in going as far as you have gone". When we came to the place where the men were straightening the rails and making them up into sets ready to take into the tunnel he commented that I would soon have a good reserve of them unless we speeded up a little. When we started in the tunnel and the drills could be plainly heard running as well as the slusher he stopped and it was evident that he was pretending to listen. Soon he commented "I did not expect to hear any noise like that. It really sounds as though someone is working and I imagined that you would have done the little bit of tunnelling you do at night when nobody was looking".

By and by we approached the face and the men could be seen to be working at top speed stripped to their waists and glistening with perspiration. He took in the whole situation noting the muck car off the track at a worn switch, one of the men with his machine apart trying to repair the blow pipe. When we got away from the blowing of air, the hammering of the pneumatic drills and the roar of the slusher, because he would not allow me to stop the men from working so it would be quiet enough for us to talk, I said "You can now see that we are not getting footage for lack of trying. It is nearly two years since these men have worked like this. They are not in shape. They will be some day. One of these times the green ones will learn to watch the switch so the car will not go over the rails and the drillers will learn to take care of their machine so the water tube won't get broken, but this will not come in three weeks. There will come a day when you won't be able to criticize us like this." I had the inside information that the day before we had taken out three rounds in three consecutive shifts for an advance of twenty feet. I felt that the time had come when we might hope to get two such days in a row and may be before the tunnel was completed, that we would be able to have seven days without mishap and I was certain that he would be just as pleased about that a I would be. I realized that his criticism up to then was quite just but it rankled just the same. Shortly after that he left saying he would return tomorrow with his President, Mr. Balfour.

My O.C., Major Campbell, came with Mr. Balfour and MacTaggart, and we proceeded to inspect the job again. MacTaggart now joked about the way our hoist men would run to catch the muck train to give the helper a hand to tip the cars (his effort would maybe save an hour over a period of a shift for this equipment which was working to capacity). He commented that his men would not do that. Then when in the tunnel we came to a car off the track again he pointed out how one of the men making a Herculian effort had replaced it on the rails, whereas it would take three of their men to do the job. Mr. Balfour listened to this with interest and remarked

on the size and line of the section which we had driven. He checked the grade and made no immediate comment. I will admit that up to that time our tunnel was overlarge, making extra work. When we were all outside where it was quiet he turned and said "How do you think the job is going?" I admitted that so far our apparent effort, judged solely by the footage, was not so good, but if the men kept up their effort it just must happen that we would do better and surprise him. He said "Of course you are not suggesting that you will break our record of a hundred and fourteen feet in a week." MacTaggart spoke up with the remark "You cannot break him down, that is just what he means." Major Campbell then said "They will do it all right, you just wait and see." Mr Balfour replied "If you ever do, I'll buy you and all your men the best banquet they ever had." We all shook hands over that and they left. We had that dinner, and it wasn't all food either that he supplied.

Sgt. McKinnon was called in then and we decided to make the drive the next week for Mr. Balfour's dinner. He said one thing he needed was a good operator for the slusher, one who would take care of it in the same manner as my car was cared for. I caught the inference and knew I was being squeezed; however he was right. There was no doubt it if the slusher didn't run for one hour through lack of proper attention we lost 6 feet. I lost my driver and McKinnon, who held Matkovich in the same esteem as I did, had captured him as a slusher operator. May be Matkovich had some grounds for saying I had thrown him to the winds. He would come from the tunnel with bruised hands - greasy, dirty and wet, so different from the way he appeared when driving our G.O.C. on his inspection. He was reloaned to me for that day only, but the slusher worked well. It is not fair to pick out any one man for his good effort in the next ten days. The loop was moved close to the face. The track, pipe and machines were got into shape with everyone hoping there would be one week without breakdown and on Wednesday (that was the day Mr. Roberts, the Resident Engineer, of Sir William Halcrow & Portness, measured the tunnel) we were ready to go. Everything went like clockwork. Not that the men worked any harder, that would have been impossible but little odd jobs of repair were put off and nothing was allowed to interfere in any way and one week later, when the tunnel was measured, we had broken the record and set up a new one of a hundred and twenty feet, arrecord which was to be broken several times in later months, once by the civilians in their end of the tunnel.

But such good fortune did not last. The following week we endured our hardest test and sustained our greatest loss. About four o'clock on Friday afternoon, June 13, the powder house exploded. Sgt. McKinnon and I were together in the Orderly Room. When everything had come to rest we eased our way out through the studding and could see the devastation. The hoist house, workshop, and powder house had disappeared. The steel sharpening shop was absolutely flat and on fire. I wanted to run away and hide. I had no desire to go and find who was missing. As we moved towards the wreckage McKinnon spoke saying, "How many do you suppose are gone." I had no heart to even hazard a guess.

Every man not on shift in the tunnel who was not hurt came to help. Sgt. Denny dug under the remains of the burning steel shop to find who was calling for help. It was Spr. Blow who had been blown there passing through the walls of the machine shop where he had been working. The remaining wounded were gathered on stretchers and placed beside the road for first aid treatment and as the telephone lines were all down a man had gone by motorcycle for the M.O. who was thirty miles away. Long before he arrived the wounded were loaded into the station wagon and taken to the hospital at Fort William where Major Jaffries, a British surgeon, did a marvellous job. Blow, who was unrecognizable, did not die but recovered to carry on as a soldier. Later, the less seriously injured were treated by the M.O. and we called the roll to find we had eight in hospital, two of whom were very badly hurt and two killed. Cpl. Henry it appears was the first to see the fire as he came out of the tunnel. He ran to warn the hoistmen and steel sharpener to leave while getting a pail of water at the same time to fight the fire. He could have easily got clear had he tried but he knew Blow and maybe others were in the shops and that the plant would be completely demolished, stopping work for some time, and that all the good effort which had been made would be effaced if the powder house exploded. He was posthumously awarded the George Cross for his action. Spr. J. Stewart, the other fatal casualty, was killed by falling stone as he came unexpectedly from the tunnel.

Brig.-Gen. J. B. White, Commander Cdn Forestry Corps, came to see us that evening. There was not a building left which was rain proof; they were all wrecked. As he looked around he asked if he could help and he did. By the next morning he had lumber delivered to completely rebuild the camp and shops. Mrs. Feilden loaned her lodge for sleeping quarters for the men while the camp was being rebuilt. Balfour, Beatty & Co. supplied them with hot meals from their camp and we were blessed with fine weather for ten days, the only consecutive ten days without rain I remember in all my stay in Scotland. By the eleventh day the place was rebuilt and ready to work but it was not the same. Cpl. Henry could not be replaced. His work as well as his spirit was missed. His shift had been the first to take out a round in eight hours, his had broken the longest round, and his comments to some complaining men about the hard work such as "Wouldn't you rather work eight hours a day every day in this tunnel than be a captured airman in Germany" were greatly missed. However, the job started again and at the end of another week we had sixty-eight feet. Three weeks before, I thought that kind of week had gone for ever. McKinnon never lost heart or patience. When we would talk about it in the evening he would say, referring to the men, "They worked our way before, they will again." But it was hard. At the end of that month we had averaged eighty-seven feet per week and had there been no explosion the very least we would have expected would have been one hundred feet.

However, the civilians on the other end had seen their record assaulted and beaten by some colonials. This was not a nice thing for them to endure and their average had jumped from seventy to ninety feet per week so our honnour was at stake again.

Mr. Brown of Balfour, Beatty & Co. gave every assistance in repairing our broken machines. Mr. McTaggart came to have a look at the job. Gone was the hard-bitten man who had first treated our efforts with scorn. He came with an offer to help us. "Is there anything I can do?" he asked. When the request was made for two new pneumatic drills and a new motor for the slusher he saw that the next day they were on the train even although they were a controlled store hard to get. He offered us 2/6 a man per week extra to the men's wages he had arranged to pay if we could do as well as the civilians which was ninety feet in a week, and 3/6 if we could get ninety-five feet. I told him that it would be a disgrace to my men to offer them eight or ten cents a day extra for working hard; that they were working to produce plants not for money because if they were working like that in one of our mines at home they would expect and get $10.00 a day at least for their effort. Mr. McTaggart took a quick look at me and said, "I appreciate that, what do you think we should do, I am paying all these men's wages and living costs and I want to do something for them to show my appreciation of their effort. We gave you one banquet, do you want another every week? Food is hard to work out, remember, but I do want to do something." McKinnon had joined us and after some consideration I mentioned that we would get a hundred, a hundred and five, or may be a hundred and ten feet per week. McTaggart laughed and said, "You will never do that." McKinnon spoke up to say, "We did it before. We will do it again. Wait and you will see." Then McTaggart said that the men would receive ten shillings for sixty men if we could average a hundred feet for four consecutive weeks (There was to be no teeing up like we did for the record), we would have to move the loop, rails and pipe lines, etc., and still make the footage each week; fifteen shillings for one hundred and five feet, and one pound for one hundred and ten feet. Mr. McTaggart had shown how shrewd he was, but it was fair because he allowed us to carry forward any excess over the minimum set down we made for the four weeks to the next four weeks period. This was also clever, because it meant there would be no break between the four weeks period. He paid all these rates. We worked right through these rates until at the last he was giving us the one pound, never once missing out or dropping to a lower rate.

I am certain the men would have done the same work without this inducement because they were interested in producing planes. They talked them at meal times, in the canteen, at dances, and in their huts at night. Those tunnellers held the record in that tunnel of one hundred and forty-two feet driven in one week, also the record for one month, and for three consecutive months. They made a grand show.

Before telling of the final banquet I would like to make mention of one man who came in and showed these men that they were not the only ones who could make a good effort. Some of the men had toothache and the nearest dentist was seventy-three miles away. I looked at their mouths and found several with teeth rotted off level with their gums. Many of them were my best men and I could not allow the large number that required treatment away for sufficient time to have them repaired. An inspection of the men by the Forestry Corps dentist revealed that all but one required dental treatment with some twenty-five extractions, one hundred and eighty-four silver fillings, two hundred and twenty-nine cement fillings, forty-four silicate fillings and twenty dentures to be done. When I reported this to my O.C., Major Campbell, he arranged to have a dentist sent up. Capt. Llyod Davis arrived and I had fears he would hold us up by requiring men to be paraded to him when he required them but this was not the case. He took a trip down the tunnel, saw what was going on, looked over the names of the men who were on shifts and started to work. There was only one man who missed a shift and he had to have several teeth removed. Not one man was missed and in no other case did it interfere with the work. He would work any hours of the day or night and many times when I came from the tunnel at 10:30 P.M. I would find him working on some man who had not been available earlier and who had to have an impression taken that day if his plate was to be fitted before he left. He completed his work in ten days and it did the men good to see a man take as much interest in his job as they were taking in theirs. It was a pleasure to have him there and I was sorry to see him go.

There were several times when outside difficulties made the work harder in the tunnel. After we had broken the record, the civilians working in the other end discovered that if they could get just one of the men on one of our shifts drunk, that we would lose a round, because every man had to do his part in taking out a round. It was a precision operation with not a man or moment to be lost if a round per shift were to be made. Thus if they could get two men on different shifts drunk we lost twelve feet and our average footage dropped from one hundred to eighty-eight feet for the week which was below theirs. Of course there was the usual enjoyable party in the process of getting the men drunk, but it was disastrous to our work. This was brought to my attention by the Corporals in charge of the various shifts. They would ask to have the offenders, after a second offence, taken away from them and it ended up by punishment being meted out very severely. No two or three men could be allowed to ruin the fine effort of sixty. Finally I saw the Sergeant, aided by some others, forcibly assist these generous civilians from our camp so effectively that our trouble was over in that respect.

It is September. The job had now reached its final phase. There was no stopping the men. I was the one who was being chased. If there was any shortage of straightened rails I would hear remarks like "you would think that an easy job such as getting rails would not fail here" (That was because some train had not delivered the rails at our station), but I should have ordered them two months earlier instead of six weeks. Of course I should have anticipated the extra one hundred feet that they had driven in that time, to make sure of these rails. There was also the time when a terrific storm blew over the hills taking down a section of power line for about one hundred yards. I was accused of not having impressed the fact on the power company that we were held up for twenty-four hours. In the end, I was forced to arrange for some of them to go and put up the poles, even although McTaggart had arranged that any hold-up over which we had no control was not to have any effect on the reward. I was delighted about this. My troubles were over and I had a troop of men who would and could surmount any obstacle. There was never any doubt about the one hundred feet per week and Major Campbell and McTaggart asked about completion dates. At that time it looked as though the end of January 1942 would see it finished but as the weeks went by and the rate changed from one hundred to one hundred and ten feet per week it was evident we would finish before Christmas, and by the 1st December the last round could be promised for certain, unless there was a serious mishap by 20th December 41. Thus the men completed a twelve months job in less than nine months.

The contractors arranged a celebration for the break through with officials from their firm, the British Aluminium Co. and the Canadian Army present. A banquet was held and very much enjoyed in the Duke of Gordon Hotel, Kingussie, and later the party proceeded to the tunnel where the late Major-General Hertzberg, Chief Engineer, Canadian Army, closed the switch which fired the last round.

There was another day's work to be done to clean out the broken rock, so the banquet for the men was held at our camp the following day. It, too, was supplied by the contractors, complete with liquid refreshments. No man rose from the table desiring more turkey, Christmas pudding or the cup that cheers. There was an abundance and Sapper Cramb, the cook, had surpassed himself and anyone who has eaten the food from his kitchen knows just how good it is. His effort all through the job had been on the same high level as the men who had surmounted all difficulties to achieve their record.

By the evening of the 22 December all the men were paid, given ration cards and leave for two weeks. But, alas, before the truck had taken them to the station a telephone message was received from Headquarters to the effect that the Detachment was to complete the outfall, remove truck, pipe, rails and wiring from the tunnel. This was about two weeks' work for twenty four men, but it mean that whoever remained would lose

Christmas and New Year's leave. There was nothing to do but call a parade and ask for volunteers. When the request was made, every man but one stepped forward. Finally, it was arranged that all those with relatives in the island should take their leave, and the others went back to unpack their kit and return to the tunnel. That was typical of the esprit de corps of these men; they were a team of thoroughbreds. The work went with a rush and when it was completed these men, too, went on their well-earned but delayed holidays. The barracks stores were returned and the last four men left Loch Laggan with the hills again covered with snow and the lake a sheet of ice on 10 Jan 42. There is a monument to Canada in the form of a tunnel which any Canadian may see, if he will stop at the Loch-Laggan Hotel situated half way between Kingussie and Fort William.

"Figures" referred to in this appendix appear as Appendix "F".

MAP OF CATCHMENT BASIN
LOCHABER POWER SCHEME

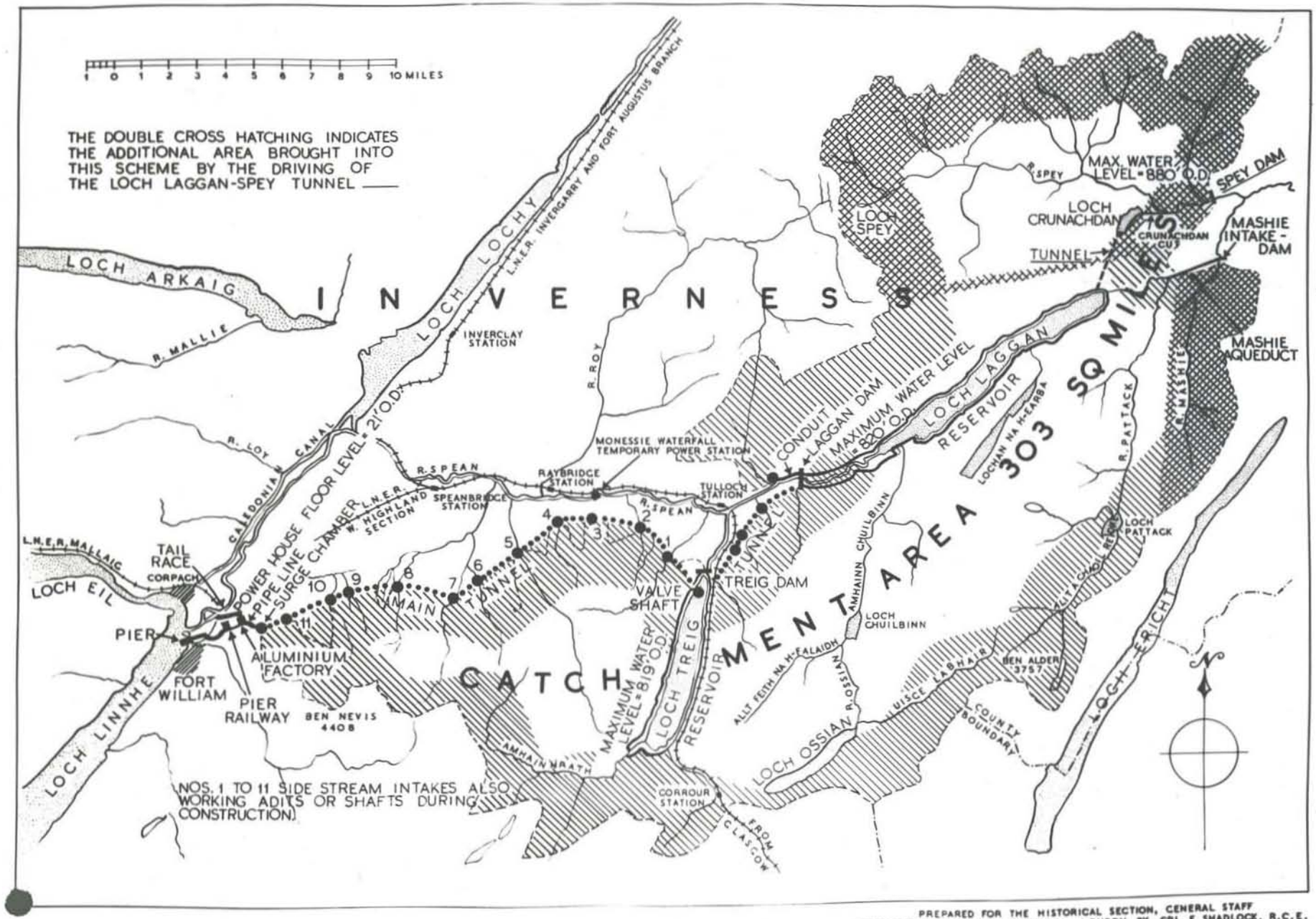

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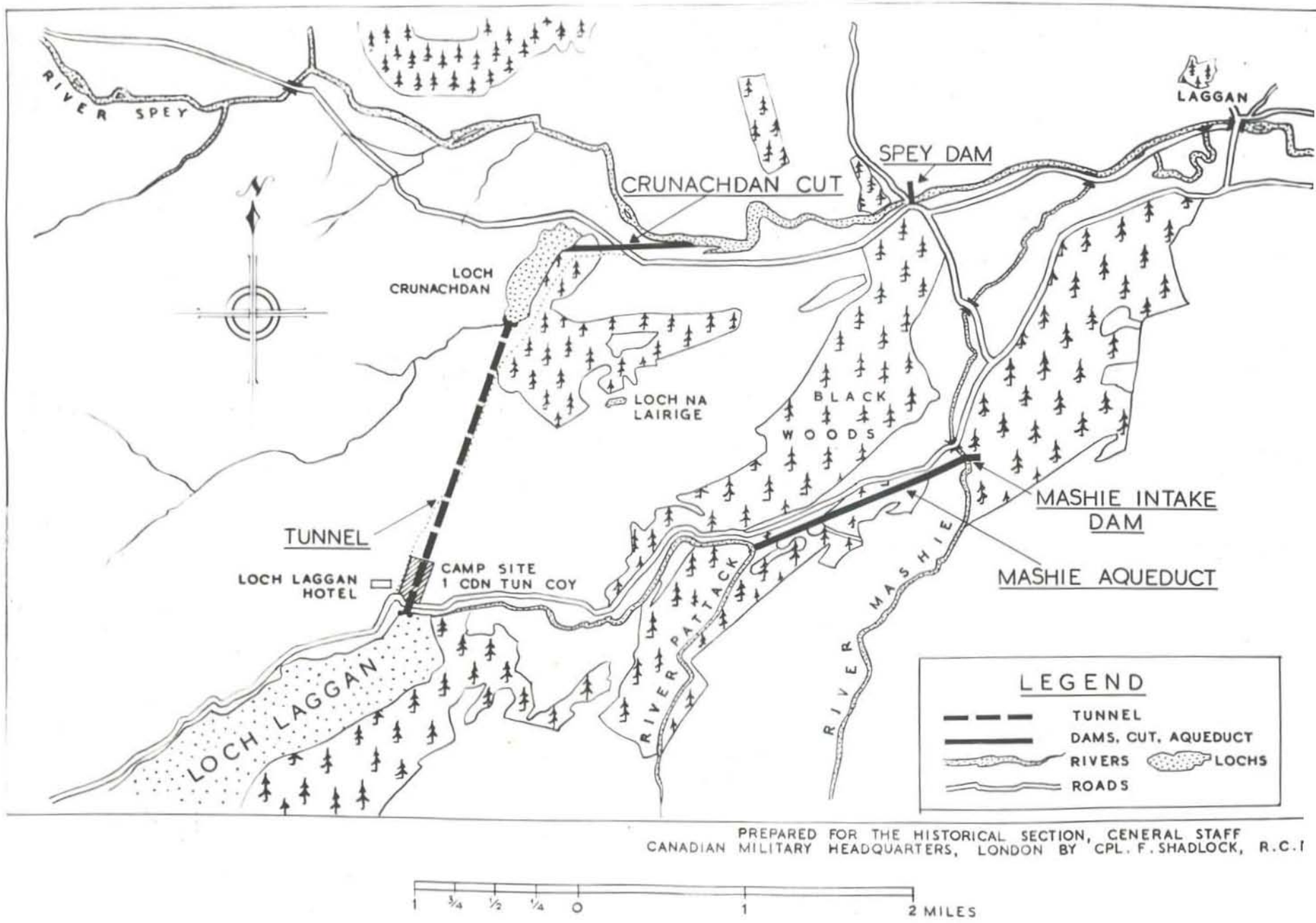
FIG. 1


RIVER SPEY
LAGGAN
SPEY DAM
CRUNACHDAN CUT
N
LOCH CRUNACHDAN
LOCH NA LAIRIGE
BLACK WOODS
TUNNEL
MASHIE INTAKE DAM
MASHIE AQUEDUCT
LOCH LAGGAN HOTEL
CAMP SITE 1 CDN TUN COY
LOCH LAGGAN
RIVER PATTACK
RIVER MASHIE
LEGEND
TUNNEL
DAMS, CUT, AQUEDUCT
RIVERS
LOCHS
ROADS
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1 3/4 1/2 1/4 0 1 2 MILES

FIG. 2

SKETCH SHOWING PLAN OF BORE-HOLES IN TUNNEL

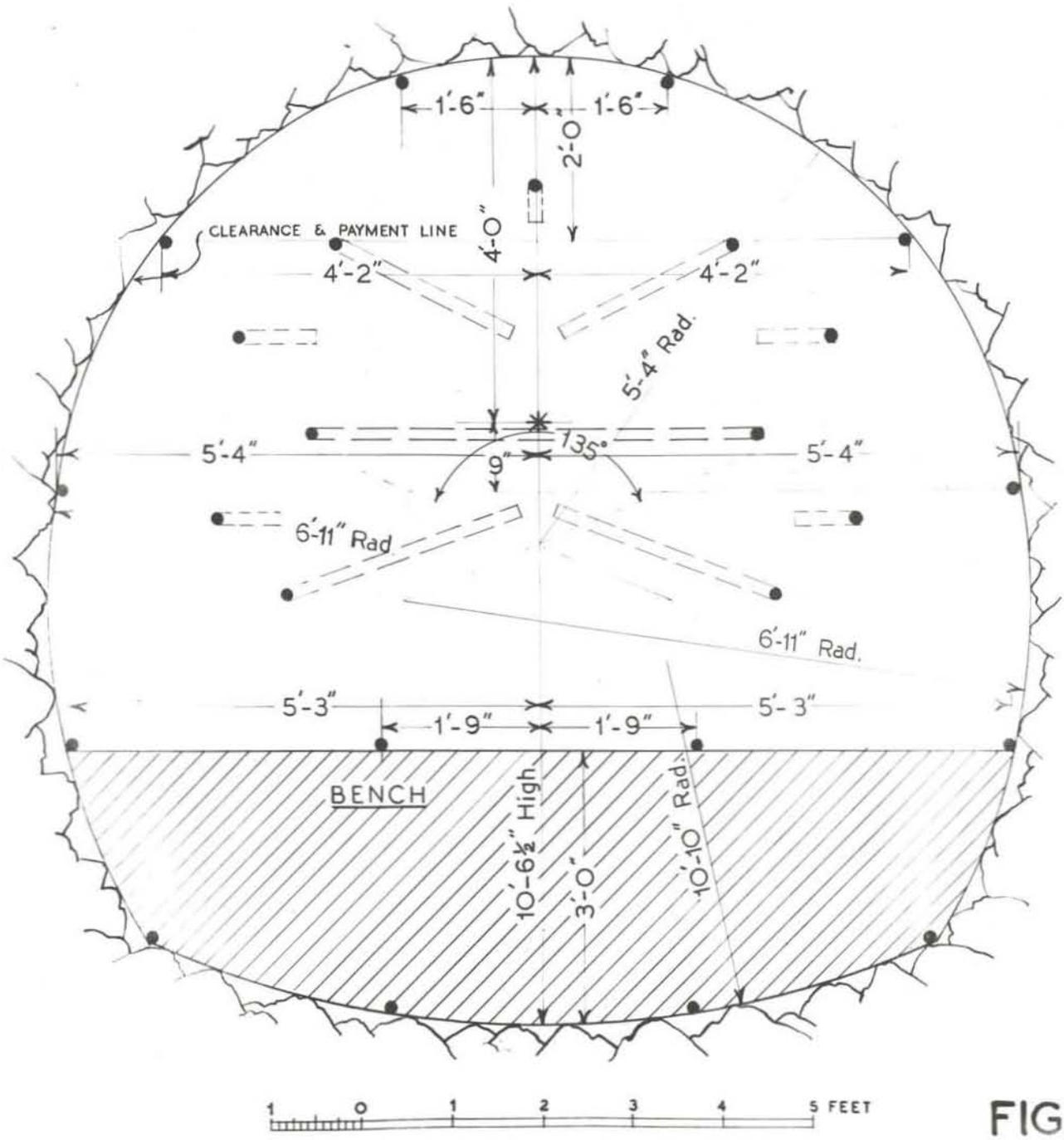

FIG. 3

HATCHED AREA OUTLINES BENCH
BLACK CIRCLES REPRESENT DRILL HOLES APPROX 7' LONG.
BLACK CIRCLES WITH DOTTED LINES REPRESENT CUT HOLES APPROX 10' LONG.
NO PIECE OF ROCK IS ALLOWED TO PROJECT INSIDE TUNNEL AREA MORE THAN 6 INCHES.

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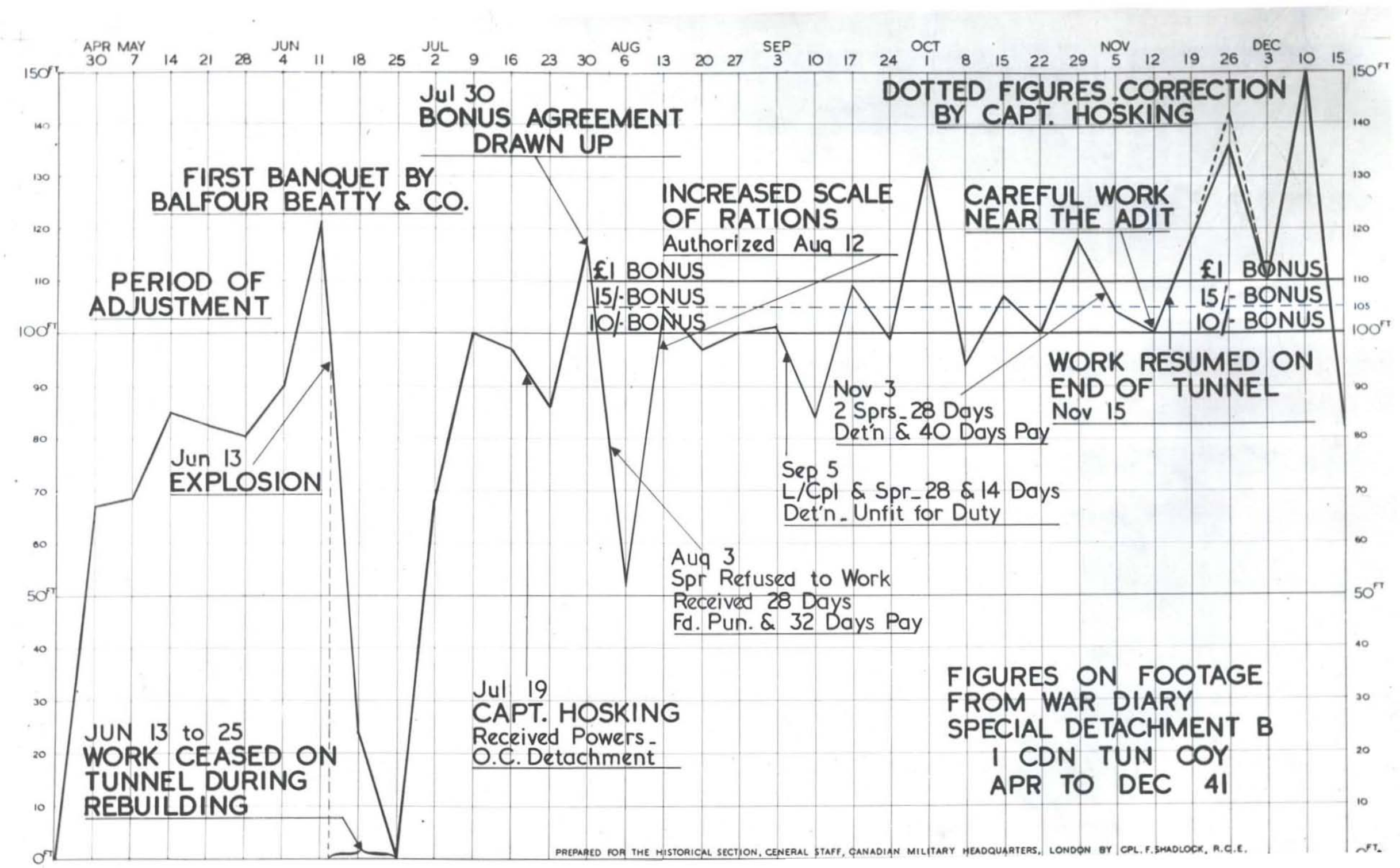
APR MAY JUN JUL AUG SEP OCT NOV DEC
30 7 14 21 28 4 11 18 25 2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 15
150FT
100FT
50FT
0FT
Jul 30
BONUS AGREEMENT
DRAWN UP
DOTTED FIGURES. CORRECTION
BY CAPT. HOSKING
FIRST BANQUET BY
BALFOUR BEATTY & CO.
INCREASED SCALE
OF RATIONS
Authorized Aug 12
£1 BONUS
15/- BONUS
10/- BONUS
CAREFUL WORK
NEAR THE ADIT
£1 BONUS
15/- BONUS
10/- BONUS
PERIOD OF
ADJUSTMENT
Jun 13
EXPLOSION
WORK RESUMED ON
END OF TUNNEL
Nov 15
Nov 3
2 Sprs. 28 Days
Det'n & 40 Days Pay
Sep 5
L/Cpl & Spr. 28 & 14 Days
Det'n. Unfit for Duty
Aug 3
Spr Refused to Work
Received 28 Days
Fd. Pun. & 32 Days Pay
JUN 13 to 25
WORK CEASED ON
TUNNEL DURING
REBUILDING
Jul 19
CAPT. HOSKING
Received Powers.
O.C. Detachment
FIGURES ON FOOTAGE
FROM WAR DIARY
SPECIAL DETACHMENT B
1 CDN TUN COY
APR TO DEC 41
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