5. *Advantages of Fullerphone.*

The Fullerphone retains advantages (1) and (2) of the vibrator. It can be used simultaneously with a telephone or buzzer on one circuit, but cannot be used for telegraphy simultaneously with ordinary morse working.

Advantage (4) is retained, and the Fullerphone will work over lines with very high resistance and very low insulation, but it will not work through either a condenser or an induction coil, and consequently will never work if the line is broken. It will work over far greater distances than the vibrator.

The Fullerphone has also the enormous advantage that, in practice, it cannot be overheard either by induction or earth leakage, and can only be tapped by the direct connection of a suitable instrument to the line. It has been found that, with very special apparatus, it is possible to overhear a Fullerphone when the listening earth is within 50 or 60 yards of the Fullerphone earth, but this overhearing apparatus is so sensitive to minute earth currents and requires such constant alteration in its adjustment to eliminate this interference, that, in practice, only a few signals at a time can be overheard. A similar apparatus would overhear ordinary single-current morse with far greater ease at much greater distances.

It must be remembered that the buzzing call and telephone fitted to the Fullerphone are not immune from overhearing; this immunity only applies to the Fullerphone proper. The buzzing call and speech on the Fullerphone can be overheard in exactly the same way and to the same extent as the similar call and speech on the "D" Marks III or IV telephone.

6. *Disadvantages of Fullerphone.*

It is very sensitive to currents set up by any differences of potential in the earth, which cause small currents in the line. Such currents may enter either by the instrument earths or at points in the line where the insulation is faulty. Leakage from neighbouring morse circuits is a fruitful source of such currents.

The methods of overcoming this disadvantage are considered later.

The Fullerphone proper is not interfered with by induction from any other circuit, nor by the leakage of rapidly alternating currents from any source.

2. *The instrument.*

1. The Mark III* Fullerphone is assembled and mounted on an enamelled iron frame which is then inserted complete into an outer case of wood. This case is covered with water-proofed canvas and

the whole is rendered damp-proof by springs, snap and rubber tubing along the joints.

The size of the closed case containing the complete instrument is :—

$13\frac{5}{8}$ in. × 8 in. × $6\frac{3}{4}$ in.

The weight, including head-phones—hand combination and plug —and batteries is $18\frac{1}{2}$ lbs.

The Figs. (1 to 6) show clearly how the instrument is made up and the arrangement of the component parts.

Fig. 1 shows the instrument in its case and open ready for work.

Fig. 2 shows the set closed and ready for transport.

The remaining Figs. (3 to 6) show the instrument itself removed from the exterior case. (Fig. 6 showing the wiring of the Fullerphone Mark III.)

2. Referring to the figures 1 to 6 the component parts are :—

A. Iron frame on which the various parts are mounted.
B. Door of buzzer compartment.
C. Door of battery compartment.
D. Morse key, hinged to allow of folding for transport (*see* Fig. 3).
E. Compartment for stowing telephone, hand, D, Mark V, and receivers headgear.
F. Telephone, hand, D, Mark V, in lieu of polyphone pattern illustrated in Fig 1.
G. Receivers headgear, W (or E) double.
H. Headband for Receivers headgear.
J. Clip for keeping phones tight on operators head.
K. Operating switch marked A.
L. Potentiometer switch marked B.
M. Potentiometer.
N. Plug, No. 406.
O. Lid of outer case.
P. Metal support to keep lid either horizontal (normal working position) or at an angle of 45 deg. (for very wet weather).
R. Springs snap for clamping lid tight for transport.
S. Switch for cutting off batteries if accidentally left on.
T. Jack, No. 8A, to take Plug No. 406.
U. Telephone induction coil.
W. Choke coils.
X1 X2. Coils of Buzzer F. X1 is bobbin 1·6 ohms ; X2 is bobbin, 11.8 ohms.
Y. Condensers. 3—1 m.f.d.
Z. Cells, electric, inert, S.
TS. Plates, contact, battery.

FIG. 1.

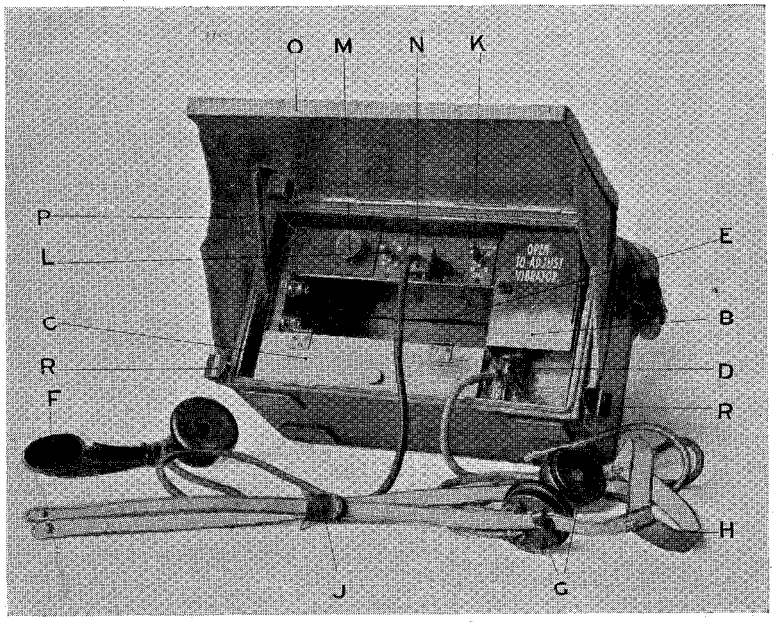

FIG. 2.

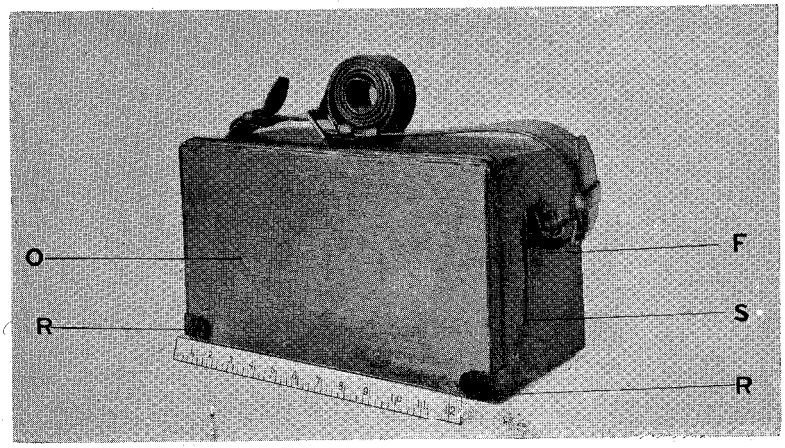

FIG. 3.

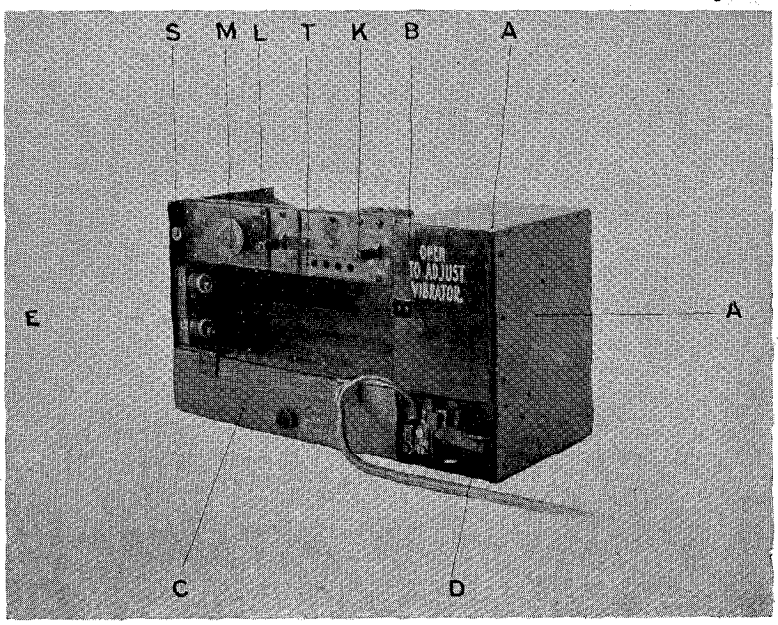

FIG. 4.