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ADVERTISEMENT INDEX
see page xii.

POST OFFICE WAR SIGNALS DESIGNS.

THE review, elsewhere in this number, of the book published by the Institution of Royal Engineers, describing the work of the Corps of Signals in the Great War, suggests that our readers might be interested in knowing something of the special military signals apparatus devised and supplied by the Post Office.

Out of about 200 special designs produced during the war, the following items are selected:—

P.O. FULLERPHONES.

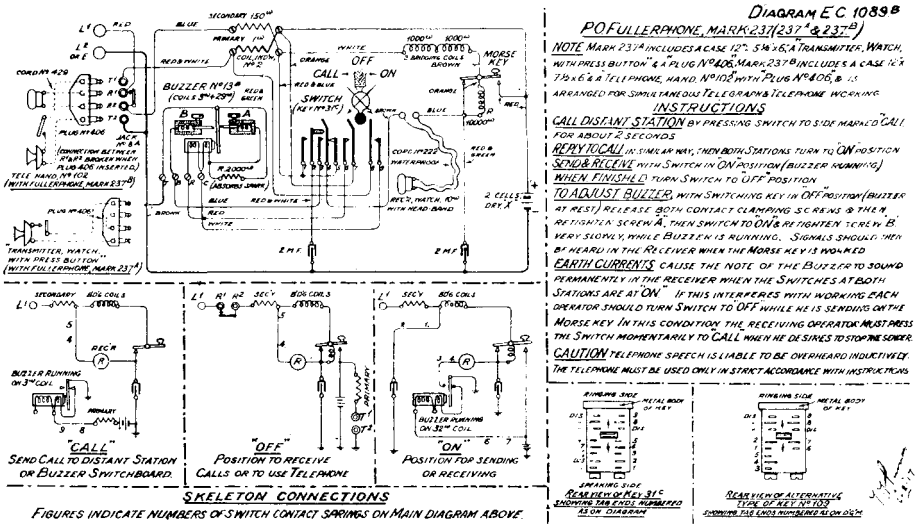
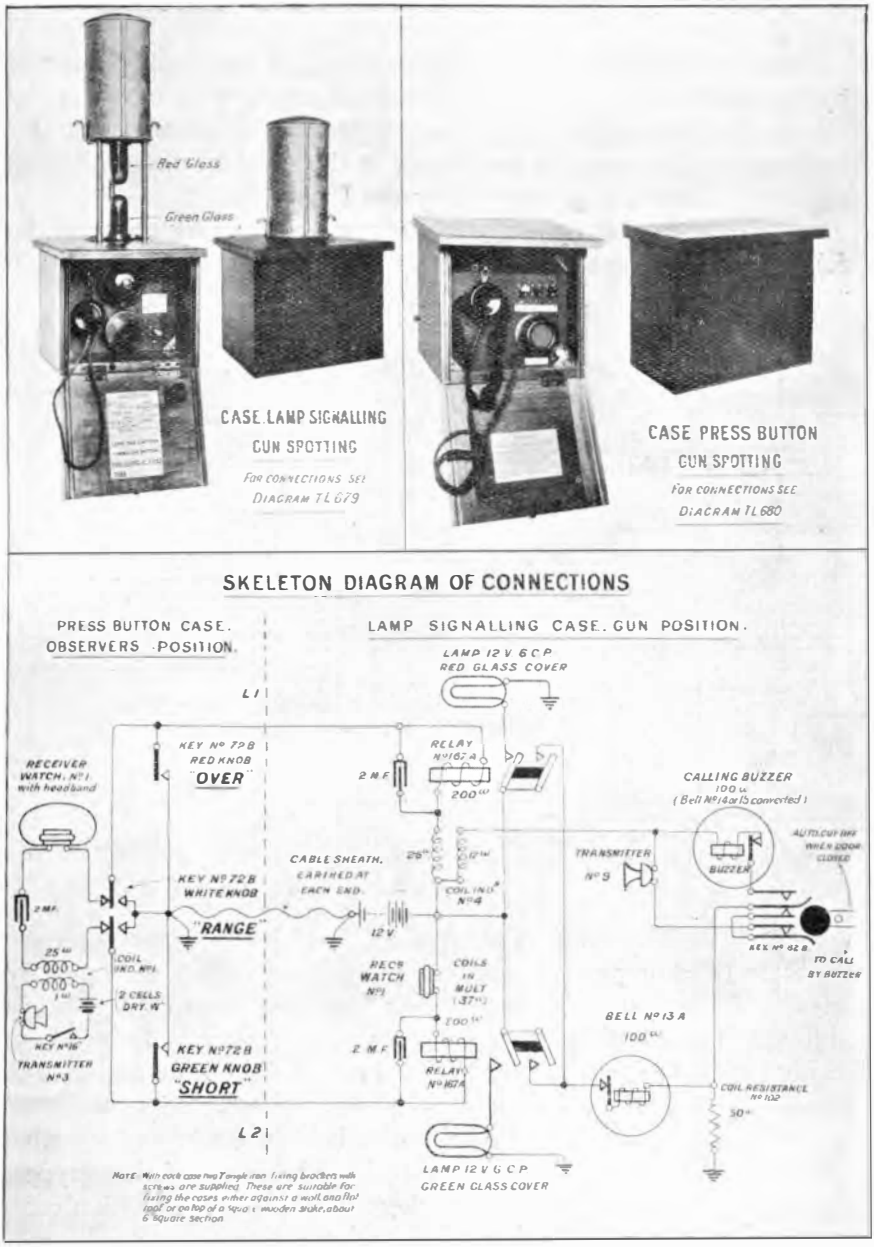


FIG. 1.

The principle of the "Fullerphone," which played so important a part in defeating enemy attempts to overhear British messages by means of thermionic valve listening sets, can be applied in many different ways both mechanically and electrically. In order to bridge over the period required for the manufacture of supplies to Major Fuller's design, the Post Office devised and constructed several types from apparatus and parts held in stock, and supplied about 3,650 sets to the armies abroad. The latest of these types, in which the Fullerphone secret telegraph is associated with a complete telephone set for independent and non-secret communication, is shown in Diagram E.C. 1089 B.

ANTI-AIRCRAFT FIRE OBSERVATION SYSTEM.

Diagram T.L. 623 shows lamp signalling and press button apparatus designed to communicate the results of anti-aircraft gun fire to the gunners. Two observers were stationed about a mile



T.L. 623.

from the guns in such positions that one or both could always secure flank observation and report whether shells were bursting beyond, or short of, the hostile target. Each observer wore a headband

receiver in which he could hear the discharge of the gun. His set included three press buttons; No. 1—green lamp—indicated to the gunner that the shot was short; No. 2—red lamp—that the shot had passed over the target; and No. 3—red and green lamps together—that the range was correct. 1000 complete sets of this equipment were provided and were in general use until the system of aiming and correcting individual shots was superseded by group and barrage firing.

TRENCH TELEPHONES.

Over 42,000 trench telephones, designed and manufactured by the Post Office, were supplied to the armies. They are self-contained magneto-ringing instruments of protected type, capable of withstanding exposure and rough usage, and transportable without packing cases. The latest type, known as "Telephone No. 110," is now the War Office standard. In appearance it is identical with "Telephone 110 B," shown on page 50. Its connections are similar to those of "Telephone 110 A," shown on Diagram E.C. 1166, with the exception that the latter, which was used in the anti-

CONNECTIONS OF TELEPHONE Nº 110A (MARK 234) DIAGRAM Nº E.C.1166 File ref. War 1101/17 (2)

Fitted with Jack N.º 8 so that Headgear set with Plug N.º 406 may be connected when desired in place of Hand-Telephone

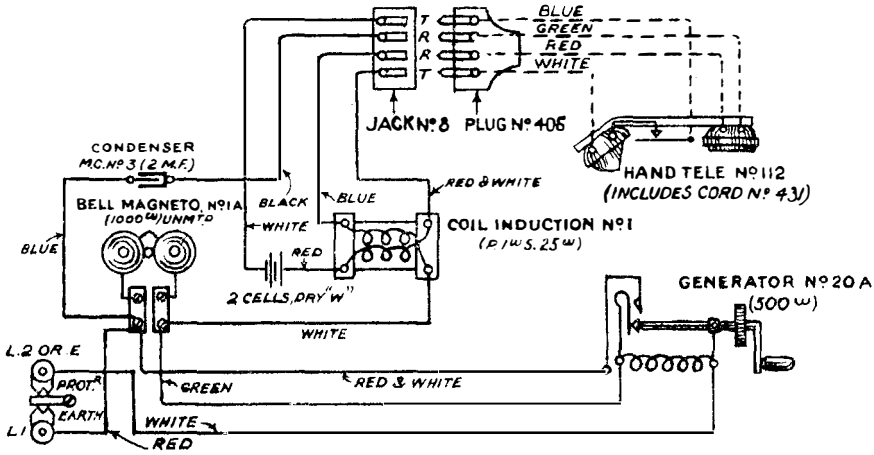


FIG. 3.

aircraft service, is provided with a jack and plug by which the hand micro telephone can, when desired, be replaced by a breastplate and headgear set. It will be seen that the instrument does not include a receiver switchhook; the bell and the generator (normally short-circuited) are connected directly across the line, in shunt with the

talking circuit, which comprises a condenser in series with the receiver and the secondary winding of the induction coil.

TRENCH SWITCHBOARDS.

The first types of trench switchboards made by the Post Office, to replace many diverse patterns improvised by the armies in the field, were known as "Switch Units, buzzer 4+3," and "Switch Units, magneto, 5-line." In these the watch receivers used to detect buzzer calls, and the drop indicators for magnetic signals, were connected permanently to the line jacks. There were no switching keys and all connections were made by loose pairs of plugs and cords. In some cases sets of triple plugs were used in order to provide for listening in by the operator, but special plugs having the rear end adapted to serve as a listening in jack were also supplied. At a later stage in the war these switch-units were superseded by 10-line types of the same size and external construction, but with provision for rapid operating with full supervision, for bunched connections, and for coupling adjacent switch-units under the control of one operator. The photo shows the appear-

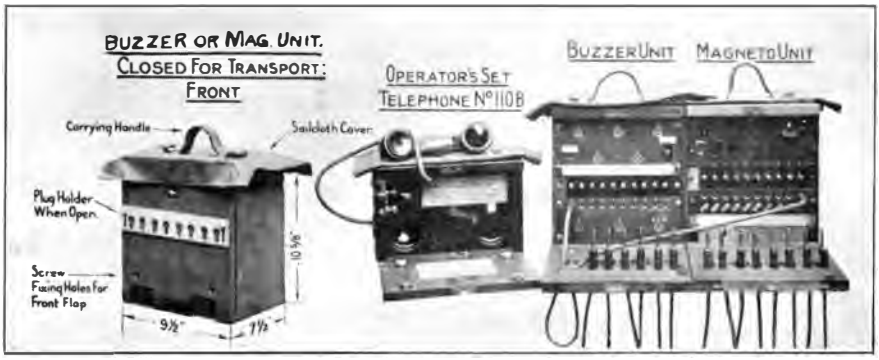
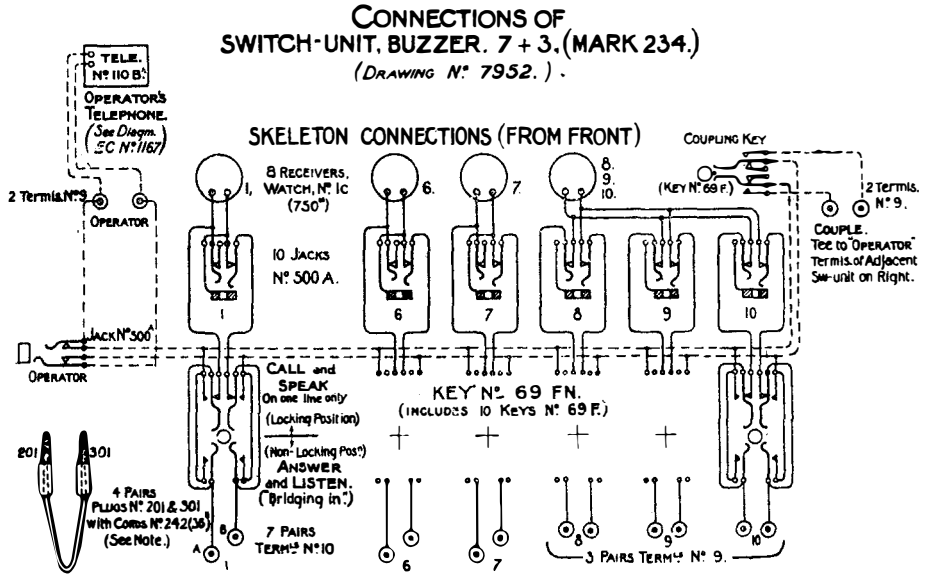
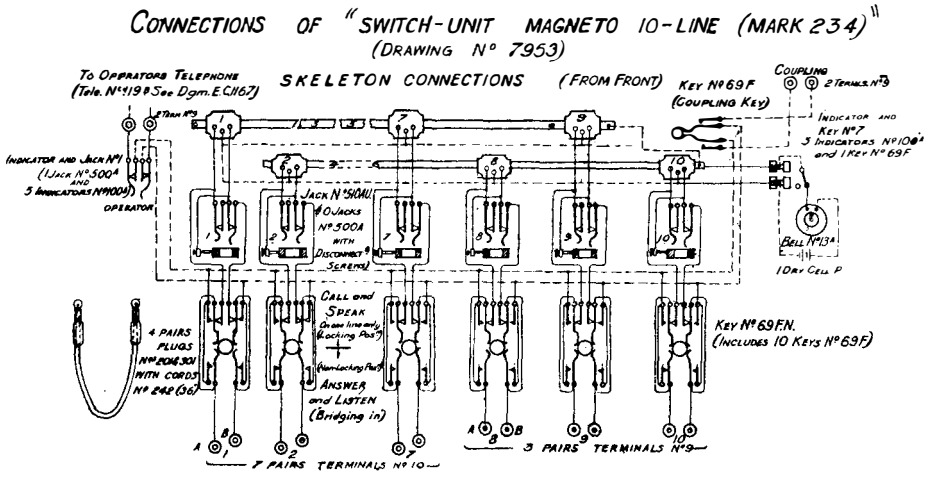


FIG. 4.

ance of these portable switchboards, which have now been adopted as standard by the War Office, and indicates how they can be lined up in groups for the equipment of exchanges in dugouts and advanced positions. Diagrams E.C. 1161 and 1165 show their electrical connections, and Diagram E.C. 1167A shows the connections of the operator's telephone (No. 110B), which is adapted for use on either buzzer or magnetic circuits. The stations connected to buzzer switch-units were usually equipped with the War Office "D 3" buzzer telephone, or with Fullerphones, and those connected to magneto switch-units had trench telephones (No. 100 or No. 110). About 36,000 buzzer units and 5,000 magneto units were



E.C. 1161



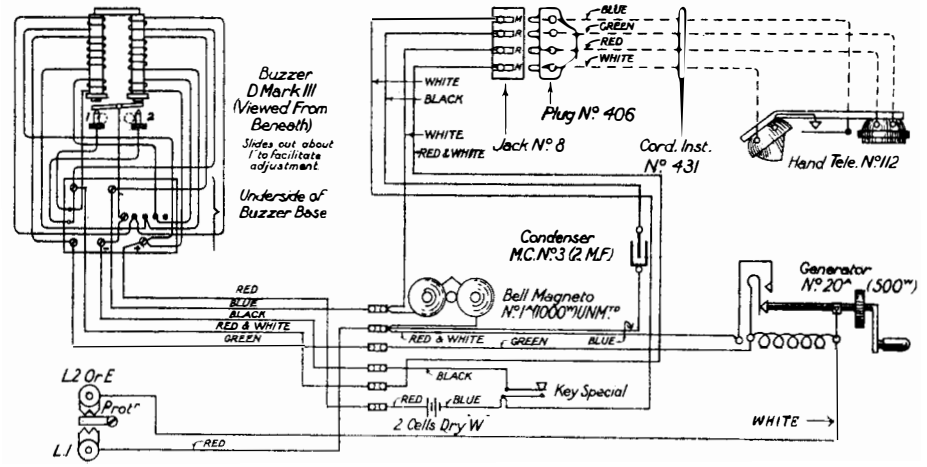
E.C. 1165.

supplied to the armies. Other forms of buzzer switch-units fitted with visual indicators responsive to buzzer signals were also devised and about 1300 were supplied, but these have not been adopted as post-war standards.

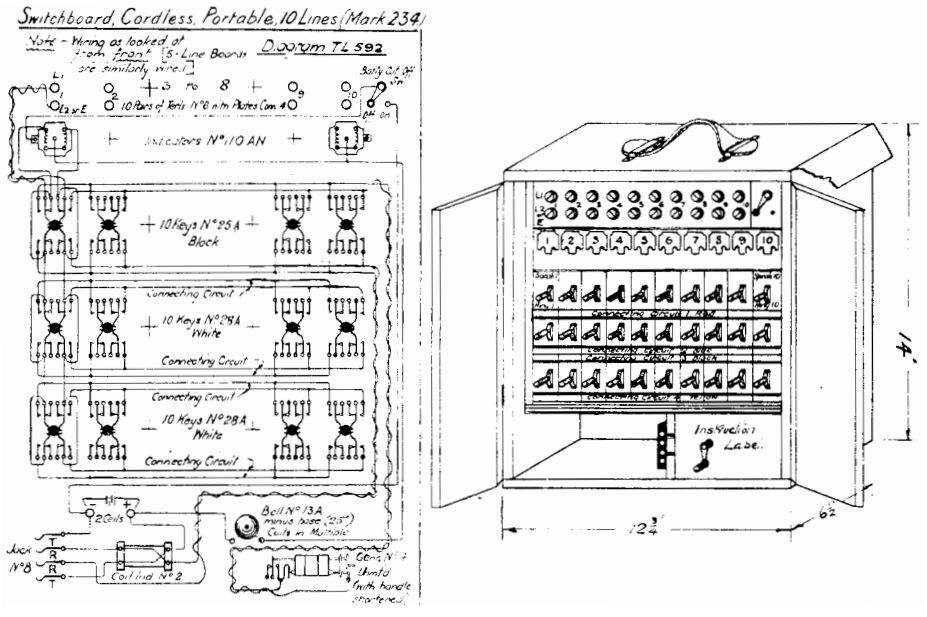
CORDLESS TRENCH SWITCHBOARDS.

The 10-line portable cordless magneto switchboards shown in Diagram T.L. 592, were introduced at an early stage in the war,

CONNECTIONS OF TELEPHONE Nº 110 B (MARK 234)



E.C. 1167A.



T.L. 592.

and were extensively used at artillery and brigade headquarters. They are of robust construction, self-contained and self-packing. About 5,000 were issued.

PORTABLE MAGNETO SWITCHBOARDS—20-LINE.

In the earlier stages of the war, great numbers of wall switchboards, 20-line and 30-line, of ordinary Post Office type, were mounted in combined stands and packing cases, for use by the larger formations—divisional and corps headquarters. When supplies of these became exhausted, special portable 20-line switchboards were designed. One of these, closed for transport, is shown by Fig. **9**. The carcase of the switchboard revolves on a trunnion

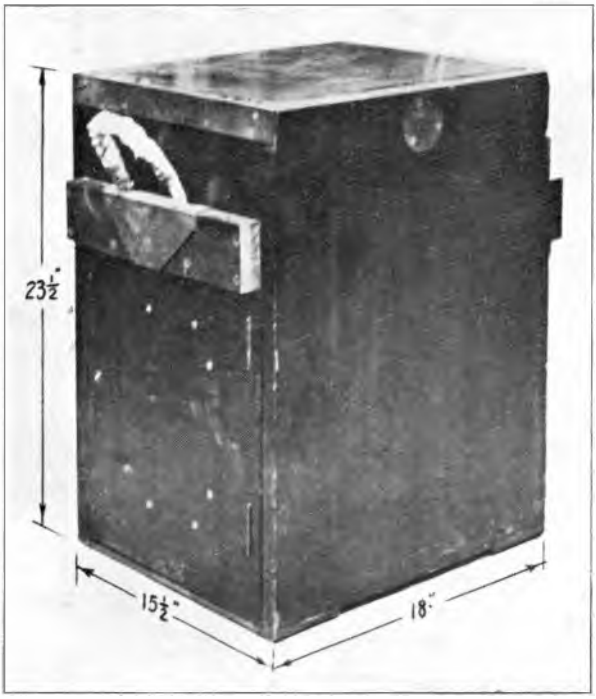


FIG. 9.

and can be swung up into the working position shown by Fig. **10**. A cord-box flap hangs behind the cords and pulleys in the working position and forms the lid of the package when collapsed for transportation. Fig. **10** also shows a 10-line magneto switch-unit secured to the top of the 20-line switchboard, increasing its capacity to 30 lines when required, and providing for the make-up of exchanges of 20, 30, 40, 50 or 60 lines. Modifications of capacity can thus be readily secured to suit the requirements of different formations which may have to occupy a positionn successively when armies are advancing or retiring. The line terminals of the 20-line switchboard are so arranged that the cables carrying the external lines can be permanently wired to 10-pair connectors, which can be

passed through holes in the roof of the switchboard and secured in position under the terminals in a few minutes.

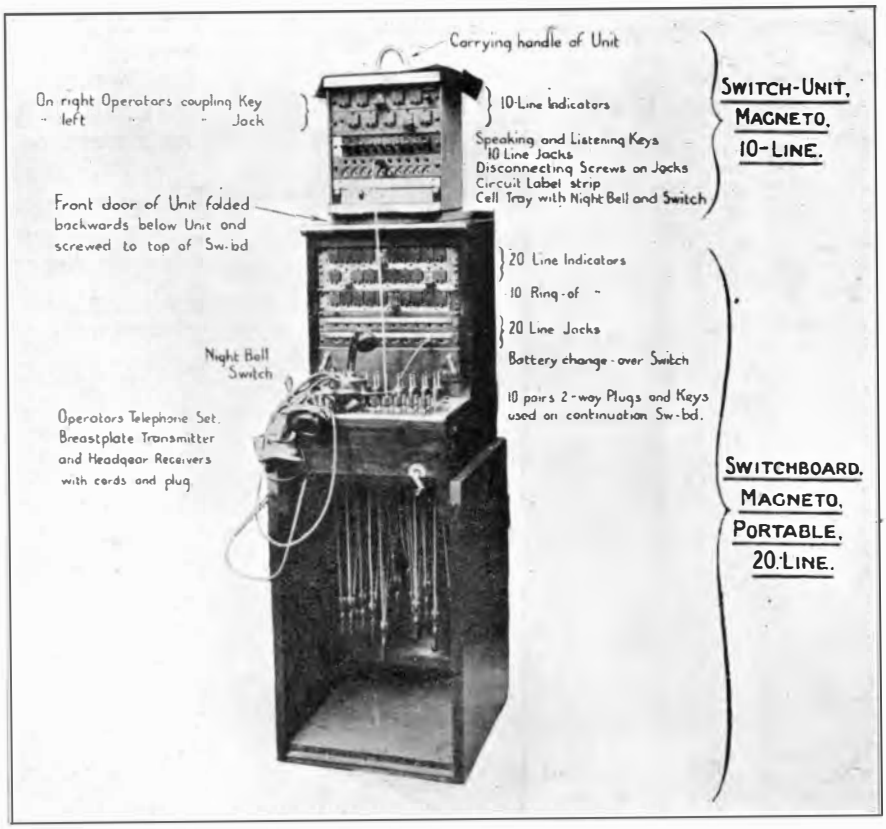


FIG. 10.

40-LINE PORTABLE SWITCHBOARDS.

These items—Figs. 11 and 12—are made up on the same collapsible and self-packing principle as the 20-line switchboards. They are fitted with self-restoring bull's-eye indicators, a pedal form of generator, and very complete arrangements for rapid installation and rapid operating. Two such switchboards side by side provide an 80-line exchange for a corps headquarters office.

PORTABLE MULTIPLE EXCHANGES.

The above 40-line switchboards are also designed for use as sections of a portable multiple exchange, which can be installed to serve as many as 320 lines at an army headquarters. For this purpose multiple jack-boxes are provided. These have a 4-point break-

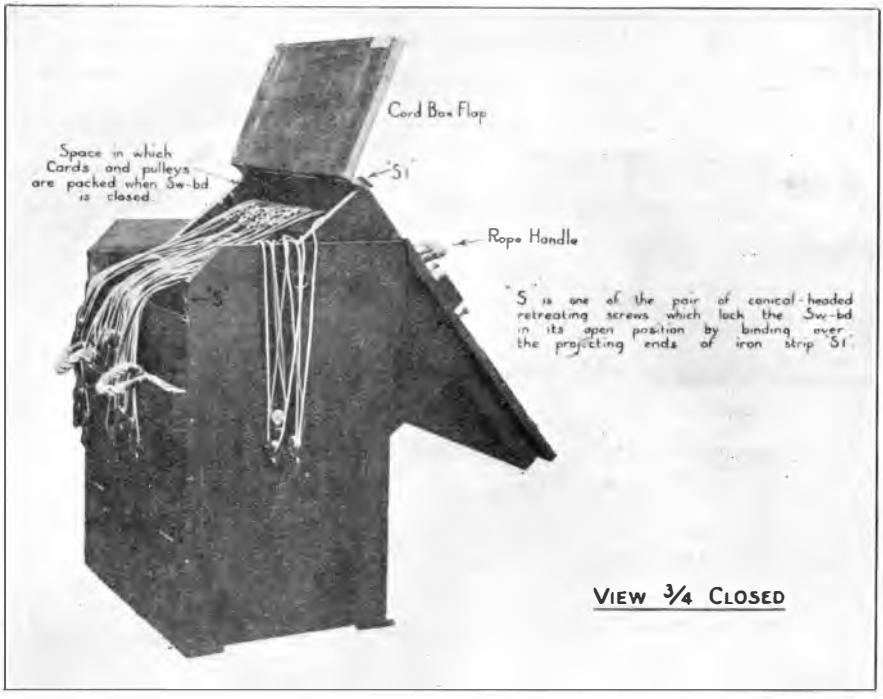

Cord Box Flap
Space in which Cards and pulleys are packed when Sw-bd is closed
S1
Rope Handle
"S" is one of the pair of conical-headed retreating screws which lock the Sw-bd in its open position by binding over the projecting ends of iron strip S1.
VIEW ¾ CLOSED

FIG. 11.

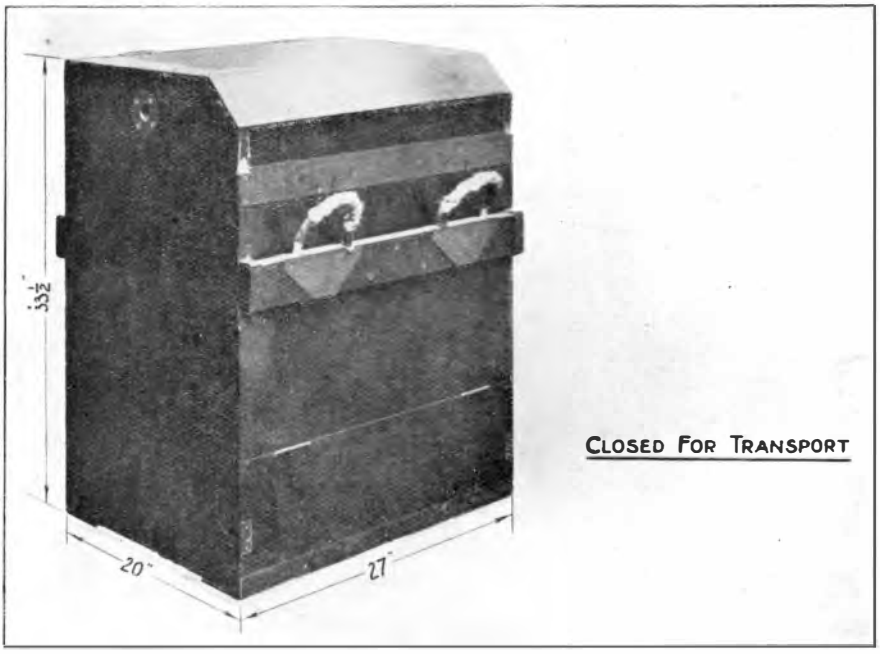

33½"
20"
27"
CLOSED FOR TRANSPORT

FIG 12

jack multiple and are fully wired and connected to extension cables terminating in 10-pair connection strips for ready connection to the

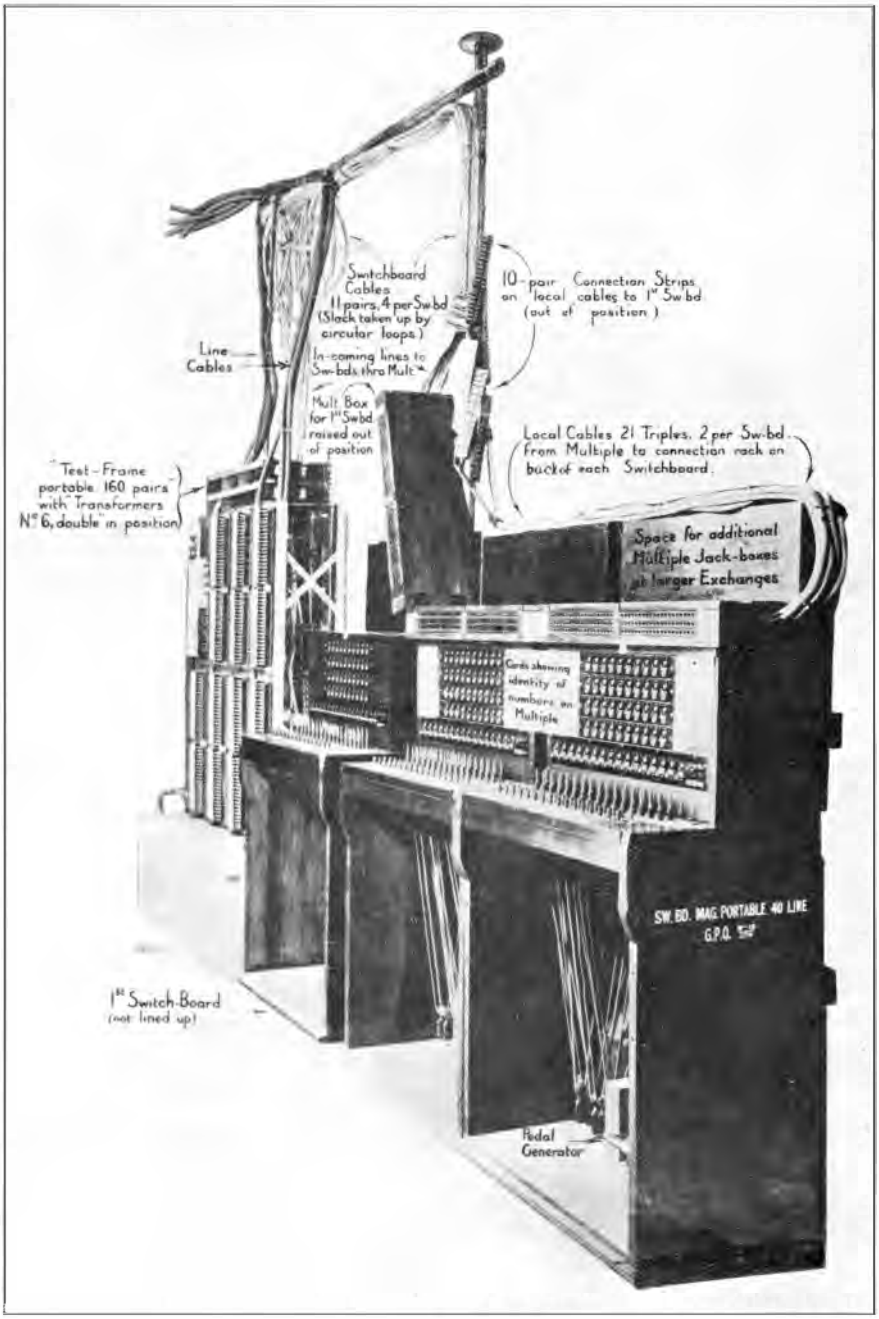


FIG. 13

answering positions of the switchboards at one end and to the test frames at the other. The sections of the multiple jack box are so hinged together that the whole can be folded up concertina fashion into a rectangular block, and transported, with its extension cables, in a special packing case. Fig. 13 shows a multiple exchange of

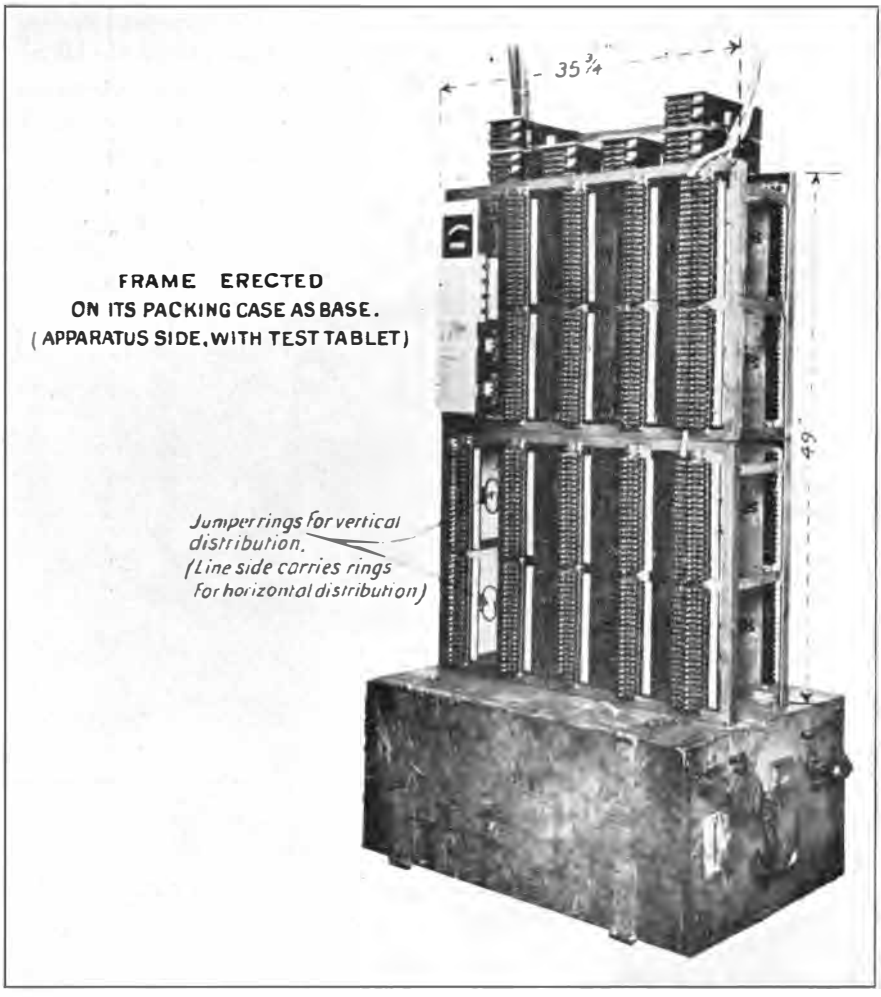


FIG. 14.

three sections in course of erection. It will be seen that the multiple jack boxes lie on top of the 40-line switchboards and can be stacked, one above the other, to the required capacity. A complete multiple is provided in front of each operator. It may be mentioned that 40 lines generally represents a maximum load for an operator under field conditions. The lines are generally very busy, the holding

time is long, and the operators have to do much tracing. 16 pairs of plugs and cords are provided on each 40-line switchboard. By the use of these switchboards and the portable test frames referred to later, a complete multiple exchange for 320 lines can be carried about, and can be set up, or dismantled and placed intact on transport, in about an hour.

TEST FRAMES, PORTABLE, 160 PAIRS (AND 80 PAIRS).

The 80-pair test frame was provided for divisional headquarter offices and the 160-pair frame for corps and army headquarters.

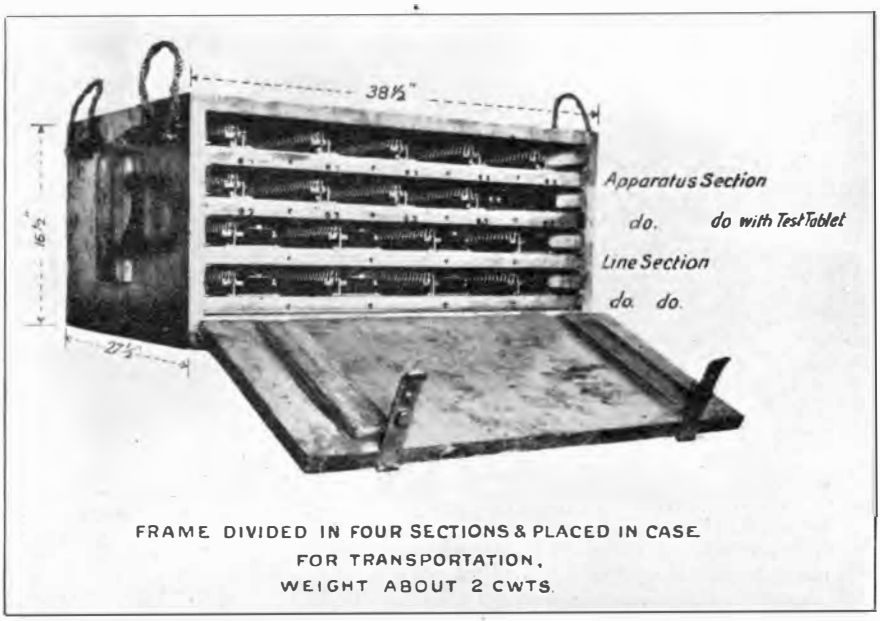


FIG. **15.**

Two or more frames can stand in line and be inter-connected by jumper wires. Fig. **14** shows a 160-pair frame erected, and Fig. **15** in its transport case. It will be noticed that the transport case forms the base of the frame when in use. The sections of the frame can be withdrawn from the case and fixed in situ in a few minutes without the use of any tools. Fig. **13** shows one of the frames erected as part of a multiple exchange. The strips on the line side carry fuses, lightning protectors, and U links; those on the exchange side carry duplicate lightning protectors and U links. The terminals are all arranged for wiring by means of cables ready connected to the 10-pair connection strips shown in Fig. **13**. Transformers specially mounted in pairs can be stacked to any required extent on top of the

frames while in situ and can be connected, either temporarily by plugs and cords or more permanently by jumper wires, for the purpose of making up superposed circuits. One section of each frame is fitted with a " Detector No. 2 " provided with four 3-position testing keys by means of which any required test may be applied automatically to a line plugged through to the testing terminals. Tables showing the resistance and insulation values corresponding to the various readings on the scale of the detector are engraved on the metal front of the test tablet.

TEST PANELS.

These were introduced in 1916 and provide mobile testing and protective equipment for all classes of the smaller formations; until the introduction of Portable Test Frames they had even been used

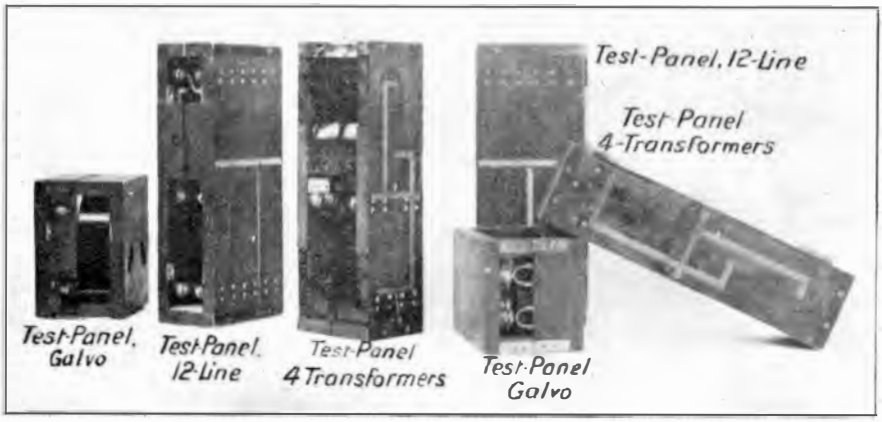


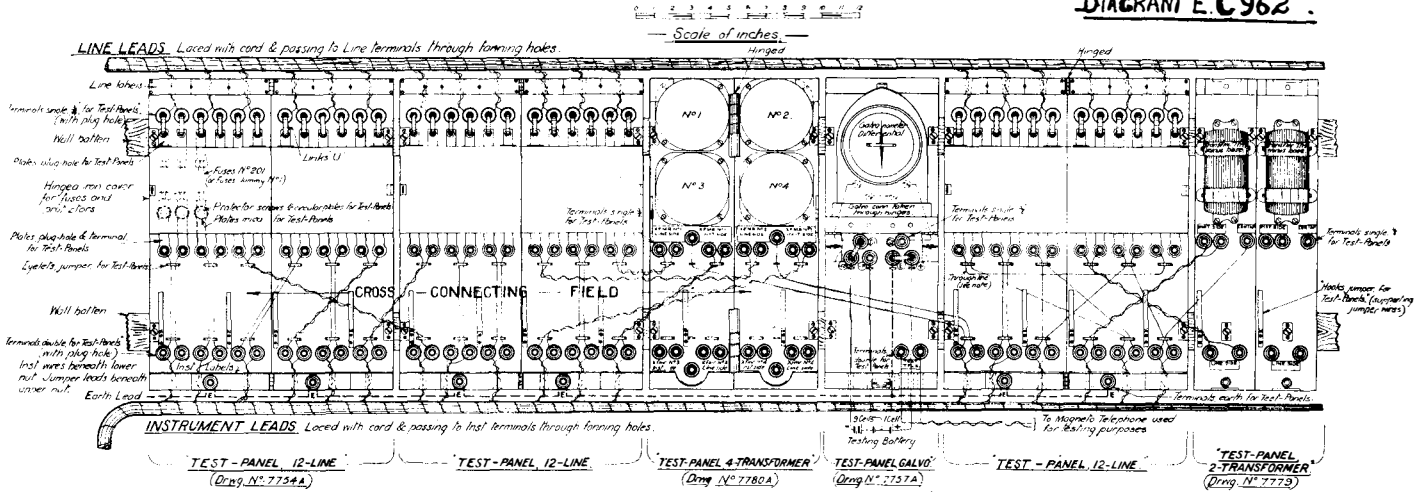
FIG. **16.**

at some corps headquarters. The line test panels provide U links, fuses, lightning protectors and cross connecting facilities. Other types of panel provide a testing galvanometer and transformers for superposing. All types are hinged and self-packing and all can be assembled *en suite* on a wall. Fig. **16** shows a group of test panels shut up for transportation, and Diagram E.C. 962 A shows how they are assembled side by side in a military office. Over 11,000 of these test panels were supplied.

GENERAL.

Among interesting items, which want of space prevents us from describing, are the special thermophone transmitters used by the sound ranging section of the R.E., by means of which the location of enemy guns at distances of several miles could be determined

DIAGRAM E.C962^.



TEST-PANEL 12-LINE – In two sections, hinged to fold inwards horizontally with spring catch for transportation.
Comprises – 12 Terminals, single ¾ for Test-Panels
12 " double " "
2 " earth " "
12 Plates plug hole " "
12 " and terminal for Test-Panels
12 Protector screws and circular plates for Test-Panels
12 Plates, mica " "
12 Eyelets jumper " "
4 Hooks " "
2 Labels "line" "
2 " "inst" "
12 Links "U"
12 Fuses N°201 (or Fuses dummy N°1)

TEST-PANEL GALVO – In two parts, hinged horizontally to fold together with spring catch. When mounting the Panel a small supporting batten should be fixed on wall behind hinges)
Comprises – 6 Terminals, single ¾ for Test-Panels
2 " double " "
2 Links "U"
1 Galvanometer, differential (coils in series)

Positions of Links etc –
Left hand group of 3
To connect 10-cell battery (12 volts) for insulation tests
To connect 1-cell battery for local continuity tests
Right hand group of 3
Insulation test, positive pole to line, plug & cord connection to line
Insulation test, negative pole to line, plug & cord connection to line
Insulation test, plug & cord connection to A line / B line

TEST-PANEL 4-TRANSFORMER – In two sections hinged to fold inwards horizontally with spring catch for transportation.
Comprises – 20 Terminals, single ¾ for Test-Panels
8 Eyelets jumper " "
2 Hooks " "
4 Coils repeating Nº4006 A, minus (bases)
1 Set of Labels for Test-Panel (4-Transformer)

Connections of Coils to Terminals

The coil and terminal numbers & colours indicated correspond to those of ordinary Repeating Coils 4006A

TEST-PANEL 2-TRANSFORMER – Consists of Test-Panel & Transformers. Fixed together for transportation by thumb-screw fastenings. Each Transformer Panel comprises –
3 Terminals single ¾ for Test-Panels
1 Hook jumper
1 Transformer, 7 Terminal mining beste
1 Set labels for Test-Panel & Transfor

Connections of Coils to Terminals

Left hand refer to corresponding terminals of ordinary "Transformers 7 Terminal"

GENERAL NOTES – The above mentioned fittings provide mobile equipment on the unit principle for Lines on Military Offices. The Panels will be fitted side by side in such numbers as may be necessary, on horizontal wall-battens provided locally. The Cross Connecting Field is continuous across all the Panels and jumper connections are made thereon by means of switchboard wire which is supplied in hundles known as WIRE SWITCH-BOARD BUNDLES, each containing four ½-yard lengths of twin wire of different colours. Jumper wires should be drawn "full" but without strain. Circuit codes should be written in pencil on the labels and washed out when allocation required. All terminals are constructed with central plug-holes, as well as with ringnuts, and pairs of wires and cords are provided for making temporary or emergency connections. 2 Sets PLUGS AND PAIRS WITH 12 INCH DI CORD are required for each Test-Panel & line. Longer cords may be made locally of DI Field Cable. If through circuits are numerous the sides towards forward offices may be connected to Instrument terminals (lowest row on Test-Panels) in order to avoid taking up the sets of fuses and protectors. Panels may be fitted in two rows one above the other, if wall space is not otherwise available, in such cases supporting hooks or pins for jumper wires between the two rows, should be arranged at the ends or at intermediate gaps left for the purpose. If floor space is plentiful suites of Panels may be fitted back to back on a simple wooden rack made locally, gaps 3 or 4 inches wide being left at suitable intervals in order that jumper wires may be passed from one side to the other.

FIG. 17.

with a margin of error of only a few yards. These were made and supplied by the Post Office, together with the special resonating air containers, microphone holders, protective devices, testboards, line balancing equipment, graphical ranging instruments, and other items used for sound ranging purposes.

Another important section of the R.E. dealt with the location of enemy guns by observed cross-bearings on the flash. Switchboards and signalling devices of various types were designed and supplied for controlling and co-relating the reports of different observers.

Portable testing sets, common battery telegraph sets, silent patrol telegraph sets, concentration and intercommunication telegraph switchboards, cross-connecting cases, etc., were made up and supplied in large numbers. Large multiple exchanges were provided for installation at the main coastal bases and at general headquarters. Thermionic valve telephone repeaters were supplied towards the end of the war and gave excellent service. A great many types of special trench and aerial cables were designed and shipped in enormous quantities to the armies in the field, as well as line stores of all descriptions.