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A Wire from the Antarctic

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Scott

Tests Made on 50 year old Wire from the Antarctic

By FERGUS G. McDONALD, M.I.E.E.*

WHEN Scott went to the Antarctic on his last expedition, in 1910, he took with him some telephone equipment, and some bare aluminium wire. Some of the original wire, after fifty years, has arrived back in England, recovered by New Zealanders now based near Cape Evans. There is a great deal of interest in the story of the wire, and of its recovery.

The telephone equipment and the wire were presented to the expedition by the staff of the National Telephone Company. This company operated the telephone system in Great Britain until the G.P.O. took over in 1910.

In the *National Telephone Journal* of July 1910, there appeared the following Editorial article:

"What we believe to be the first attempt to use the telephone in connection with Polar discovery will be that made by Capt. Robert Scott in the expedition which has just set sail to make a further endeavour to reach the South Pole. We congratulate the staff on their gift to the exploration party of a telephonic outfit, which will doubtless facilitate communication between point and point on those desolate shores, and, it is hoped, afford some additional security to human life in this hazardous expedition. The proposed telephone system consists of lines from the winter quarter's hut to the observatory hut (about a quarter of a mile away), from a post in the open air near the observatory hut to another post in the open air about five miles away, and from the winter quarter's hut to Sir Ernest Shackleton's old quarters, 26 miles distant. The wires will be laid direct on the snow, a few feet apart; the low temperatures which are to be expected in these regions will, it has been calculated, improve the conductivity of the wire by some 30 per cent. The storage batteries belonging to the expedition will be employed to supply the current, as primary cells cannot be expected to work in polar latitudes. Whether Captain Scott's adventurous party are successful in their quest or not—and it will be the fervent wish of every telephone man that they may be—it seems tolerably certain that the news of the measure of success that has crowned the advanced party's efforts will reach the winter quarters over these lines and instruments, and the National staff, having presented the equipment, will have a personal and peculiar interest in the "Furthest South" telephone".

The equipment was duly put to use when the expedition arrived in the Antarctic.

In *South with Scott* by Edward Evans (Evans of the "Broke") there are several references to the telephones. One of them, in particular, summarizes the use made of telephones by the expedition.

"In connection with the work of Simpson at the base station, I must not forget the telephone. Certain telephones and equipment sufficient for our needs were presented to us in 1910 by the staff of the National Telephone Co., and they were very largely used in scientific work at the base station as well as for connecting Cape Evans to Hut Point,

Fig. 1. July 14th, 1911. Dr. Simpson at the telephone and sidereal clock. It was advice from Sir George Simpson on where to look that led to the finding of the remnants of the wire.

*Alcan (U.K.) Ltd., London.

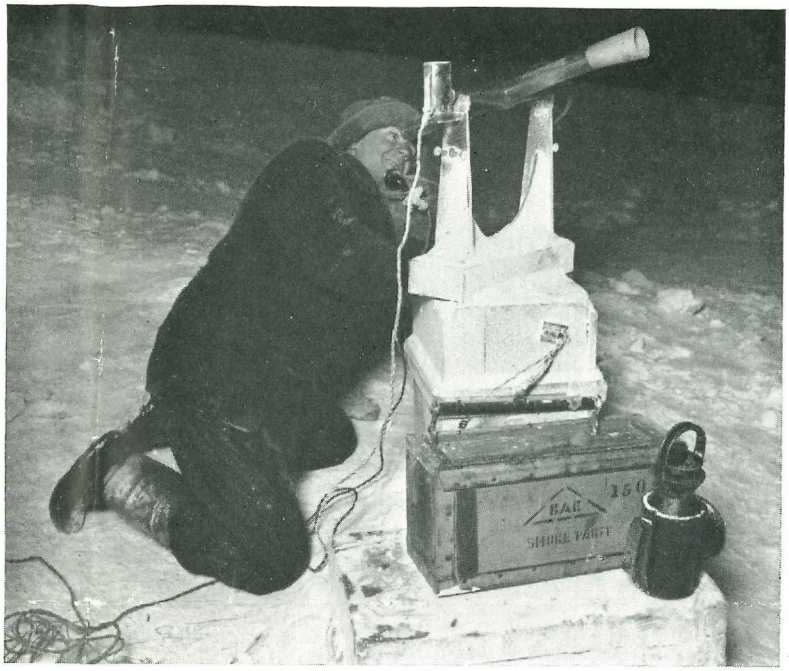

Fig. 2. August 8th, 1911. C. S. Wright on the telephone to Dr. Simpson whilst using the transit telescope. Note that the telephone wire between Wright and the hut is ordinary twin flexible with copper conductors. Bare aluminium wire was only used for the long runs.

fifteen miles away. Simpson made the Cape Evans-Hut Point connection in September, 1911, by laying the bare aluminium wire along the surface of the snow-covered sea ice, and for a long time there was no difficulty in ringing up by means of magnetos. However, when the sun came back and its rays became reasonably powerful, difficulty in ringing and speaking was experienced.

We used the telephones almost daily for taking time, and Simpson used to stand inside the hut at the sidereal clock whilst I took astronomical observations outside in the cold. We also telephoned time to the ice-cave in which the pendulums were being swung when determining the force of gravity. Telephones were quite efficient in temperatures of 40° and more below zero".

Scott's Journal often refers to the telephones. Two extracts are of particular interest:

> **August 1, 1911.** This afternoon as I sit in the hut I find it worthy of record that two telephones are in use: the one keeping time for Wright who works at the transit instrument, and the other bringing messages from Nelson at his ice hole three-quarters of a mile away. This last connection is made with a bare aluminium wire and earth return, and shows that we should have little difficulty in completing our circuit to Hut Point as is contemplated.
>
> **October 6, 1911.** At 5 o'clock the Hut Point telephone bell suddenly rang (the line was laid by Meares some time ago, but hitherto there has been no communication). In a minute or two we heard a voice, and behold! communication was established. I had quite a talk with Meares and afterwards with Oates. Not a very wonderful fact, perhaps, but it seems wonderful in this primitive land to be talking to one's fellow beings fifteen miles away.

The telephone instruments were conventional, equipped with magnetos for ringing, and cased in wooden cabinets for wall mounting (see Fig. 1). For the local system round the hut at Cape Evans, to the ice-cavern and to the transit instrument, conventional twin cables were used, with copper conductors. For long runs across the ice, from Cape Evans to Hut Point and from the hut to the hole in the ice where Nelson (the expedition's biologist) spent long periods fishing, a single aluminium wire was used, with the sea as an earth return (see Fig. 3). The aluminium wire was only 0.041 in. diameter. Pieces of old iron dropped through holes in the ice formed the earth electrodes.

The sledging route from Cape Evans to Hut Point, 15 miles across ice in the winter, becomes open sea when the ice melts. The wire was laid in a day; it was simply paid off a reel rotating at the rear of a sledge and it lay on the snow where it fell. It was laid towards the end of September 1911. The first tests showed the line to be broken. On October 1, the break was found by "Sunny Jim" Simpson (the expedition's meteorologist) and made good. On October 6, Scott reports the line as working. Joints were made with tiny twisting sleeves, perhaps 3 in. long. This line was in use only for two or three months. With the end of the winter and the breaking up of the ice, the wire would have snapped and disappeared.

The wire was sent out on three or four reels, each containing several miles. A mile of this 0.041 in. diameter wire weighs only 8 lb. The wire recovered was from a partly used reel found near the hut, in the snow. It would have been covered each winter in deep snow. During the summer months it would have been exposed to salt spray. A considerable amount of salt spray blew over the Cape during the summer—Simpson has described how when he used melted snow from a drift as distilled water for his accumulators, he completely spoilt a charge of acid—a serious loss because not much spare acid was available.

The wire found by the New Zealand expedition was flown out to New Zealand in December of 1959, and was first sent to the head office of the Aluminum Company of Canada Limited in Montreal. It recently arrived in this country, and samples of it have been sent to a number of interested institutions and individuals. It has been examined by Aluminium Laboratories Limited.

Tests Made on the Wire

The wire has become brittle, and its useful life is gone. Even at that, three samples tested for tensile strength gave results of 18.8, 15.5 and 18.9 lb respectively—corresponding to approximately 14,000 lb/sq. in., or about half the original strength. Elongation was little more than zero.

A metallographic examination with polarized light showed the wire to be ½ hard or a little harder. Micro hardness measurements gave a value of 48.9. The constituent structure was somewhat coarse; this can be put down to the fact that when the wire was made the wire ingots would have been cast in tilt moulds.

The chemical composition was determined, showing the following:

Copper 0.02 per cent
Iron 0.46 per cent
Silicon 0.28 per cent
Titanium 0.02 per cent
Vanadium less than 0.001 per cent.

Except for vanadium, all these elements are rather in excess of what would be usual for conductor metal today, but the excesses are slight, and not significant.

The wire is not so fragile that it cannot be handled. It is still strong in tension, but it kinks easily and breaks when kinked. Its condition is uniform along its length and is typical of what would be expected of a small diameter wire exposed to salt spray for a long period.

Who Made the Wire?

This story is interesting, but there are still gaps in it.

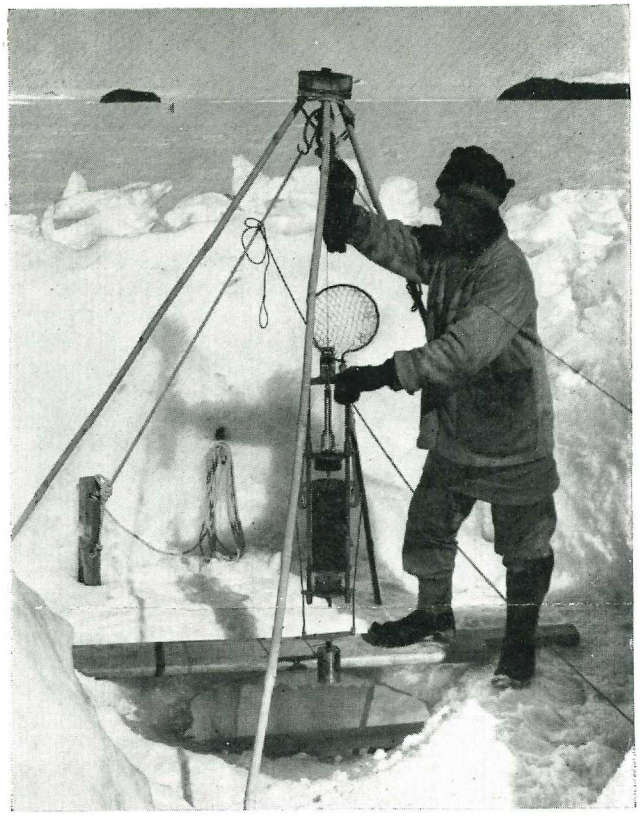

Fig. 3. August 24th, 1911. Nelson at his fishing hole. A telephone connection between this hole and the hut used bare aluminium wire, with the seawater underneath as an earth return.

Where was the wire made? And who first combined the ideas of using ice or frozen snow as an insulator, and the sea underneath as an earth return? (The sea had been used as an earth return by the Post Office Engineering Department as early as 1882). Perhaps some readers of this article may recollect something that will lead to the filling of these gaps.

This wire cannot represent the first use of aluminium telephone wire. Reference to trade directories of the time show several firms offering aluminium telegraph wire, including W. T. Glover and Company Limited, and Felten and Guilleaume, of Germany, through their London agent.

Neither does the wire represent the first use of aluminium in Polar exploration. Scott's expedition used aluminium cookers, aluminium trays for cookers, and aluminium sledge mugs. Many of these items are still in existence. Visitors to the "Discovery" now moored on Victoria Embankment may see there an aluminium pannikin, once the property of Lt. R. W. Skelton, Engineer, R.N. This pannikin was taken on Scott's earlier expedition in 1901; except that its original handle has been replaced by a rough loop of copper wire, it is in excellent condition, quite ready for another journey to the Antarctic.

Acknowledgment

Acknowledgment is made to those who have helped in building up this story, including the Librarian of the Institution of Electrical Engineers, members of the Post Office Engineering and Archives Departments, and members of the New Zealand Section of the Deep Freeze Expedition.

Special thanks are also due to the members of Scott's expedition who used these telephones—Sir Charles Silas Wright, now living in Vancouver, and Sir George Simpson, now of Putney.