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THE INSTITUTION OF POST OFFICE ELECTRICAL ENGINEERS

A Lightweight Moledrainer

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D. B. AFFLECK, A.M.I.E.E.

The author describes a lightweight type of moledrainer used for laying subscribers' cables up to 7pr/20 lb. The moledrainer can be towed by a 2-ton Albion or a small tractor.

Introduction.

THE Peterborough Area, which is mainly rural in character, has been faced with the problem of providing telephone service to a large number of farmers. As a general rule their houses are remote from any existing overhead routes and provision of service by normal methods of construction would entail the erection of numerous poles. In two cases as many as 90 poles for each applicant would have been wanted. A selection of 171 cases on the waiting list would have required 3,675 poles. The employment of the small amount of labour available on works of such magnitude would seriously impede progress on other works, and with the shortage of poles growing more acute a search had to be made for some means of providing service which would show an appreciable saving in labour and poles.

A solution has been found in the use of a light moledrainer which will lay small sizes of cable direct in the ground. It has been used along grass verges of public roads as well as along the margins of private roads leading to farms. The soft fen soil which preponderates in the most intensely farmed parts of the Area seemed admirably suited to this method of construction, and results achieved have amply justified expectations.

Description of the Moledrainer.

A moledrainer adapted for cable laying direct in the ground has been described in this Journal¹, but that implement was fitted with a 2½-in. mole and required a 45-60 H.P. tractor to pull it. A much lighter device which could be pulled by one of the Post Office vehicles or by a small tractor has been found. The machine is a Howard's "Wholroot R" Beet Lifter, manufactured by Messrs. Ransomes, Sims & Jefferies, Ltd., Ipswich, bought locally for £7 10s. (The price has since been increased to £8 8s.) By removing the beet lifting attachment from the bottom of the coulter and fitting in its place a piece of hardened steel shafting 1½ in. in diameter and 19 in. long, cut at an angle of about 30° at the front, the machine was converted into a moledrainer with an exceptionally small diameter mole. For feeding the cable behind the mole a piece of ½ in. diameter W.I. pipe was welded to the back of the coulter, the bottom of this pipe being bent to a radius of about 6 in. and terminated just above the centre of the back of the mole. A conical shaped cup to hold petroleum jelly for lubricating the cable as it passes through the pipe and to provide some protection against corrosion was welded to the top of the pipe. In addition to the foregoing modifications some strengthening of the machine was found to be desirable and the whole of the strengthening and modification was carried out by the vendors for the sum of £3 15s.

¹ P.O.E.E.J., Vol. 35, p. 41.

The depth at which the mole moves through the ground is adjustable to a maximum of 14 in. by altering the height of two wheels at the front. These wheels are independently adjustable, permitting the use of the machine on a sloping grass verge. The distance between them can also be varied.

Method of Operation.

The moledrainer can be pulled by any of the vehicles which can be used for drawing in cable, but the heavier vehicles with their lower gearing are more suitable. The 2-ton S.C. Albion has been found convenient and has been used also to transport the machine. The best results, however, are achieved with a small tractor of about 25 H.P., and most farmers for whom service was being provided have been very willing to provide a tractor to pull the moledrainer. This saves the transport of officially owned tractors. A length of 7/14 steel suspension strand has been used for towing, and between this and the machine, when using the Albion, is inserted a tension fuse consisting of two pieces of 400 lb. G.I. wire in parallel made off with clamps and thimbles. This breaks with a pull exceeding about 2,400 lb., and has been effective in protecting the machine and the vehicle against damage from obstructions such as tree roots and large stones.

Experience shows that there are few situations in which the machine cannot be used to lay cable at a depth of from 6 to 14 in. as an alternative to erecting an overhead route. It can be operated along any road where there is a grass verge more than about 18 in. wide even if it slopes at an angle not exceeding about 45°. In sloping ground the machine is kept vertical by the independent adjustment of the front wheels. Large stones up to about 6 in. in length are usually deflected without breaking the fuse in all but the heaviest soil and the coulter will generally cut through tree and hedge roots which are not larger than about 1 in. in diameter. The greatest difficulty is experienced in operating within a few feet from tree trunks as large roots near the surface frequently cause the fuse to break. When working in long grass a disc-coulter is attached to the machine as shown in Fig. 1. This assists in preventing the accumulation of grass in front of the knife coulter, which impedes progress.

The machine can successfully be operated by a party of five men who are employed as follows:— The first drives the towing vehicle, the second walks or rides with him keeping a watch on the moledrainer party for start and stop signals, the third takes the two handles of the moledrainer, the fourth feeds the cable into the conical cup, and the fifth walks alongside with a spade ready to cut away any grass which collects round the front edge of the coulter. Before operations begin, the cable is run off the drum and laid out alongside the track which is to be followed. Alternatively, if a tractor is available, the cable can

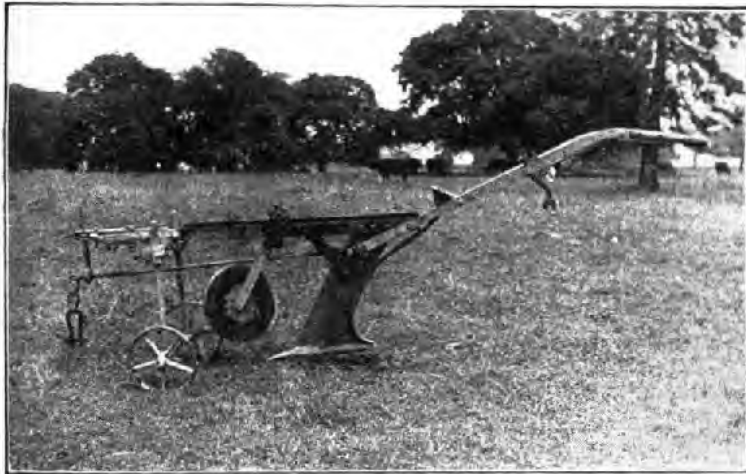


FIG. 1.—LIGHTWEIGHT MOLEDRAINER.

be paid out from a drum mounted in a vehicle which travels alongside the moledrainer.

At unmade road crossings and field entrances it has been the practice to lay the cable, surrounded by a few inches of soft earth in a trench about 18 in. deep, and farmers, for whom the services have been provided, have been willing to excavate these trenches. It has, of course, been necessary to erect poles on either side of a road, or to lead in to the subscribers' premises, if continuing the underground cable would have involved an expensive reinstatement. It has also been necessary to excavate and lay the cable under drainage channels cut across grass verges.

A comparison between the costs of 44 Advice Note works completed up to May 1946 and the costs estimated to have been incurred had normal methods of construction been used is given in the following table:—

	Poles	Labour		Stores	Transport
		Manhours	£	£	£
Normal Construction	737	6,609	660	1,076	77
Moledraining..	77	3,420	342	907	20

Conclusions.

It remains to be seen whether this method of construction will create any maintenance difficulties. Experience gained with larger cables laid by this method round the perimeters of aerodromes during the war indicates that there is no reason to expect any difficulties. Faults on aerodrome cables have nearly all been due to one of two causes: damage by other contractors unaware of the existence of the cables and puncturing of the sheath by rodents. Damage from the first cause should be infrequent along public roads. It is believed that the large diameter mole had something to do with the attacks by rodents and that this trouble will be eliminated, or much reduced, by the use of the small mole. There is no case recorded

so far of a mole-drained perimeter cable suffering breakdown from corrosion, and there is no reason to expect more serious corrosion of cables laid bare along public roads. However, the method has been in use too short a time to come to any conclusions regarding the corrosion aspect. Experiments carried out with a search-coil have shown that a mole-drained cable is very easily located.

The conclusion drawn from the experience gained with the light moledrainer is that it is a satisfactory method of providing telephone service where normal methods of construction would require an abnormally large number of poles. It has not been found necessary to confine the operations to one gang as the technique can be quickly learned by gangs stationed in different parts of the area. The method might very well come to be regarded as normal when providing service to isolated subscribers along roads which promise little or no development. Where only one pair is required the cable used is Cable I.R.V. Core T., 1 pr/12½ or, if its resistance would be too great, 1 pr/40. In some cases a cable containing more than one pair has been justified in a section of the route which is to serve two or more subscribers or where provision is being made to meet development. Multi-pair cables up to 7 pr/20 have been successfully laid with this machine.