

MAGNETO TELEPHONES



22 LINCOLN'S INN FIELDS, LONDON, W.C.2

WORKS: BEESTON, NOTTINGHAM, ENGLAND



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Magneto Telephones

AUTOMATIC or manual central battery telephones are in general use in the populous parts of the world, nevertheless there are very large areas where these telephones are uneconomical and in many places quite impossible to use, so that, there is a considerable demand for magneto instruments which are more reliable and more suitable for the less densely populated areas.

Plastic moulding has completely revolutionized the design of many articles including the telephone, and a vast improvement in the magnetic properties of certain alloys has, in a similar way, enabled the construction of compact, lightweight magneto generators of equal output to the older and clumsier types, so that, the bringing together of these two innovations made possible the production of neat and efficient magneto table and wall telephones.

TABLE TELEPHONE.

The improved magneto table telephone embodying the modern materials mentioned above is seen in Fig. 1 and differs only slightly in outward design from the well known central battery instruments, in as

much as the bakelite case is a little deeper to provide more space internally for the apparatus.



Fig. 1—Table Telephone. N 2121 Type

The case serves only as a cover conveniently shaped to accommodate the micro-telephone and plungers for operating the switch, all other parts being mounted on a baseplate which can be completely detached by undoing the fixing screws of the captive type as in Fig. 2.

In order clearly to illustrate the disposition of each piece of apparatus two views of the base plate complete are shown in Fig. 2, where the location of the generator, ringer, induction coil, switch, and switch operating plate with insulated plunger may be observed.

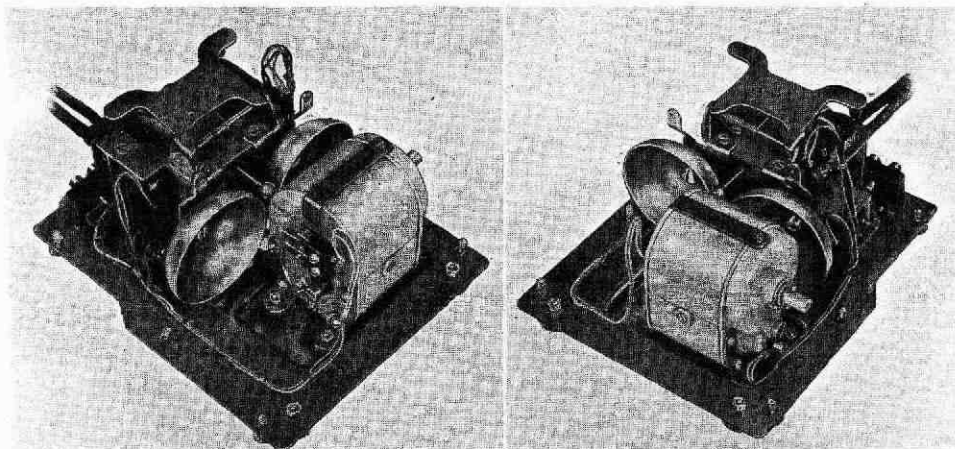


Fig. 2—Table Telephone. Interior



Between the induction coil and terminal block can be seen, in the right-hand view, a condenser which is only fitted to meet the local requirements, and as indicated hereafter in the circuit diagram.

The terminal block cord and the micro-telephone cord enter at the rear and are connected by screws; the other internal connections are soldered.

By combining all parts on a detachable mounting base, maximum accessibility is provided for maintenance.

WALL TELEPHONE.

The case of the new magneto wall telephone, Fig. 3, is practically identical to those used for automatic and manual central battery instruments except that a hole is provided in one side for the generator handle. In design, it follows to a very large extent its prototype the table set; and apart from the switch operating plunger mechanism, acts only as a cover and rest for the micro-telephone.



Fig. 3—Wall Telephone. N 2204 Type

The distinctive, pleasing and neat design makes it ideally suitable where permanent fixing to a wall is desired.

When answering a call it very often happens that information may be required or another person desired (personal call) which necessitates leaving the telephone, so

that, instead of dangling the micro-telephone by the cord, to its detriment, it may be placed vertically as in Fig. 4 without the switch plungers being operated, which, of course is important where automatic clear is in use.

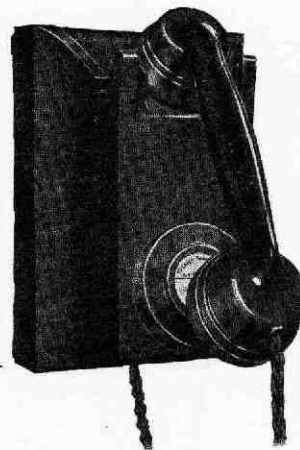


Fig. 4—"Personal Call."

By undoing one captive type screw at the right-hand side, the front case may be swung open to display the backplate and interior as illustrated in Fig. 5, where again the vertical position of the micro-telephone is useful.

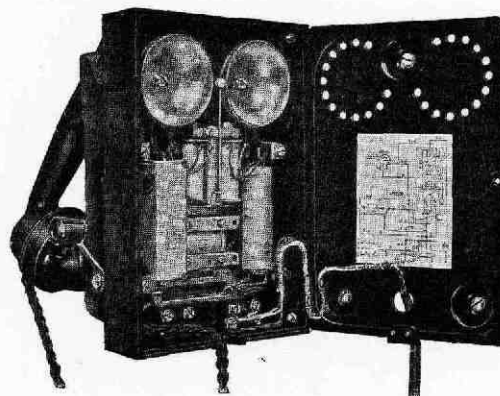


Fig. 5—Interior

The backplate has three-point fixings press formed so that the set hangs clear of the wall, two circles of holes to allow egress of the sound from the ringer gongs, a hole near the bottom for entry of the external cables and a wiring diagram attached and preserved by a coating of clear varnish.



Inside the case the arrangement of the parts is clear, neat and accessible—a condenser on the left, induction coil on the right, ringer in centre top and connecting terminal block at the bottom. Behind these and on the same mounting plate are the generator and switch with operating mechanism.

By removing the generator handle and releasing four captive type screws the whole unit may be removed as in Fig. 6. The U shaped piece near the bottom left hand, also seen in Fig. 5, controls the movement of the external cable or wires and prevents pull on the terminals.

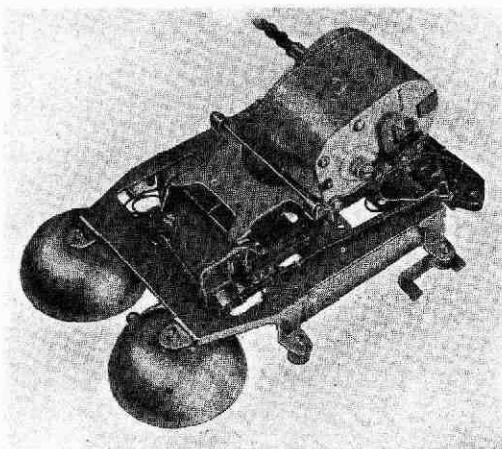


Fig. 6—Apparatus Unit

The micro-telephone cord enters at the bottom of the set and is connected by screws, as are also the external line, extension bell and battery wires, all other internal wires being soldered.

CIRCUIT.

Fig. 7 is a schematic diagram of the basic circuit for magneto telephones but the actual wiring of table and wall sets may differ on account of the disposition of the parts or, as in the case of the table set, where the lines, extension bell and battery connections are brought into the instrument by a four-way cord. A pasteur diagram

showing the wiring is fixed in each telephone as already stated, and seen in Fig. 5.

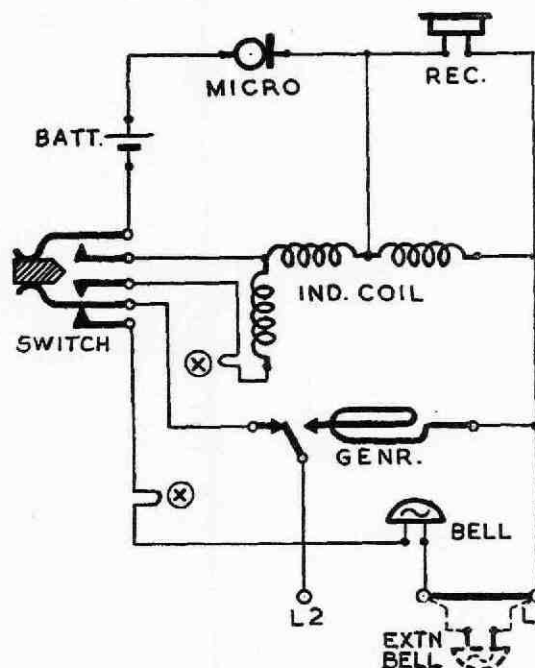


Fig. 7—Schematic Diagram

At either of the points marked X in the diagram, a condenser is included when ordered, however, the wiring may be arranged at each of these points with a loop which is cut to connect a condenser when required.

The switch is shown in the normal position, i.e. with the micro-telephone on the cradle, and an extension bell can be connected by removing the strap between L1 and the centre terminal.

Modifications of the circuits used for standard stock instruments can be made for orders of *fair* quantities, but much better deliveries are available if stock instruments are acceptable. Condensers are not fitted in telephones held in stock.

MICRO-TELEPHONE.

The bakelite micro-telephone seen in the views of the telephones and shown in drawing form in Fig. 8 is standard for both local battery and central battery instruments and is fitted with a three-way flexible cord the



connections of which are made in the base of the transmitter housing, while those to the receiver housing are embedded in the moulding and terminate on tapped metal inserts which enable the inset-type receiver to be connected by means of the fixing screws.

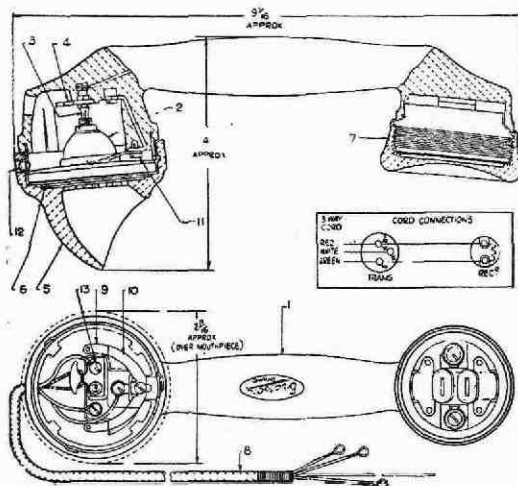


Fig. 8—The Microtelephone

The receiver has an "alnico" permanent magnet, and two coils each wound to a resistance of, usually, 40 ohms. Its efficiency is of a very high standard.

The carbon transmitter or microphone is considered the most suitable type for telephony on account of its high degree of sensitivity, however, the earlier designs, such as the solid back type, varied considerably in the response to the range of voice frequencies, especially to the higher frequencies the reproduction of which is important to good articulation and intelligibility of speech.

Due to research work and new ideas in design the capsule type transmitter fitted and automatically connected in the bakelite micro-telephone has vastly improved transmission characteristics, as well as constructional features to provide a trouble-free service and of special value in damp and tropical climates, the immersed elect-

rodes and carbon granules being contained in a totally enclosed chamber of improved construction.

GENERATOR.

Hitherto magneto telephones have been heavy and cumbersome on account of the large size of the magneto generators available. This was mainly due to the steels used for the magnets which, on account of the low output energy per unit volume, had to be made large in order to obtain the necessary power, and especially to overcome unfavourable conditions sometimes met in long telephone lines.

Originally, magnets were produced from carbon steel, followed by chromium and tungsten steels, and latterly by alloys with exceptionally good magnetic properties, one of which, aluminium-nickel-cobalt known as "alnico", proved most suitable for the magnets of hand operated generators. The exceptional characteristics of this alloy,

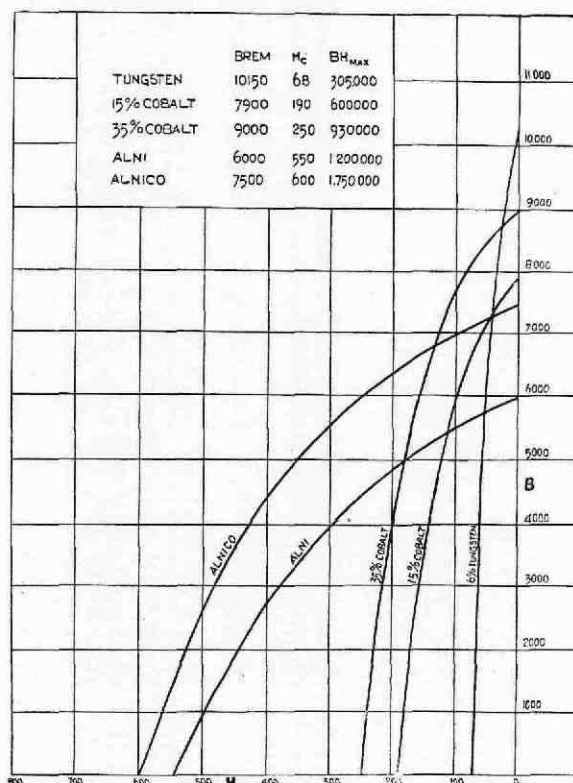


Fig. 9—Characteristics, and Demagnetization Curves of Magnet Metals



compared with others and with tungsten steel in Fig. 9, made it possible to design a simple small magnet as a bridge to the soft iron polepieces and thus to produce generators which are highly efficient, light in weight and of small dimensions.

usually 500 ohms. The ends are accurately machined to take the ball-pivot bearing discs, to one of which is affixed the pinion by means of a nut which also fastens the pivot bearing.

$7\frac{3}{4}'' \times 2\frac{7}{8}'' \times 5\frac{1}{4}''$ 6lb.

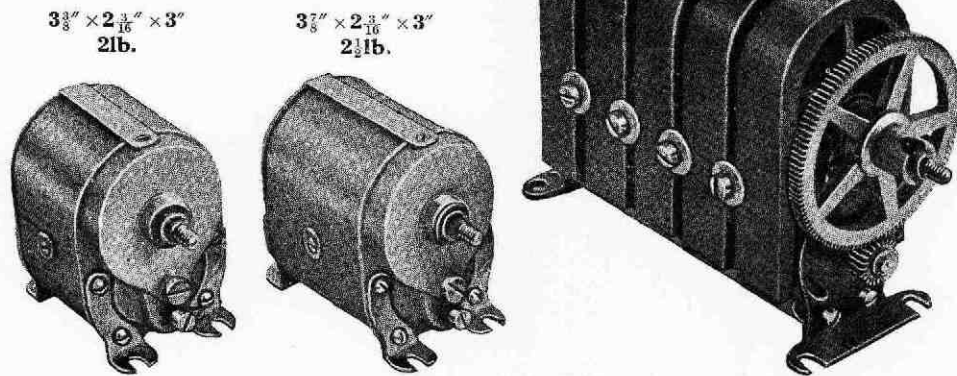


Fig. 10—A Comparison. Standard and Heavy Duty Alnico and Old Type Five-Magnet Generators

A comparison in size and weight between two modern "alnico" generators and one old type five-magnet generator is seen in Fig. 10, which also clearly illustrates the saving in mounting space achieved by the new designs and, therefore, their adaptability for incorporating in table and wall telephones of the latest plastic moulded type, without in any way rendering the telephones unduly heavy or cumbersome.

The remarkable voltage outputs of these generators are shown and compared with older types in Fig. 11, furthermore, the watts output of the smaller "alnico" reaches a peak of about 3 watts with an external resistance of 1200 ohms, and the output of the larger which is only half-an-inch longer is approximately 40% greater.

The construction of the standard and heavy duty "alnico" generators is practically the same, as may be seen from the illustrations in Fig. 10, so that the following description is applicable to either.

The special malleable cast-iron part of the armature is Γ shaped and wound with enamelled wire to the specified resistance

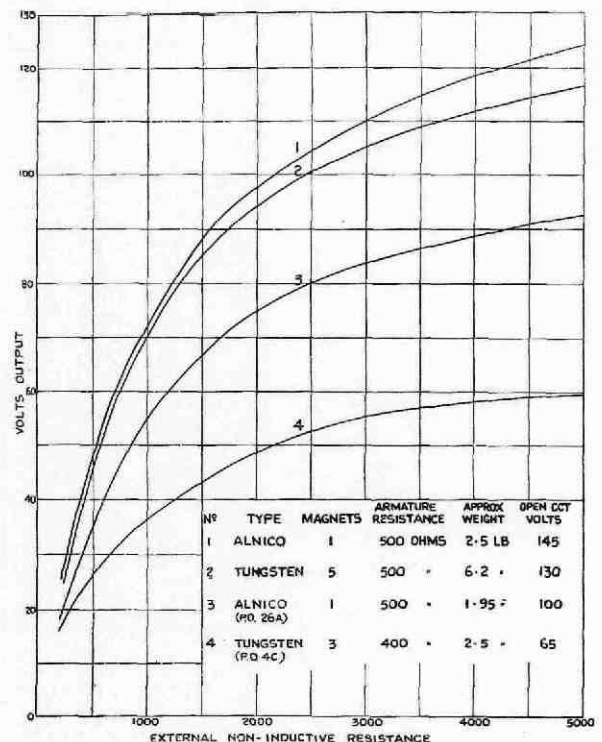


Fig. 11—Volts Output Curves for Various Generators



The pole pieces are made from drawn section, best quality soft iron, machined, drilled and tapped for the end cheeks.

The magnet is cast from the alloy, "alnico", ground to make good contact with the pole-pieces and magnetized.

The driving parts consist of a spindle with a pin engaging a cam slot in the bush of the gear wheel, and held in the normal position by a compression spring. When turned, the spindle makes a small lateral movement which operates the springset. The ratio of driving gear to pinion is 1 to $4\frac{1}{3}$.

The cheeks are diecast from zinc alloy with an insert bush of bearing metal for the driving spindle. The bearings for the armature consist of pivot screws, the one in the springset cheek being adjustable. Brush holders and carbon brushes are fitted for collecting the current from insulated rings on the armature end discs.

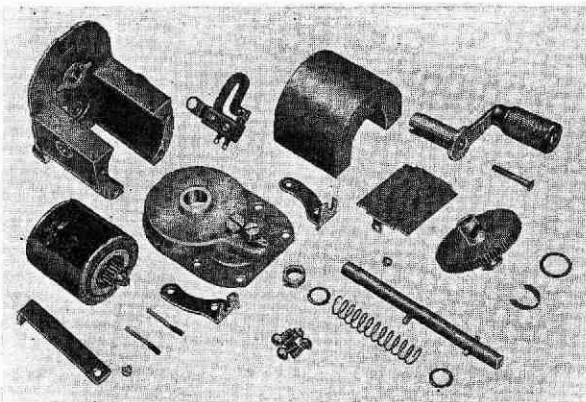


Fig. 12—Generator. Part Exploded

The feet for mounting purposes are detachable and are different for table and wall telephone, those shown in Fig. 10 are the table set type.

A "part exploded" view of a generator is illustrated in Fig. 12.

The generator is protected by patents.

RINGER.

The ringer movement, Fig. 13 comprises a minimum number of parts, is very reliable, not readily put out of adjustment and adaptable for mounting in various positions.

To a flat rectangular soft iron yoke the two coils and a circular magnet are fastened. At the other end of the magnet the armature with stem and hammer is pivoted. The coils are each wound to a resistance of, usually, 500 or 1000 ohms giving a series resistance, to the completed ringer, of 1000 or 2000 ohms respectively.

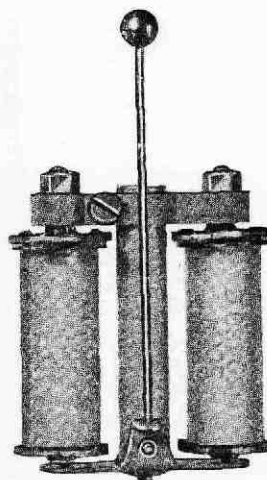


Fig. 13—The Ringer

Gongs of high, medium or low tone are available and although integral are separately mounted according to the position of the movement and other parts, so that they are ordered as a separate item, and the desired tones stated.

INDUCTION COIL.

The induction coil, Fig. 14, is of almost solid construction and therefore very reliable and unlikely to cause trouble. The core wires of Swedish charcoal iron are tightly pressed into an insulating tube which has fixed at each end a bakelite moulded cheek with three numbered insert connection tags.

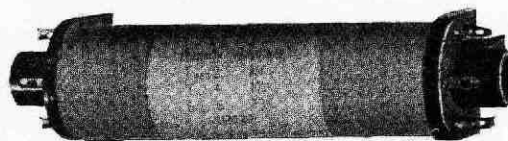


Fig. 14—The Induction Coil

Improvements in the sensitivity of the transmitter naturally increased the level of side-tone which, however, has been remarkably suppressed by the introduction of the anti-side-tone induction coil incorporating three windings—1, 17 and 33 ohms.

CONDENSERS.

Although condensers are not included in the standard magneto circuit they are sometimes called for in either the bell or transmission circuit as indicated in the diagram Fig. 7. Usually a 2 μ F for the former and a .5 μ F for the latter.



CONTACTS.

The springs of the switch and generator cut-out have double contacts in order to ensure trouble-free service.

TROPICAL.

A speciality is the attention given to instruments for use in the Tropics and damp places. Metals and finishes are carefully selected and prescribed, coils impregnated and the wiring P.V.C. insulated.

CONVERTIBLE MAGNETO TABLE TELEPHONE

In areas where considerable development in industry is anticipated, or where there is an expanding population, it is often economic to install magneto telephones which are convertible for C.B. manual and automatic working. Such instruments are invaluable to telephone operating concerns, particularly when conversion from one system to another can be readily carried out.

The convertible magneto telephone N.2185 type, which in external appearance is similar to the ordinary table instrument

shown in Fig. 1, can be readily altered for any of the following systems:—

- (1) Magneto (condenser in bell circuit)
- (2) Magneto (auto release signal exchange, earth clear)
- (3) Magneto (auto loop clear)
- (4) C.B.S. No. 1, party line
- (5) C.B.S. Nos. 1, 2 or 3
- (6) C.B. (extension to intermediate)
- (7) C.B.
- (8) Automatic

The interior apparatus is very similar to that for N.2121 type, an additional terminal block being fitted, above the ringer domes, for automatic dial connections.

Internal wiring is fully terminated and a condenser is always fitted, to simplify conversion. When not required the condenser is cut out by connecting both condenser leads to the same tag.

Schematic diagrams for the various systems are shown in Fig. 15. Conversion from one to any other is achieved by rearranging terminal strappings and fitting a common battery type induction coil and an automatic dial when necessary.

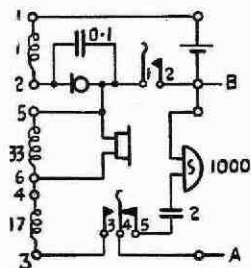


FIG. 1. C.B.S. N° 2 & 3.

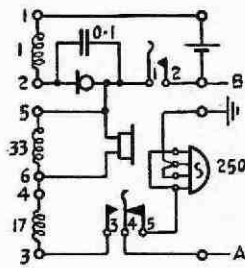


FIG. 2. C.B.S. N° 1.

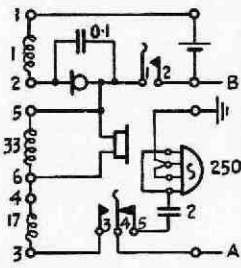


FIG. 3. PARTY LINE C.B.S. N° 1.

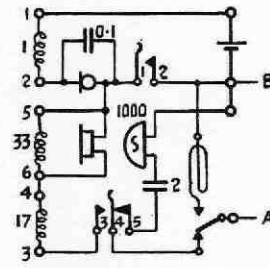


FIG. 4. MAGNETO.

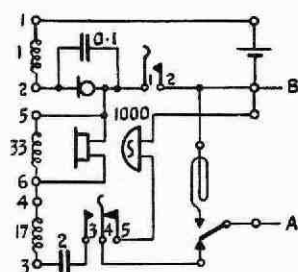


FIG. 5. MAGNETO (WITH LOOP AUTO CLEAR).

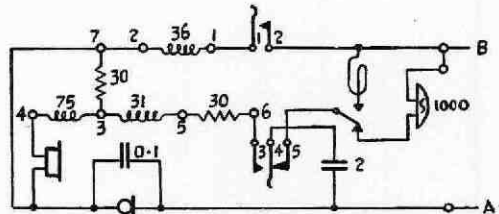


FIG. 6. C.B. (EXTENSION TO INTERMEDIATE)

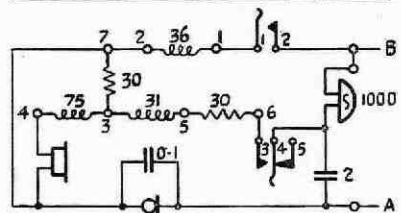


FIG. 7. C.B.

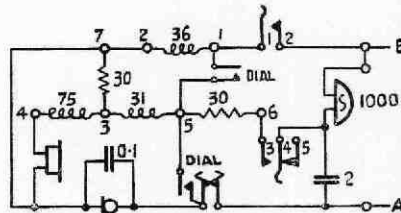


FIG. 8. AUTO.

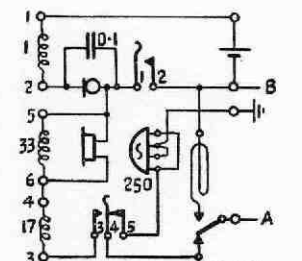


FIG. 9. MAGNETO. (R.S.A.X. EARTH CLEAR)