



TELEPHONE DIAGRAMS

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POST OFFICE TELEGRAPHS.

CONNECTIONS
OF
TELEPHONIC APPARATUS
AND
CIRCUITS.

GENERAL POST OFFICE,
1909.

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PART I.--COMMON BATTERY.

SECTION 1.

SUBSCRIBERS' APPARATUS
ON DIRECT EXCHANGE CIRCUITS.

Plate 1.

C.B. Diagram No. 2.

COMMON BATTERY WALL TELEPHONES.

FIG. 1.—APPARATUS SCHEDULE.

Telephone No. 1. The description includes Cord, Flexible, No. 222, and Receiver, Bell; Coil, Induction, No. 3 or 4; Bell, Magneto, 1,000 ohms; Condenser, metal-cased, 2 m.f.; Transmitter, C.B.; and 3 fixing screws and washers.

The 3-terminal type of the instrument is superseded by the 5-terminal patterns, but existing supplies of the former will be used up. *See* Fig. 4.

The instrument should be ordinarily fixed upon the wall with its lower edge 40 inches from the floor. If the subscriber desires it placed at some other height, his wish should be complied with. When the wall has to be plugged, care must be taken that no unnecessary damage is caused.

The wires may be led to the instrument, either from above or below, by way of the grooves in the back, through the holes below the terminals, and should be fixed below the lower nut of the terminal.

FIG. 2.—SUBSCRIBER'S SET WITH COIN
COLLECTING BOX.

In addition to the items given under Fig. 1, the schedule includes :—

Box, Coin Collecting, Complete.

The description includes the Cash Box. The box should be fitted adjacent to the Telephone.

FIG. 3.—SUBSCRIBER'S SET WITH EXTENSION BELL.

The additional items in this case are :—

Bell, Magneto (1,000 ohms).

Switch, Tumbler, 3 ampères (bronzed).

The Tumbler Switch may be fitted adjacent either to the Wall Set or the Extension Bell in accordance with the desire of the subscriber.

FIG. 4.

Telephone No. 1 (Telephone, Wall, C.B.). The figure shows the wiring of the 5-terminal instrument, which has superseded the original C.B. Wall Set with 3 terminals shown in Fig. 1. *See also* Fig. 4, Plate 2, which shows the connections of the later form of Induction Coil fitted in C.B. sets.

Recent deliveries of this instrument are fitted with a detachable switch-hook (Hook, Receiver "F"), and the switch is arranged similarly to that shown in Plate 2, Fig. 5.

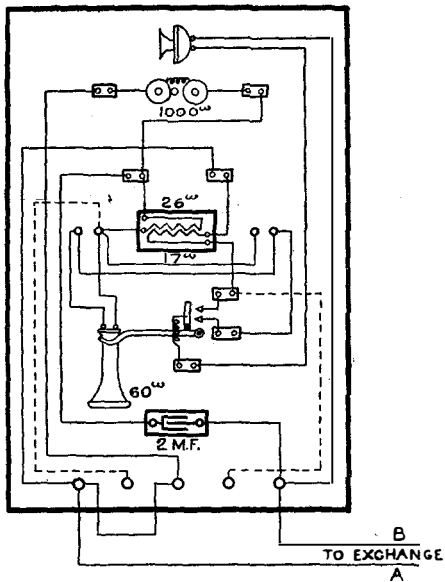
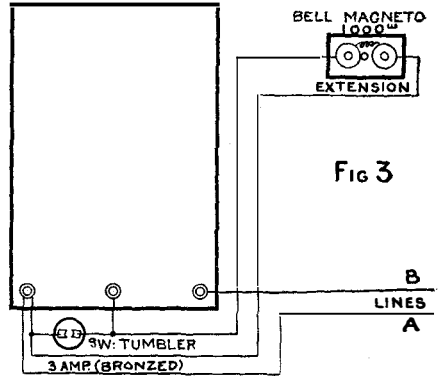
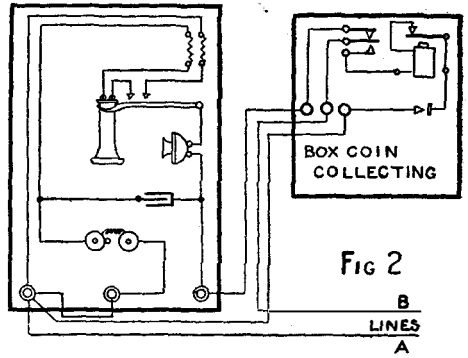
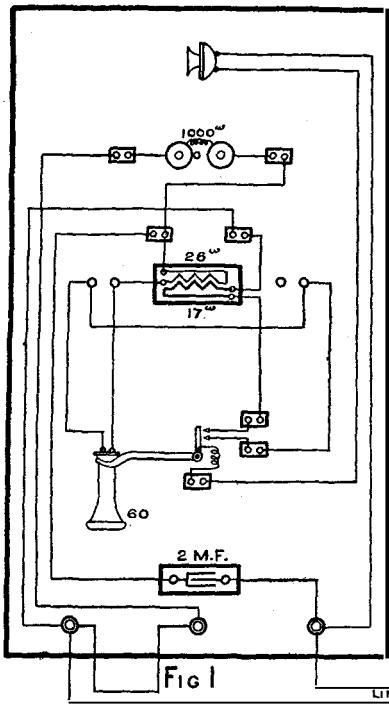


FIG. 4.

Plate 2.

C.B. Diagram No. 1.

COMMON BATTERY TABLE TELEPHONES.

FIG. 1.—APPARATUS SCHEDULE.

Telephone No 12. The description includes Cord, Flexible, No. 302; and Strip, Flexible Cord Connection, 4-terminal; Micro Telephone, C.B. (Telephone 38); and Cord, Flexible, No. 409.

This pattern of instrument is not now fitted on Exchange Circuits in competitive areas.

Bell Set No. 1 (Bell Set, Magneto, C.B.). The description includes Condenser, metal-cased, 2 m.f.; Induction Coil; and also screws for fixing. The internal connections are shown theoretically in this figure; for actual connections *see* Fig. 2. The Induction Coil fitted has two windings: Primary Coil 17 ohms, Secondary Coil 26 ohms. The resistance of the Bell, Magneto, is 1,000 ohms. A later pattern is fitted with a 500 ohms + 500 ohms Bell, the coils of which are joined in series, and an Induction Coil $\frac{26}{17}$ fitted with connecting plates and screws similarly to the primary battery Induction Coils. *See* Fig. 4.

FIG. 2.—APPARATUS SCHEDULE.

Telephone No. 2. The description includes Cords, Flexible, Nos. 222 (Receiver Cord) and 302; Receiver Bell; Strip, Flexible Cord Connection, 4-terminal; Transmitter, C.B.; and Label No. 43. *See also* Fig. 5.

Bell Set No. 1.

FIG. 3.—TABLE SET, WITH EXTENSION BELL.

The apparatus schedule is the same as either of the above, with the addition of:—

Bell, Magneto (1,000 ohms),

and

Switch, Tumbler, 3 ampères (bronzed).

FIG. 4.

Bell Set No. 1. In this Set the Induction Coil ("Coil Induction No. 4") is mounted on plates similarly to the primary battery Induction Coil. The small figure shows the method of winding the two coils; it will be observed that the magnetic effect will be in series if a current is sent through the coils from 2 to 1. and 3 to 4.

FIG. 5.

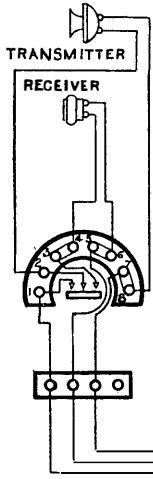
This figure shows the connections of Telephone No. 2 with a detachable switch hook. The description under Fig. 2 includes also 2 Cords, Flexible, No. 116 (Transmitter cord), in this case.

The Telephone should stand on the desk or table in a position indicated by the subscriber, and the Strip, Flexible Cord Connection, fixed to the ledge underneath the desk or table top in the vicinity of the telephone user's position.

The Bell Set, Magneto, C.B., should be fixed on the wall in the position desired by the subscriber, generally not less than 6 feet from the floor.

The Tumbler Switch may be fitted adjacent to either the Bell Set or the Extension Bell as required.

TELE., MICRO.
C.B.



BELL SET,
MAGNETO, C.B.

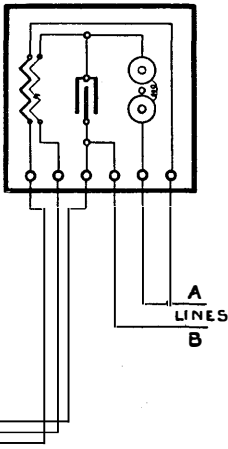
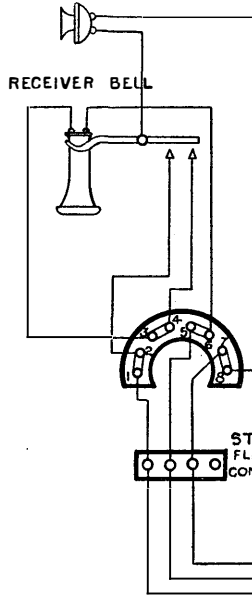


FIG. 1

TRANSMITTER,
SOLID BACK, C.B.



BELL SET,
MAGNETO, C.B.

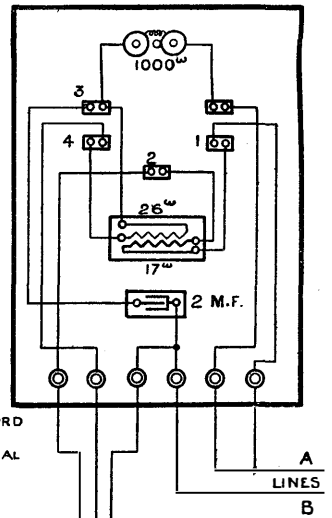


FIG. 2

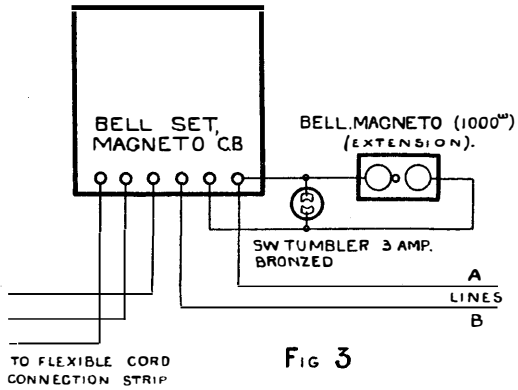


FIG 3

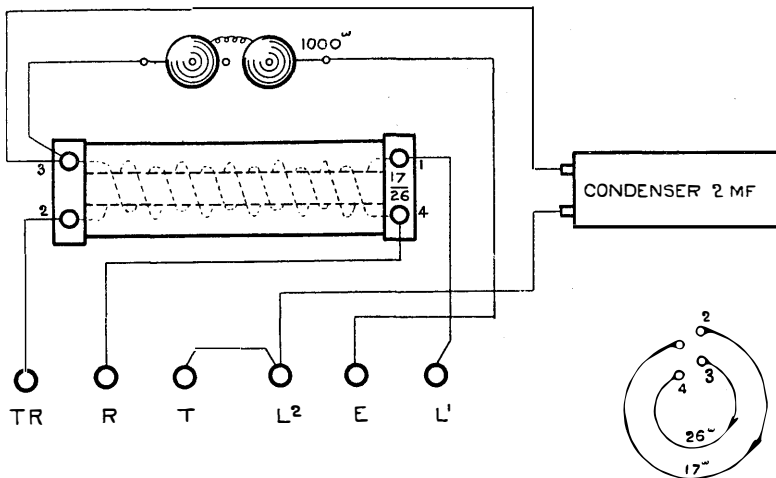


FIG. 4.

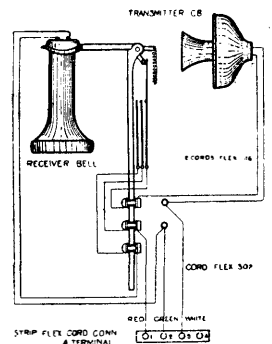


FIG. 5.

Plate 3.

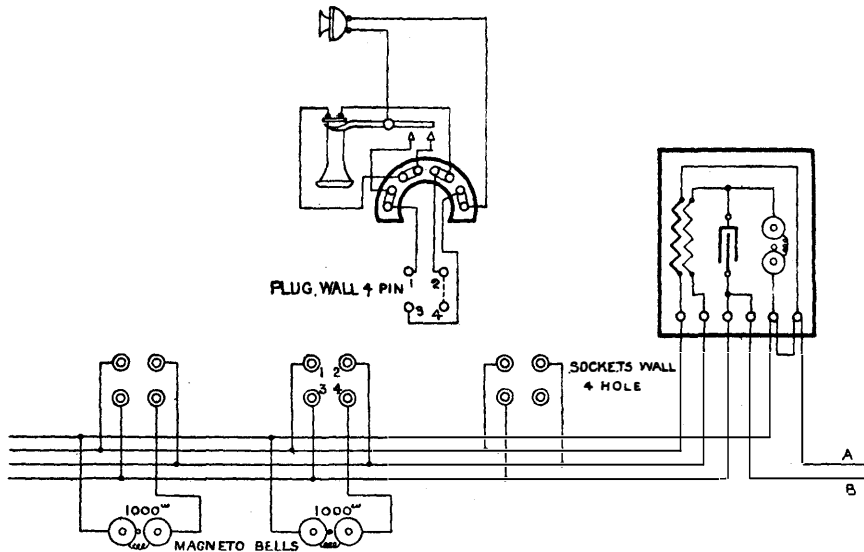
C.B. Diagram No. 30.

**CONNECTIONS OF SUBSCRIBER'S CIRCUIT
EQUIPPED WITH WALL SOCKETS AND
PLUGS. TABLE TELEPHONE.**

In addition to the items required for an ordinary Table Set, shown in Fig. 2 of Plate 1, the following items are required :—

- n Sockets, Wall, 4-hole.
- n Bells, Magneto (1,000 ohms).
- Plug, Wall, 4-pin.

The connection shown dotted between 2 and 4 of the plug has to be made locally.



SECTION 2.

SUBSCRIBERS' APPARATUS WITH
SIMPLE EXTENSIONS.

Plate 4.

C.B. Diagram No. 3.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH SIMPLE EXTENSION. TABLE
TELEPHONE AT EACH POINT. OLD
ARRANGEMENT.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 2.
Bell Set No. 1.
Press Button, "F."

Extension Set.

Telephone No. 2.
Bell, Trembler, Circular, 100 ohms.

The Press Button, "F," should be fitted on the table or desk, the Bell, Trembler, Circular, on the wall with the Armature in a vertical position, in positions agreed upon with the subscriber. For other fitting information, see page 5, Subscribers' Ordinary Circuit.

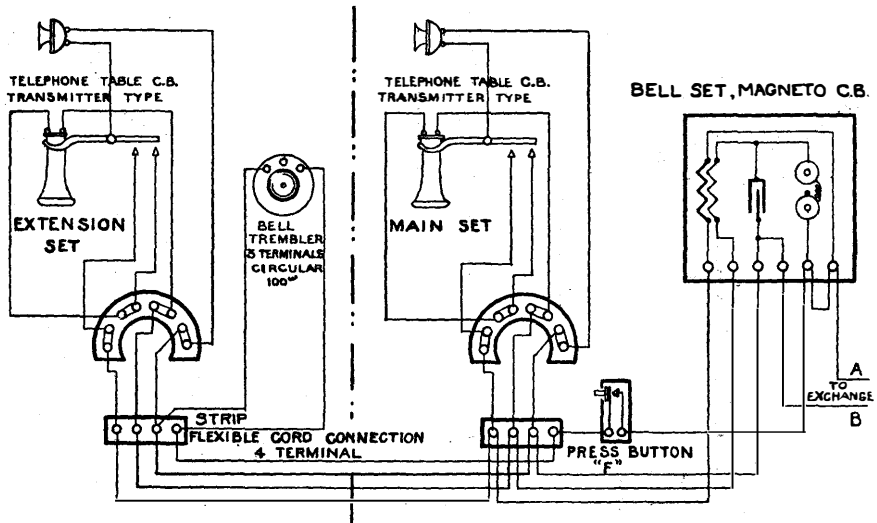


Plate 4.

Plate 5.

C.B. Diagram No. 151.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH SIMPLE EXTENSION. TABLE
TELEPHONE AT EACH POINT. NEW
ARRANGEMENT.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 10. The description includes, Cords, Flexible, Nos. 222 and 402; Strip, Flexible Cord Connection, 4-terminal; Transmitter, C.B.; and Receiver, Bell.

Bell Set No. 1.

Extension Set.

Telephone No. 2.

Bell, Trembler, Circular, 100 ohms.

The Press Button on the Main Set performs the same function as the Press Button, "F," in the old arrangement; *i.e.*, its depression completes the circuit of the Exchange Battery through the Trembler Bell at the Extension Set, thus giving a call at that point.

See Fig. 2, Plate 14, for original connections of Telephone, Table, C.B., with Press Button, Transmitter Type (now Telephone No. 10).

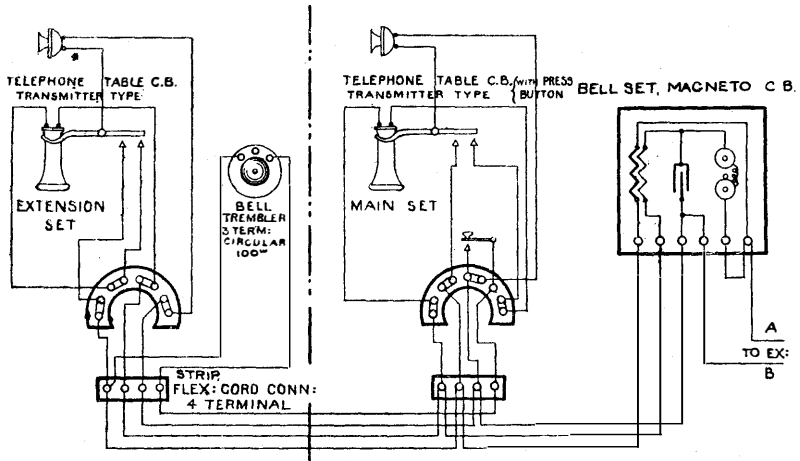


Plate 5.

Plate 6.

C.B. Diagram No. 4.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH SIMPLE EXTENSION. WALL
TELEPHONE AT EACH POINT.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 1 (3-terminal type shown).
Press Button, "F."

Extension Set.

Telephone No. 1 (3-terminal type shown).
Bell, Trembler, Circular, 100 ohms.

The Press Button, "F," should be fitted on the left side of the telephone desk, on a level with the Magneto Bell; the Trembler Bell at the Extension on the wall immediately above the instrument.

It should be observed that the two left-hand terminals of the Extension Set are not joined together as in the case of an ordinary Set, the Magneto Bell not being required at this point, all Exchange calls being received on the Magneto Bell at the Main Set.

See Plate 1 for internal connections of Sets.

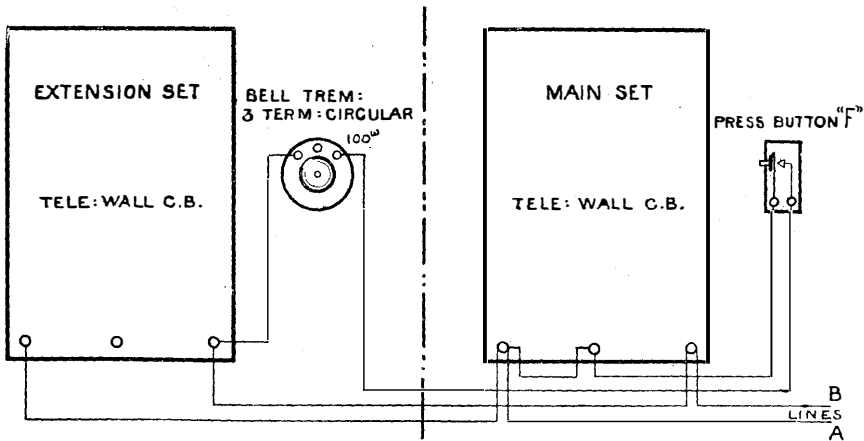


Plate 6.

Plate 7.

C.B. Diagram No. 5.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH SIMPLE EXTENSION. WALL
TELEPHONE AT MAIN SET, AND TABLE
TELEPHONE AT EXTENSION.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 1.
Press Button, "F."

Extension Set.

Telephone No. 2.
Bell, Trembler, Circular, 100 ohms.

The Press Button should be fitted on the left side of the Main Set telephone desk, on a level with the Magneto Bell, and the Trembler Bell at the Extension Set on the wall in a position agreed upon with the subscriber.

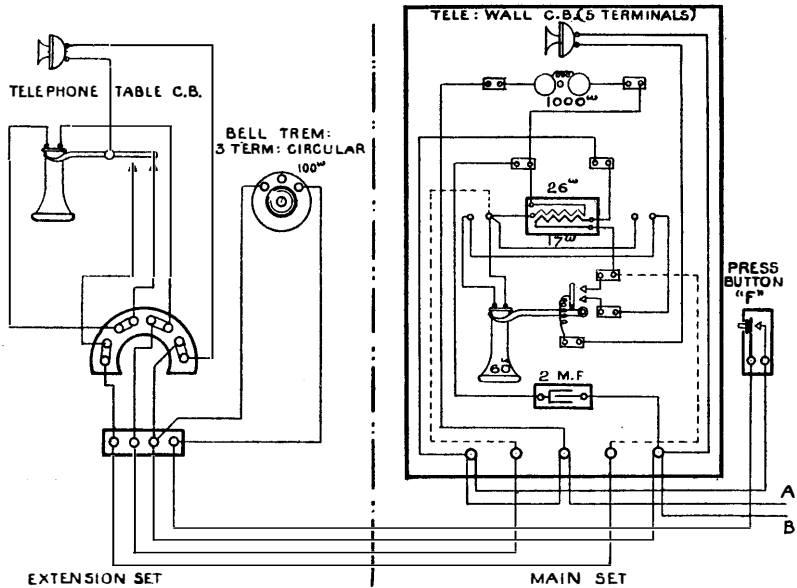


Plate 7.

Plate 8.

C.B. Diagram No. 6.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH TWO SIMPLE EXTENSIONS.
WALL TELEPHONE AT MAIN SET,
TABLE TELEPHONES AT EXTENSIONS.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 1.

2 Press Buttons, "F" (One for each Extension).

Extension Sets 1 and 2.

Telephone No. 2.

Bell, Trembler, Circular, 100 ohms.

The Press Buttons, "F," should be fitted on the sides of the desk of the Main Set Telephone; No. 1, which calls Extension No. 1, on the right side, and No. 2, which calls Extension No. 2, on the left.

For internal connections of Main Set instrument, *see* Plate 1, Fig. 4.

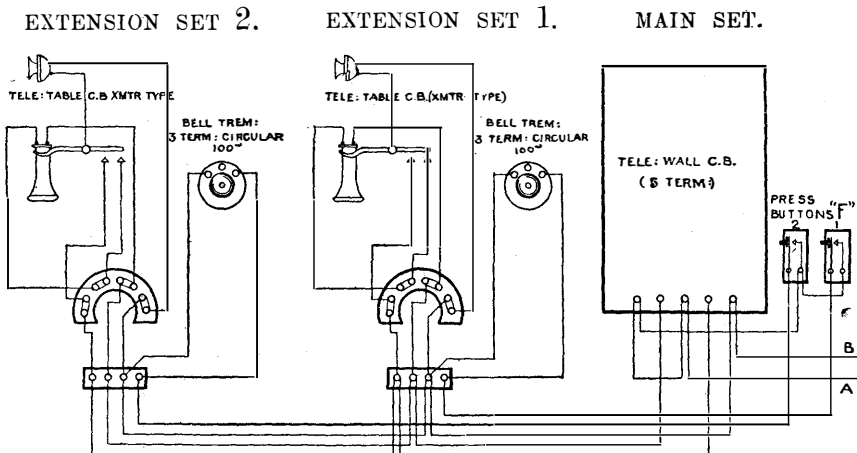


Plate 8.

Plate 9.

C.B. Diagram No. 7.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH TWO SIMPLE EXTENSIONS, WALL
TELEPHONE AT MAIN SET AND AT
EXTENSION NO. 1, TABLE TELEPHONE
AT EXTENSION NO. 2.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 1.

2 Press Buttons, " F " (One for each Extension).

Extension Set No. 1.

Telephone No. 1.

Bell, Trembler, Circular, 100 ohms.

Extension Set No. 2.

Telephone No. 2.

Bell, Trembler, Circular, 100 ohms.

See page 18 for position of Press Buttons,
and Plate 1 for internal connections of Wall
Telephones.

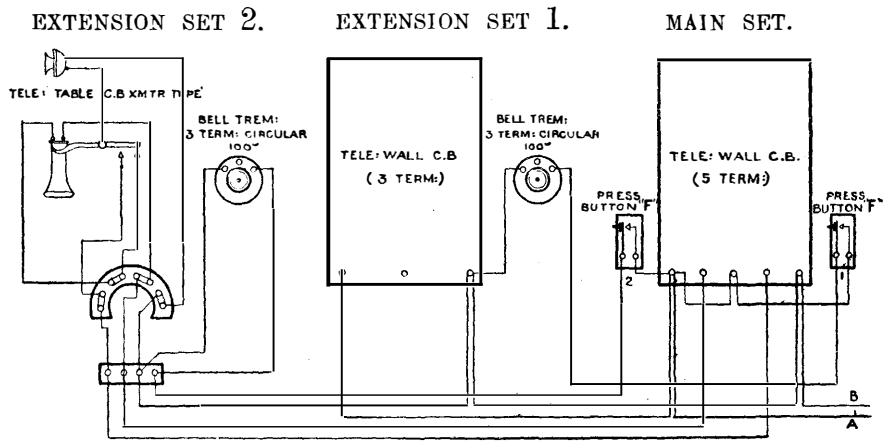


Plate 9.

Plate 10.

C.B. Diagram No. 8.

CONNECTIONS OF SIMPLE EXTENSION
CIRCUIT WITH "SECRECY" SWITCH
AT EXTENSION SET.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 1 (3-terminal shown type).
Press Button, "F."

Extension Set.

Telephone No. 2.
Bell Set No. 1.
Bell, Trembler, Circular, 100 ohms.
Switch, 6-point, 2-position.

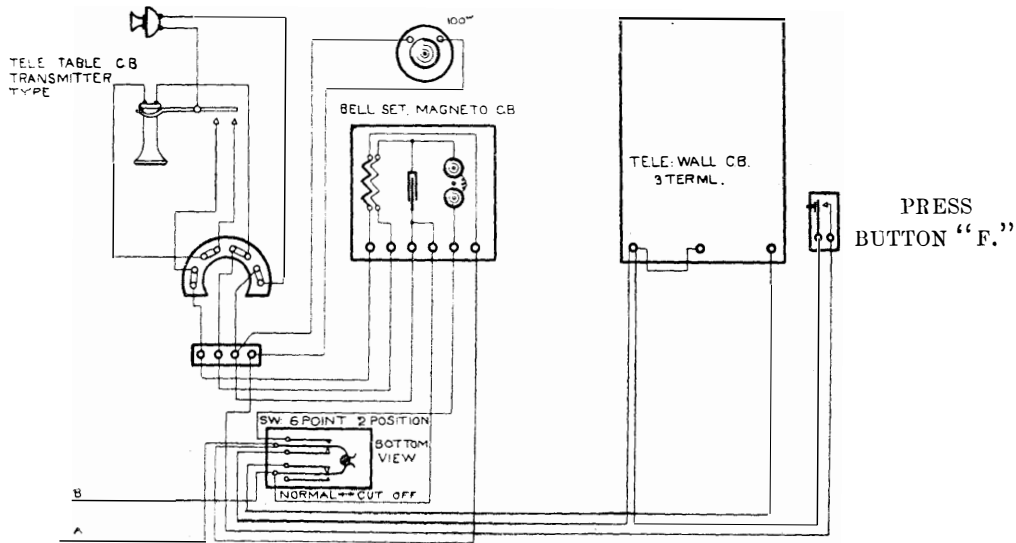
The Switch should be fitted adjacent to the Extension Set in a position agreed upon with the subscriber.

Normally, the circuit is through to the Main Set for receiving calls, the Magneto Bell at the Extension instrument being out of circuit. When the "Secrecy" Switch is turned, the Main Set is entirely cut off from the Exchange, and the Bell at the Extension instrument is joined up, making that Set an ordinary "Terminal" instrument.

EXTENSION SET.

BELL TREMBLER
CIRCULAR.

MAIN SET.



SECTION 3.

SUBSCRIBERS' APPARATUS
WITH ONE EXTENSION AND
INTERCOMMUNICATION.

Plate 11.

C.B. Diagram 140A

CONNECTIONS OF SUBSCRIBER'S CIRCUIT
WITH SIMPLE EXTENSION, GIVING
INTERCOMMUNICATION, AND WITH OR
WITHOUT SECRECY.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 5.

In this, the more recent, type of Intermediate Telephone, an Intermediate Switch 4-way (Key, Type 2077) takes the place of the 3-way Switch in the older form, and the title includes also a Coil, Retardation, 400 ohms, Type 2010 F.

This arrangement permits of an additional "position" being utilised:—"Main Set through to Extension, Exchange held." See Plate 12 giving the theoretical connections of the circuit in the several positions of the Switch.

Extension Set.

Telephone No. 7.

The connections of the Switch and Links are shown as seen from the back of the Telephone.

For "Secrecy" the links should be connected between 1 and 2; for "Non-Secrecy" between 1 and 3.

Plate 13 gives the Table equivalent of the Main Set, and Plate 14 the Table equivalent of the Extension Set.

TELE. WALL, C.B.
INTERMEDIATE WITH GENR.

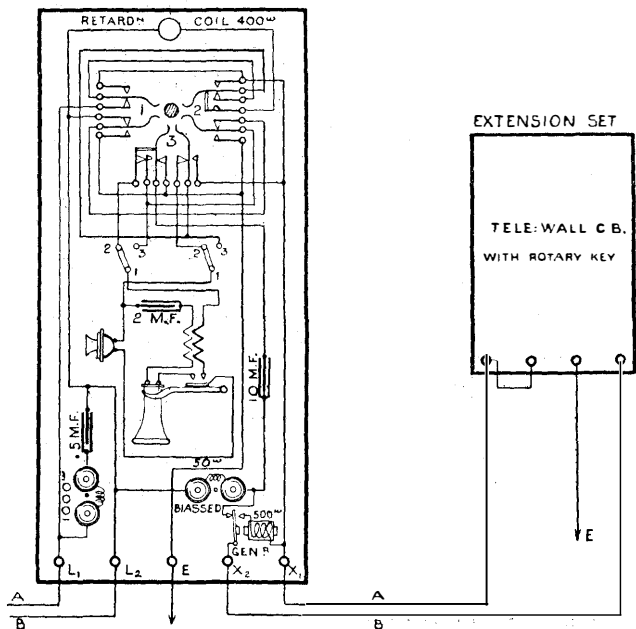


Plate 11

Plate 12.

C.B. Diagram No. 141.

THEORETICAL CONNECTIONS OF SUBSCRIBER'S CIRCUIT WITH SINGLE EXTENSION, GIVING INTERCOMMUNICATION, AND WITH OR WITHOUT SECRECY.

Fig. 1.—Switch in “Exchange” position. Lever Central—Main Set through to Exchange.

Fig. 2.—Switch in “Extension” position. Lever in 1—Main Set through to Extension Set.

Fig. 3.—Switch in “Main Set to Extension and Exchange held” position. Lever in 2.

Fig. 4.—Switch in “Extension Set through to Exchange” position. Lever in 3.

The Extension Set calls the Main Set by intermittently earthing the B line by means of the Rotary Key. This operates the Biassed Bell without indicating a signal at the Exchange. The Extension is called by generator.

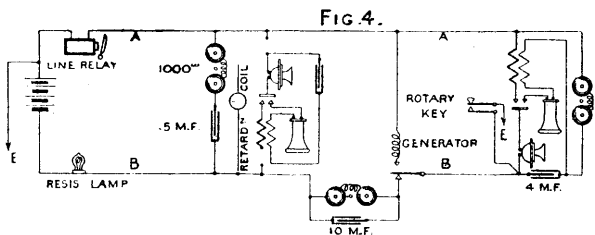
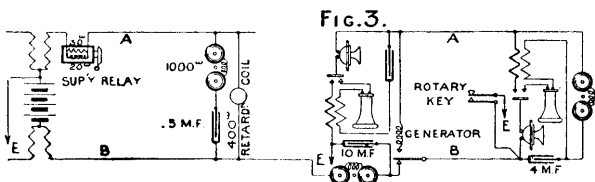
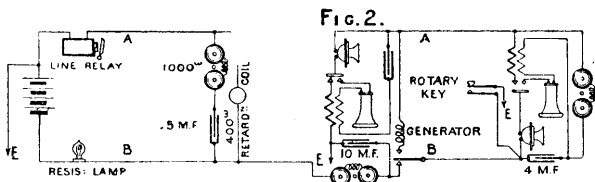
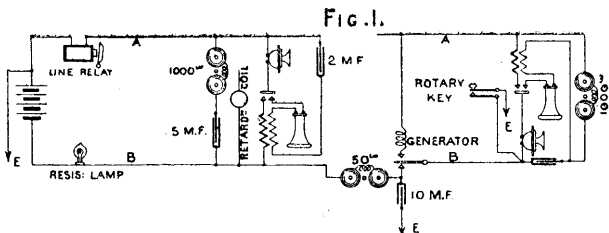


Plate 12.

Plate 13.

C.B. Diagram No. 174.

CONNECTIONS OF SUBSCRIBER'S CIRCUIT WITH SINGLE EXTENSION, GIVING INTERCOMMUNICATION, AND WITH OR WITHOUT SECRECY. TABLE TELEPHONE AT MAIN SET.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 6. The description includes Cord, Flexible, No. 1202; Intermediate Switch (Key Type 2077); and Block, Flexible Cord Connection, 12-terminal. These instruments have now been fitted with a fixed C.B. Transmitter, Receiver Rest, and Receiver, Bell, "D," with Cord, Flexible, No. 222.

Bell Set No. 3 (Bell Set, Magneto, $\frac{2}{2}$ C.B.).

The description includes 2 Bells, Magneto—one 1,000 ohms, the other 50 ohms (biassed); Coil, Retardation, 400 ohms, Type 2010 F; Coil, Induction, Type 2203; and 3 Condensers, metal-cased, .5 m.f., 2 m.f., and 10 m.f.

See Plates 11, 12, and 14 for Extension Sets; and Plate 11 for the Wall Set equivalent of the above.

All connections are shown as if looking at the fronts of the sets, except the Key, which is shown as if seen from the back.

TELE. TABLE,
C.B. INTERMEDIATE, WITH GENR.

BELL SET,
MAGNETO $\frac{2}{2}$ C.B.

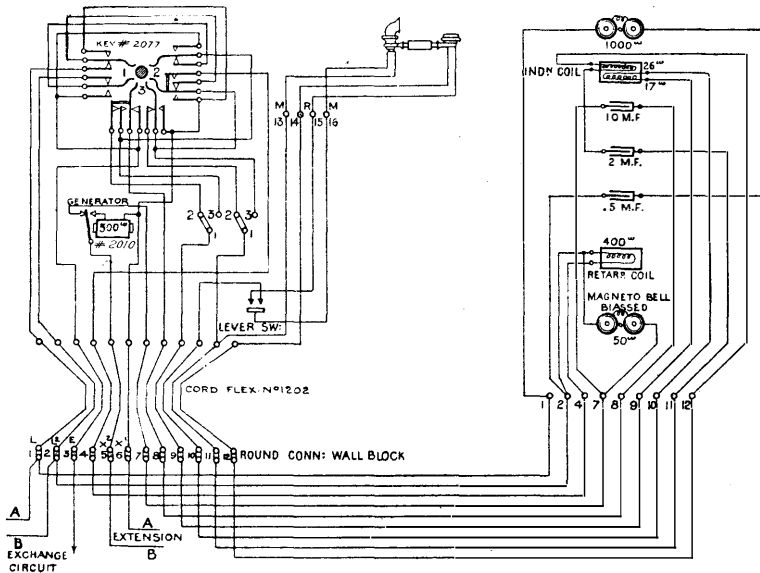


Plate 13.

Plate 13—cont.

Lever Central—Main Set through to Exchange.

Lever in Position 1—Main Set through to Extension.

Lever in Position 2—Main Set through to Extension and Exchange held.

Lever in Position 3—Extension Set through to Exchange.

For "Secrecy" the links should be connected between 1 and 2. For "Non-Secrecy" the links should be connected between 1 and 3.

See Plate 12 for theoretical conditions in the various positions of the Switch, and page 28 for the methods of calling. Lifting the Micro Telephone from the cradle in this instance calls the Exchange, when the Switch Lever is in the central position.

Plate 14.

C.B. Diagram No. 13.

**CONNECTIONS OF EXTENSION SET, GIVING
INTERCOMMUNICATION WITH MAIN SET,
WITH OR WITHOUT SECRECY. TABLE
TELEPHONE AT EXTENSION.****APPARATUS SCHEDULE.**

Telephone No. 10.

Bell Set No. 1.

This Table Set is the equivalent of the Wall Set, "Telephone No. 7" shown in Plates 11 and 12, the Press Button when pressed intermittently performing the same function as the Rotary Key in the case of the Wall Set.

Fig. 2 shows the original connections of the Press Button and the Telephone Base.

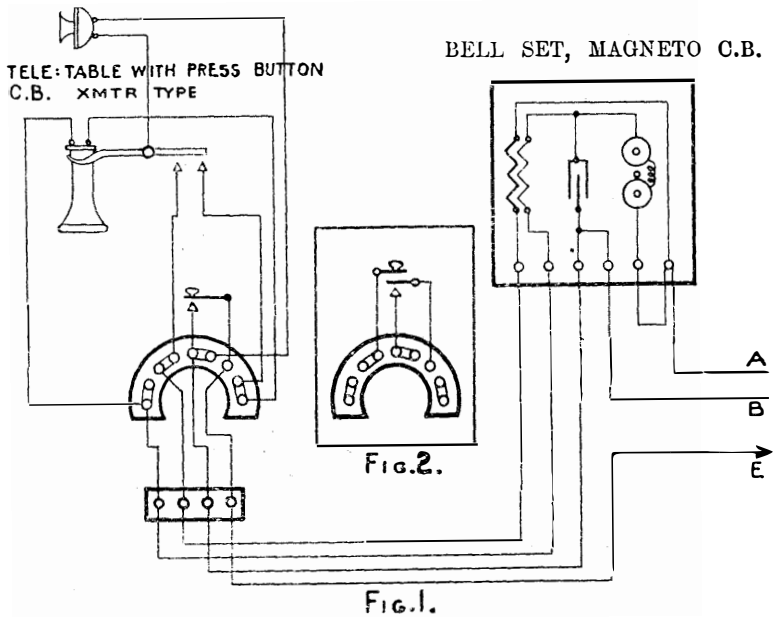


Plate 14.

Plate 15.

C.B. Diagram No. 157.

CONNECTIONS OF EXTENSION SET, GIVING
INTERCOMMUNICATION WITH MAIN SET,
WITH OR WITHOUT SECRECY. TABLE
TELEPHONE WITH WALL PEG AND
SOCKETS.

APPARATUS SCHEDULE.

Telephone No. 10.

Bell Set No. 1.

Peg, Wall Socket, 7-connection.

n Sockets, Wall, 7-connection.

n Bells, Magneto, 1,000 ohms.

Connections at * to be made normally. When it is required that one Bell only should be in circuit at any time, the connections shown dotted should be made and the connection at * left disconnected.

See Plates 11 and 14 for ordinary Extension Sets.

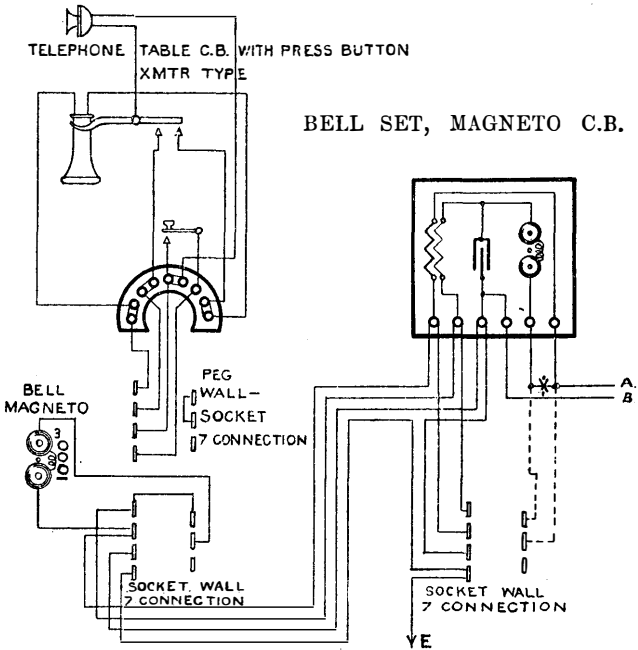


Plate 16.**BELL SET No. 4.**

The plate shows the connections of the Intermediate C.B. Switching Set introduced in 1909 for use on a Subscriber's Circuit with one Extension, giving Intercommunication, with or without secrecy.

When the two pairs of terminals AA and BB are connected, as shown by the dotted lines, the intermediate station (at which an ordinary complete C.B. telephone set is fitted) is connected in bridge with the extension on the Exchange lines when springs "2" are operated. With the dotted connection removed, the intermediate station cannot overhear under the same conditions.

Speaking current for conversation between the intermediate and extension stations is provided by two dry cells which are connected to the terminals marked Z and C.

The Indicator is connected so as to afford an automatic clearing signal of a negative character, when the Extension clears to the Exchange.

See Plate 17 for the conditions in the various positions of the switch.

At the Extension an ordinary C.B. telephone is fitted with the addition of a generator for the purpose of calling the intermediate station.

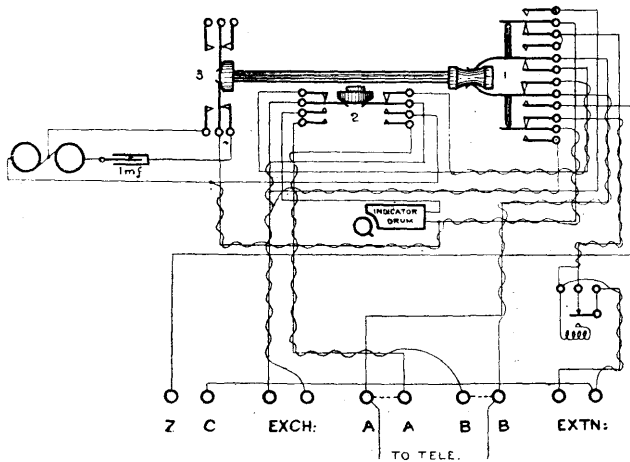


Plate 16.

Plate 17.

THEORETICAL CONNECTIONS OF SUBSCRIBER'S CIRCUIT WITH SINGLE EXTENSION, GIVING INTERCOMMUNICATION, WITH OR WITHOUT SECRECY, WHEN BELL SET No. 4 IS USED.

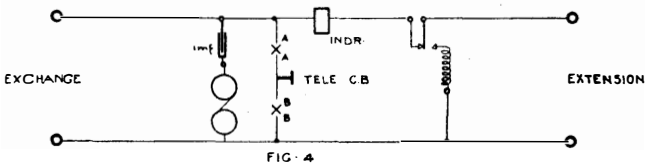
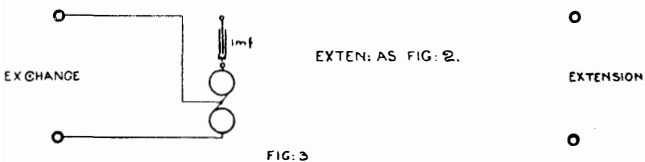
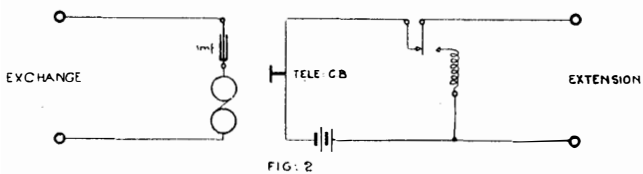
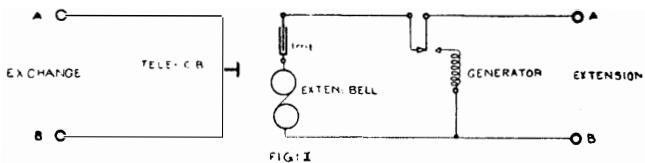
Fig. 1.—Switch in “Exchange” position. Lever central—Main Set through to Exchange; Extension on Extension Bell.

Fig. 2.—Switch in “Extension” position. Springs No. 1 operated—Main Set through to Extension; Exchange on Extension Bell. Local battery in series on the “Main to Extension” lines.

Fig. 3.—Switch in “Main Set to Extension and Exchange held” position. Springs Nos. 1 and 3 operated—Exchange held by one bell coil.

Fig. 4.—Switch in “Extension Set through to Exchange” position. Springs No. 2 operated—Drum Indicator on lines. Main Set in bridge on lines, if terminals AA and BB are connected; otherwise disconnected.

See Plate 16 for wiring of Switching Set.



SECTION 4.

PRIVATE BRANCH EXCHANGES.

Plate 18.

C.B. Diagram No. 19:

**CONNECTIONS OF EXCHANGE CIRCUIT :
 COMMUNICATION WITH NATIONAL TELE-
 PHONE COMPANY'S EXTENSION CIRCUITS,
 OR WITH A PRIVATE WIRE (N.T.
 COMPANY'S). P.O. WALL TELEPHONE,
 COMMON BATTERY, FIXED.**

APPARATUS SCHEDULE.

Instrument, Extension, C.B., No. 19. The description includes Case for Extension Instrument, C.B., No. 19; fitted with Coil, Retardation, Type 9A (80 + 80 ohms); Switch, 3-position, Drawing 926; 2 Condensers, metal-cased, 2 m.f.; and Switchspring, 5-point.

Calls from the P.O. Exchange are received on P.O. Telephone, and answered by turning Switch to "Exchange." If an Extension is wanted, the Switch is left in "Exchange" position, Receiver is replaced on hook, and the Extension is called by means of the National Company's instrument in the usual way.

When Extension subscriber replies, he is plugged through to Switchspring on this instrument and the Switch turned to "Extension." When the Extension subscriber clears, his Indicator drops and bell of P.O. Telephone rings. The pegs should then be withdrawn and the Switch restored to normal, the latter operation sending the clearing signal to the P.O. Exchange.

When an Extension subscriber desires to communicate with the P.O. Exchange, his line should be connected to the Switchspring on this instrument and the Switch turned to "Extension"; the P.O. Exchange will then be automatically called.

When the instrument is used in connection with a private wire circuit maintained by the N.T. Company where that is the only extension, teed connections should be taken from the private wire to the right hand terminals A, B. The operating is the same as before, except that no plugging through is necessary.

The position of the apparatus should be in accordance with the wishes of the subscriber.

INSTRUMENT, EXTENSION, C.B., NO. 19.

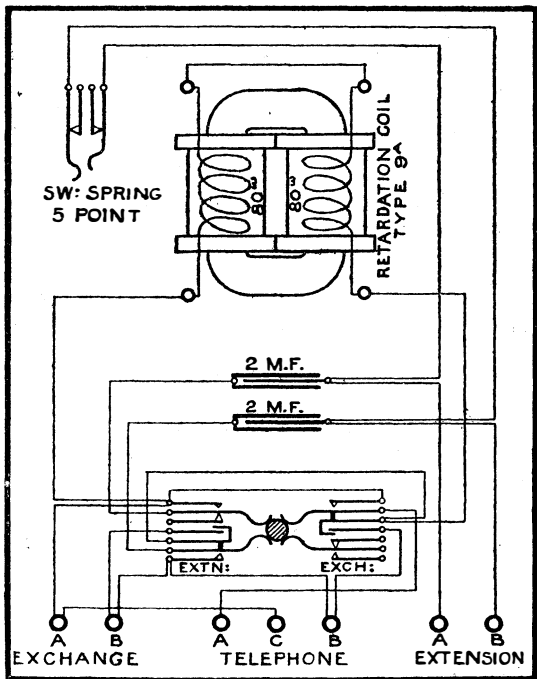


Plate 18.

Plate 19.

C.B. Diagram No. 20.

**CONNECTIONS OF EXCHANGE CIRCUIT ;
COMMUNICATION WITH NATIONAL TELE-
PHONE COMPANY'S EXTENSION CIRCUITS.
N.T. COMPANY'S TELEPHONE USED FOR
SPEAKING ON ALL CIRCUITS.****APPARATUS SCHEDULE.**

Instrument, Extension, C.B., No. 20. The description includes Case for Extension Instrument, C.B., No. 20; fitted with Bell, Magneto, 1,000 ohms (unmounted); Coil, Retardation, Type 9A (80 + 80 ohms); Switch, 3-position, Drawing 926; 2 Condensers, metal-cased, 2 m.f.; and Switchspring, 5-point.

Calls from P.O. Exchange are received on the Magneto Bell, and answered by turning the Switch to "Exchange" position and inserting peg in Switchspring. If an Extension is wanted, Peg should be withdrawn and inserted in Switchspring of Extension asked for on N.T. Company's Switch. The Extension should then be called as usual from N.T. Company's Telephone and after replying should be connected to the Switchspring on this instrument.

Clearing Signal from Extension is received on the Magneto Bell, and the clearing signal to the Exchange is sent by restoring the Switch to normal.

Calls from the Extension are received on N.T. Company's Indicator. The Extension is

then pegged through to Switchspring on this instrument, and the Exchange is called by the action of turning Switch to "Exchange" position.

Clearing signal as before.

The movement of the 3-position Switch to the left should be blocked.

INSTRUMENT, EXTENSION, C.B., NO. 20.

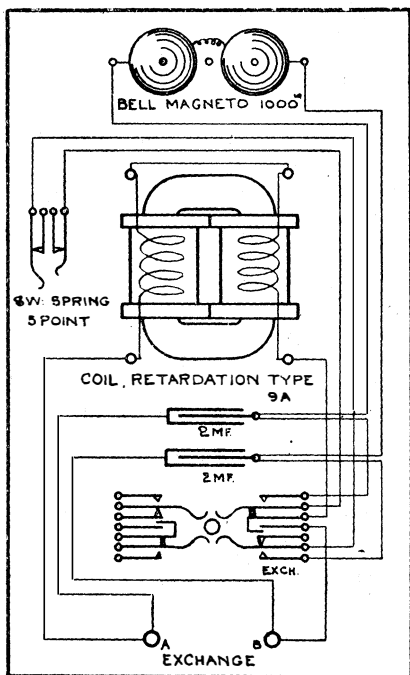


Plate 19.

Plate 20.

C.B. Diagram No. 21.

CONNECTIONS FOR LONG EXTENSION CIRCUIT, OR FOR AN EXTENSION OF A BRANCH EXCHANGE CIRCUIT.

APPARATUS SCHEDULE.

Instrument, Extension, C.B., No. 21. The description includes Case for Extension Instrument, C.B., No. 21; fitted with Bell, Trembler, Circular, 25 ohms; Coil, Retardation, Type 9A (80 + 80 ohms); 2 Condensers, metal-cased, 2 m.f.; Switchspring, 5, 8, and 5-point, $\frac{1 + 1 + 1}{3}$; Indicator, Drop, Tubular, 1,000 ohms, $\frac{2}{2}$, or Indicator, Non-polarised, "C," 500 + 500 ohms, $\frac{2}{2}$, Generator, Bracket, 3-terminal (Un-mounted); Coil, Induction, $\frac{150}{1}$; and Suspender for Micro Telephone.

*Telephone No. 28 (with Hook).

Battery, Leclanché, Agglomerate, 2-block, 2-cell, No. 2.

Switch, 6-point, 2-position (*see* Notes).

The Exchange is automatically called by insertion of peg in the "Exchange" Switchspring; the Extension is called by Generator.

* Superseded by Telephone, Table, P.B., Transmitter Type, Complete (Telephone No. 4).

INSTRUMENT, EXTENSION, C.B., NO. 21.

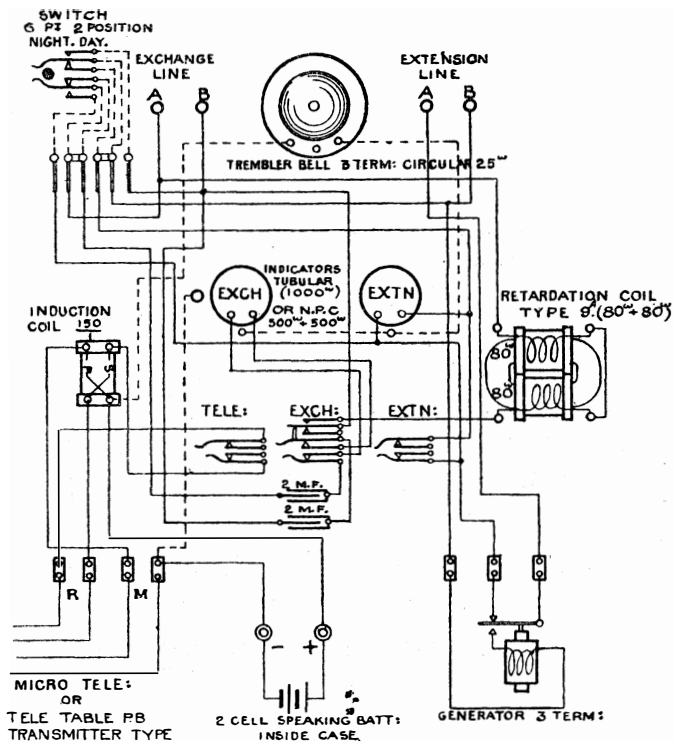


Plate 20.

Plate 20—cont.

At the Extension a Telephone, Table (or Wall), with Generator, is required, the Generator being used both for calling and clearing. The clearing signal to the Exchange is sent by withdrawing the peg from the "Exchange" Switchspring.

When it is desired to extend the Exchange Circuit to the Extension Station at night and the length of the line will permit this to be done satisfactorily, it is necessary to ask for "Instrument, Extension, C.B., No. 21, with Switch, 6-point, 2-position."

If it is necessary to add such a Switch locally to an instrument not previously equipped, a "Switch, 6-point, 2-position, engraved 'Night' and 'Day'" should be demanded. It should be fitted immediately over the aperture for the Indicators, and connected to the six screw tags (as shown by the dotted lines in the diagram), the connections shown between tags 2 and 3, and 4 and 5, being removed.

The wires must be taken round to the right-hand inside the case, and carefully cabled up so as to allow the hinged front to be freely opened.

Plate 21.

C.B. Diagram No. 134.

WIRING DIAGRAM OF SWITCHBOARDS, BRANCH EXCHANGE, C.B., $\frac{5}{10}$ AND $\frac{10}{10}$, USING LINE INDICATORS FOR CALLING AND CLEARING.

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, C.B., $\frac{5}{10}$ or

$\frac{10}{10}$. The description includes Transmitter, Solid-Back, C.B.; Cord, Flexible. No. 222; and Receiver, Bell, "D."

Switch, Tumbler, 3 ampères (bronzed).

Bell, Trembler, Small,

or,
Bell, Trembler, Circular, } If required.
25 ohms.

Battery : 2 Cells, Dry, Y (for local bell circuit only).

This diagram shows the connections of the original $\frac{5}{10}$ and $\frac{10}{10}$ Switchboards, re-wired and brought into line with the principles adopted in the later forms of smaller sized Switchboards for Branch Exchanges. The Indicators, Type 34, formerly used for calling purposes only, now indicate both calling and clearing signals. This arrangement renders the use of clearing indicators

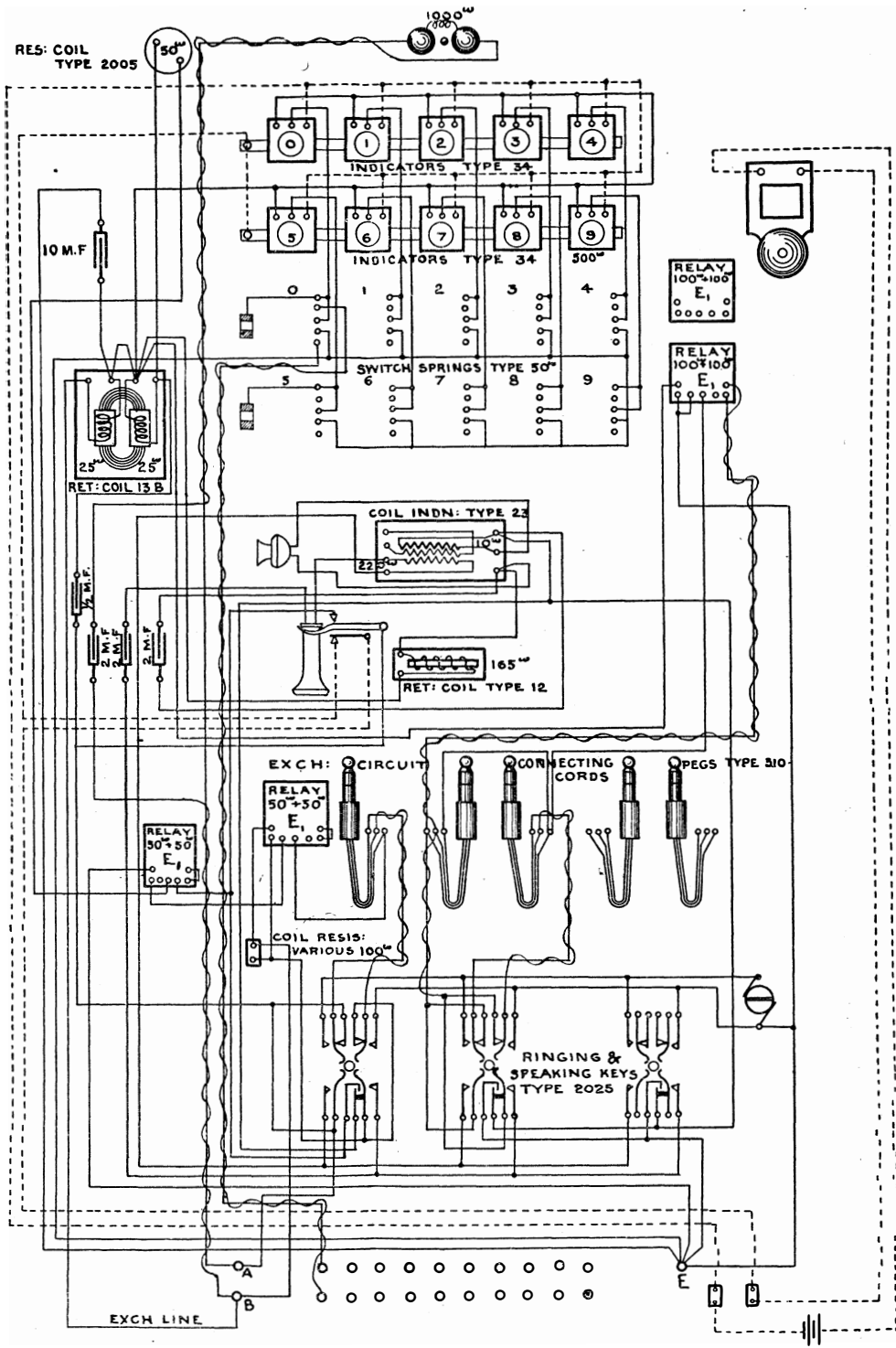


Plate 21.

on the B Cords unnecessary, and they have been accordingly cut-out.

The dotted connections show the local Bell Circuit where such is fitted. The Bell should be fitted off the Board in a position indicated by the subscriber; if a Switch, Tumbler, 3 ampères (bronzed), is used to control the Bell Circuit, it may be fitted on the Board.

Plate 22 shows the circuit arrangements on this Board.

Plate 22.

C.B. Diagram No. 133.

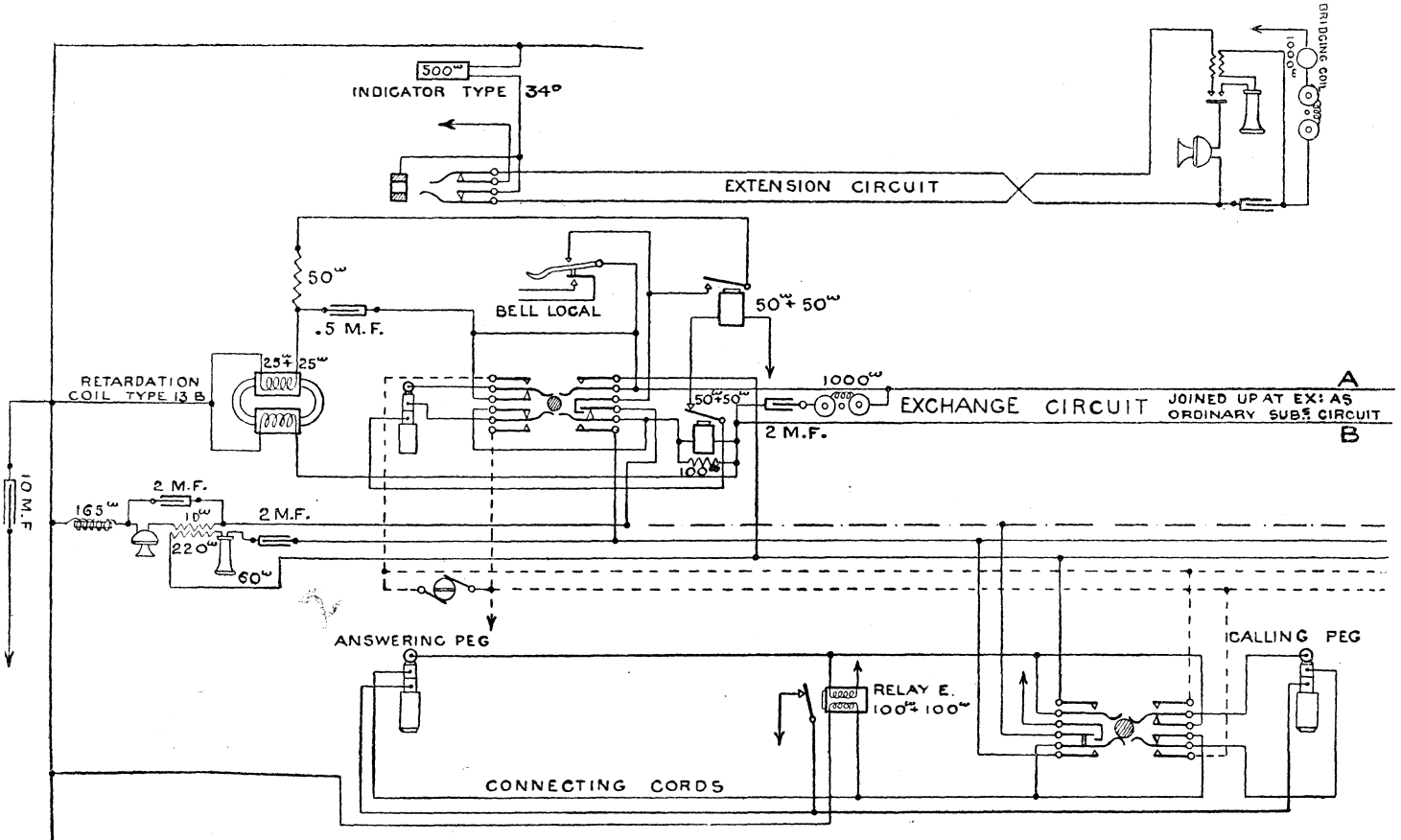
SUBSCRIBER'S INSTALLATION WHEN ONE EXCHANGE CONNECTION AND TWO TO TEN EXTENSIONS PROVIDED. SWITCHBOARDS, BRANCH EXCHANGE, C.B., $\frac{5}{10}$ AND $\frac{10}{10}$. (LINE INDICATORS CALLING AND CLEARING.)

CIRCUIT ARRANGEMENTS.

The principles on which this board is worked are similar to those described on page 64, but owing to the fact that the arrangement had to be introduced on the boards originally supplied, which were wired and equipped in a somewhat different manner, the methods by which calling and clearing to the Exchange are effected differ from those of the later boards.

In this case the Exchange line terminates at the board on a peg. A Magneto Bell, 1,000 ohms, in series with a Condenser, metal-cased, 2 m.f., is permanently connected across the lines for the purpose of receiving calls from the Exchange. To call the Exchange, the operator pushes the Speaking and Ringing Key into the "speaking" position and at the same time raises the Receiver from the hook. This operation closes the circuit of the Exchange battery from the "A" line through the upper contact of the Receiver hook, the inner springs of the "speaking" Key, primary coil of Induction Coil, Transmitter, Retardation

EQUIPMENT AT EXTENSION POINT
 CONSISTS OF ORDINARY WALL OR TABLE SET.



Coil (165 ohms), and one half of the Retardation Coil (Type 13B), to the B line and negative pole of the battery.

If an Extension is required and independent communication between the board and the Extension not first considered necessary, the operator inserts the Exchange peg in the Switchspring associated with the Extension circuit, and throwing the Speaking and Ringing Key into the "ringing" position calls the Extension by Generator. The movement of the Key from "speaking" to "ringing" breaks the Exchange circuit that had been completed through the "speaking" side of the Key; but it will be observed that the insertion of the peg in the Switchspring had caused the upper of the two 50 + 50 ohm Relays (Type E 1) to be actuated by way of the third point on the peg and the bush of the Switchspring. The Exchange is thus "held" by the closing of a circuit from the A line through the Receiver hook and upper contact armature of the above Relay, 50-ohm Resistance Coil, Retardation Coil, Type 13B, to the B line. When the Extension replies by lifting the Receiver from the hook, this circuit is broken by the actuation of the lower 50 + 50 ohm Relay, and the condition then becomes that of an ordinary subscriber's circuit, the A and B Exchange lines on the peg being joined straight through to the Extension. The lower Relay, which is in series with the B line, is shunted by a non-inductive resistance of 100 ohms for speaking purposes.

If the operator considers it necessary to advise the Extension of the Exchange call, the Exchange peg should be inserted in a spare Extension Switchspring to hold the Exchange, and the Extension required called by means of an adjoining peg.

Plate 22—*cont.*

An Extension clears to the board—and also incidentally to the Exchange—by hanging up the Receiver, thereby breaking the main circuit, in which the lower E 1 Relay is placed. The movement of its armature to the upper contact closes the circuit of the Clearing Indicator (Type 34); from Earth on the upper E 1 Relay, armature of lower E 1 Relay, sleeve of peg, bush of Switch-spring, Indicator, distribution lead to the B line, and negative pole.

When an Extension calls the board by raising the Receiver, the calling circuit is completed from Earth on the inner A spring, the Extension A line, Extension Set, Extension B line, Indicator Type 34, to the Exchange B line as above.

Two Extensions are connected by means of a pair of pegs and cords, and in this respect the arrangement is similar to that of the later boards; viz., the distribution point at the middle of the large inductance (Retardation Coil, Type 13B), to which is connected one side of a 10 m.f. Condenser—the other side being earthed—is placed in a symmetrical position with regard to the A and B Exchange lines.

See Plate 21, for Wiring Diagram of board, and Plates 23 and 24 for connections of later types of Switchboards of this capacity.

Plate 23.

C.B. Diagram No. 149.

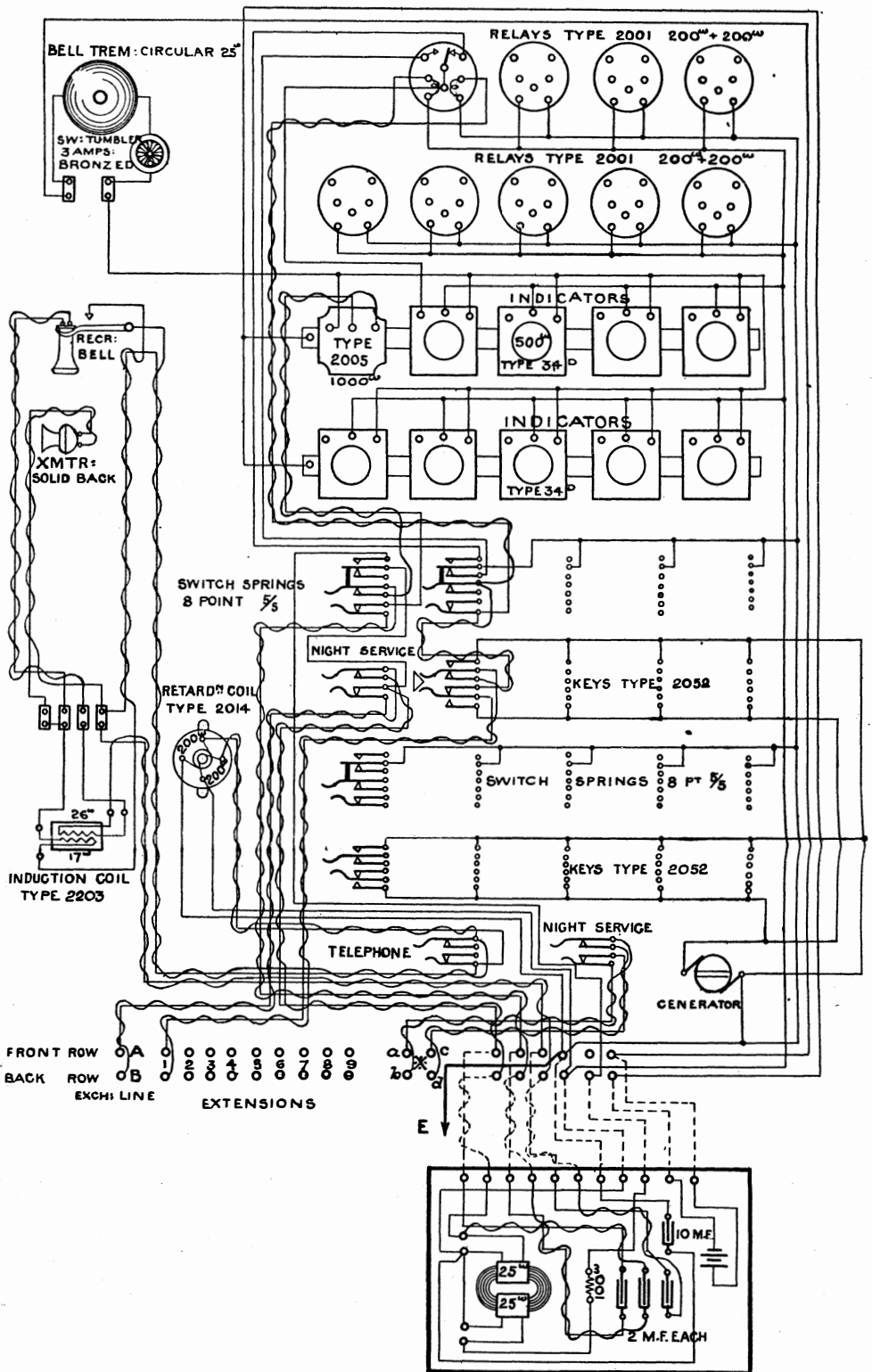
WIRING DIAGRAM OF SWITCHBOARDS,
 BRANCH, EXCHANGE, C.B., $\frac{1+4}{5}$ AND
 $\frac{1+9}{10}$; AND CASE WITH RETARDATION
 COIL AND CONDENSERS, C.B. (1 + 4).

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, C.B., $\frac{1+4}{5}$
 or $\frac{1+9}{10}$. The description includes Transmitter,
 C.B.; Cord, Flexible, No. 222, and Receiver,
 Bell, "D." Two pairs of Pegs and Cords are
 issued with a $\frac{1+4}{5}$ board, and four pairs with
 a $\frac{1+9}{10}$ board.

Case with Retardation Coil and Condensers,
 C.B. (1 + 4). The description includes Coil,
 Retardation, Type 2013 or L 5, 25 + 25 ohms;
 Spool, Resistance, Type 2200, 100 ohms; and
 4 Condensers, metal-cased (three 2-m.f., and one
 10-m.f.).

Bell, Trembler, Circular, 25 ohms.



CASE WITH RETARDATION COIL AND CONDENSER C.B. (1 + 4).

Switch, Tumbler, 3 ampères (bronzed).
Battery : 2 Cells, Dry, Y (for local bell circuit only).

The four tags at * and the corresponding Switchspring are to be used only when a Night Extension Service is required. When used, the line wires of the Extension requiring the Night Service should be connected to tags "a" and "b," while "c" and "d" should be connected to the ordinary tags of the Extension.

When a Night Service is wanted, a Label, No. 66, should be fitted on each of the Switchsprings so marked by means of two Brass Screws, No. 1, R.H., $\frac{3}{8}$ -inch. When not wanted, Plugs, No. 1, Ebonite, should be inserted in the switch holes.

The Tumbler Switch controlling the local bell circuit should be fitted on the board, but the Trembler Bell should be fitted off the board in a position indicated by the subscriber.

See Plate 26, for diagram of circuit connections.

Plate 24.

C.B. Diagram No. 156.

WIRING DIAGRAM OF SWITCHBOARDS,
 BRANCH EXCHANGE, C.B. AND MAGNETO,
 $\frac{1 + 2 + 2}{5}$; AND CASE WITH RETARDA-
 TION COIL AND CONDENSERS, C.B.
 (1 + 6).

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, C.B., and
 Magneto, $\frac{1 + 2 + 2}{5}$. The description includes
 Transmitter, C.B.; Cord, Flexible, No. 222;
 and Receiver, Bell, "D." Two pairs of Pegs and
 Cords are issued with each board.

Case with Retardation Coil and Condensers,
 C.B. (1 + 6). The title includes Coil, Retardation,
 Type 2013, 25 + 25 ohms; Spool, Resistance,
 Type 2200, 100 ohms; and 6 Condensers, metal-
 cased (five 2 m.f., and one 10 m.f.).

Bell, Trembler, Circular, 25 ohms.

Switch, Tumbler, 3 ampères (bronzed).

Battery: 2 Cells, Dry, Y (for local bell circuit
 only).

The four tags at * and the corresponding
 Switchspring are to be used only when a Night
 Extension Service is required. When used, the
 line wires of the Extension requiring the Night

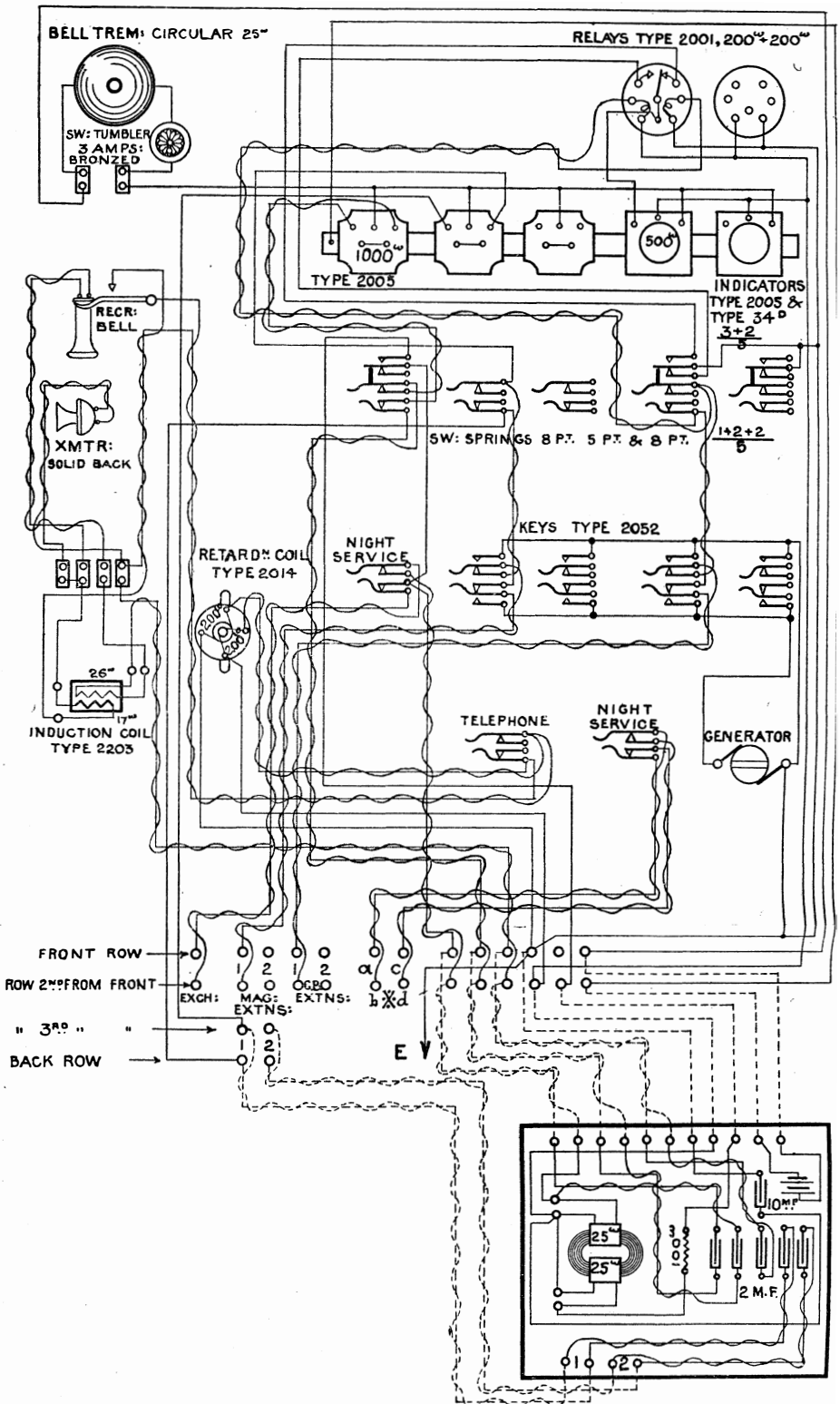


Plate 24.

CASE WITH RETARDATION COIL
AND CONDENSERS C.B. (1+6).

Service should be connected to tags "a" and "b," while "c" and "d" should be connected to the ordinary tags of the Extension.

When a Night Service is wanted, a Label, No. 66, should be fitted on each of the Switchsprings so marked, by means of two Brass Screws, No. 1, R.H., $\frac{3}{8}$ -inch. When not wanted, Plugs, No. 1, Ebonite, should be inserted in the switch holes.

The Tumbler Switch controlling the local bell circuit should be fitted on the board, but the Trembler Bell should be fitted off the board in a position indicated by the subscriber.

See Plate 26 for diagram of circuit connections.

Plate 25.

C.B. Diagram No. 155.

WIRING DIAGRAM OF SWITCHBOARD,
 BRANCH EXCHANGE, C.B. AND MAGNETO,
 $\frac{1 + 5 + 4}{10}$; AND CASE WITH RETARDA-
 TION COIL AND CONDENSERS, C.B.
 (1 + 8).

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, C.B. and
 Magneto, $\frac{1 + 5 + 4}{10}$. The description includes
 Transmitter, C.B.; Cord, Flexible, No. 222, and
 Receiver, Bell, "D." Four pairs of Pegs and
 Cords are issued with each board:

Case with Retardation Coil and Condensers,
 C.B. (1 + 8). The title includes Coil, Retardation,
 Type 2013, 25 + 25 ohms; Spool, Resistance,
 Type 2200, 100 ohms; and 8 Condensers, metal-
 cased (seven 2 m.f., and one 10 m.f.).

Bell, Trembler, Circular, 25 ohms.

Switch, Tumbler, 3 ampères (bronzed).

Battery: 2 Cells, Dry, Y (for local bell circuit
 only).

The four tags at * and the corresponding
 Switchspring are to be used only when a Night
 Extension Service is required. When used, the
 line wires of the Extension requiring the Night

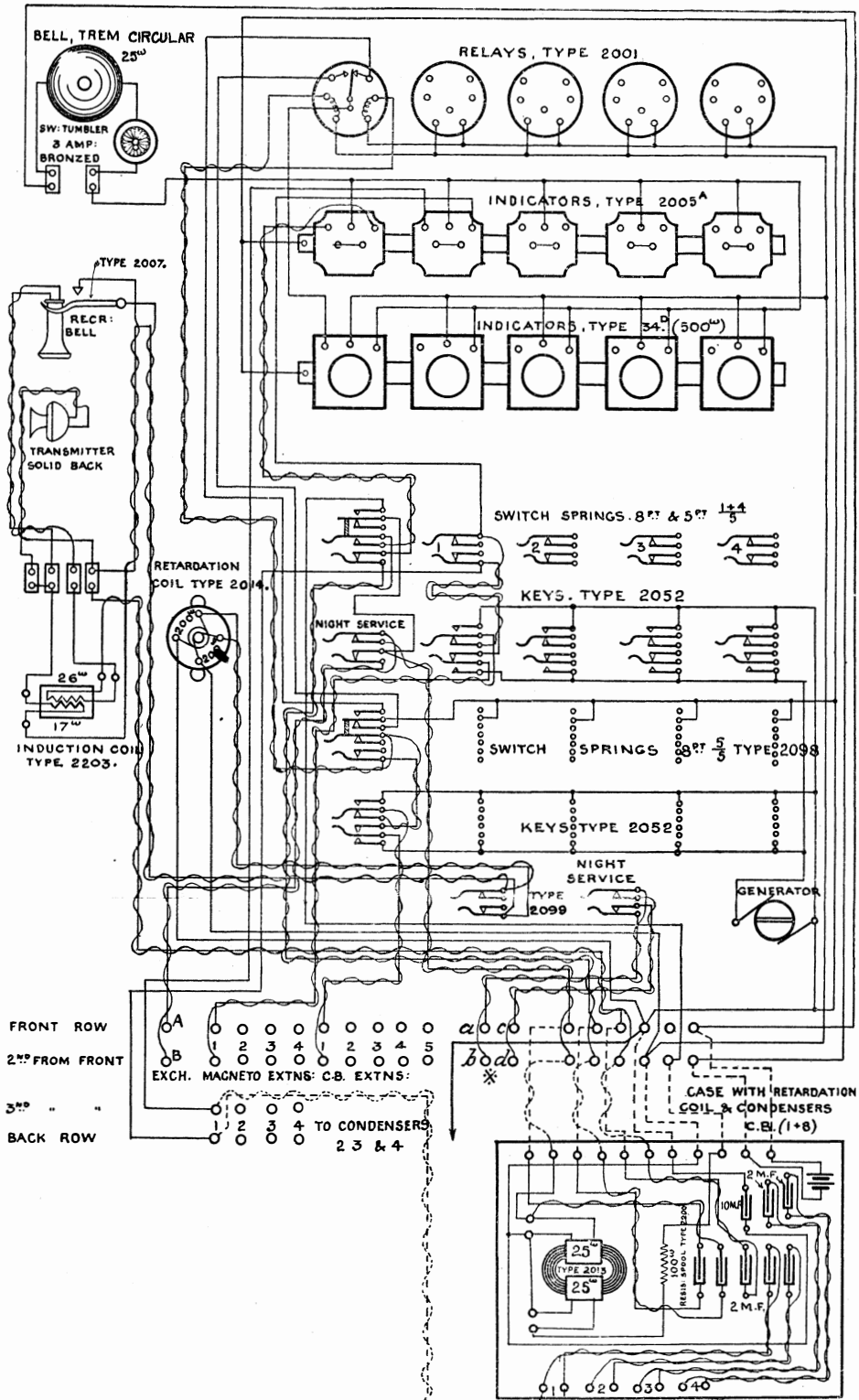


Plate 25.

Service should be connected to tags "a" and "b," while "c" and "d" should be connected to the ordinary tags of the Extension.

When a Night Service is wanted, a Label, No. 66, should be fitted on each of the Switchsprings so marked by means of two Brass Screws, No. 1, R.H., $\frac{3}{8}$ -inch. When not wanted, Plugs, No. 1, Ebonite, should be inserted in the switch holes.

The Tumbler Switch controlling the local bell circuit should be fitted on the board, but the Trembler Bell should be fitted off the board, in a position indicated by the subscriber.

See Plate 26 for diagram of circuit connections.

Plate 26.

C.B. Diagram No. 148.

CIRCUIT ARRANGEMENTS ON SWITCH-
BOARDS, BRANCH EXCHANGE, C.B.,
 $\frac{1+4}{5}$ AND $\frac{1+9}{10}$, AND ON SWITCH-
BOARDS, BRANCH EXCHANGE, C.B. AND
MAGNETO, $\frac{1+2+2}{5}$, $\frac{1+3+1}{5}$, AND
 $\frac{1+5+4}{10}$.

Night Extension Switchsprings, if required, are fitted at the points marked "x" on the upper portion of the diagram, which shows two Extension Circuits, the upper a Magneto Extension, and the lower a C.B. Extension. See separate diagrams for actual connections at Extensions; Plates 55 and 56 show the instruments fitted on Magneto Extensions, and Plate 27 the instruments on C.B. Extensions.

At the Exchange the lines are terminated in the ordinary manner, and calling and clearing signals from the board are indicated there like those of a simple subscriber's circuit. To the inner springs of the Exchange Switchspring a Non-polarised Indicator is connected, the A and B springs being joined through Condensers, metal-cased, 2 m.f., to the A and B lines respectively

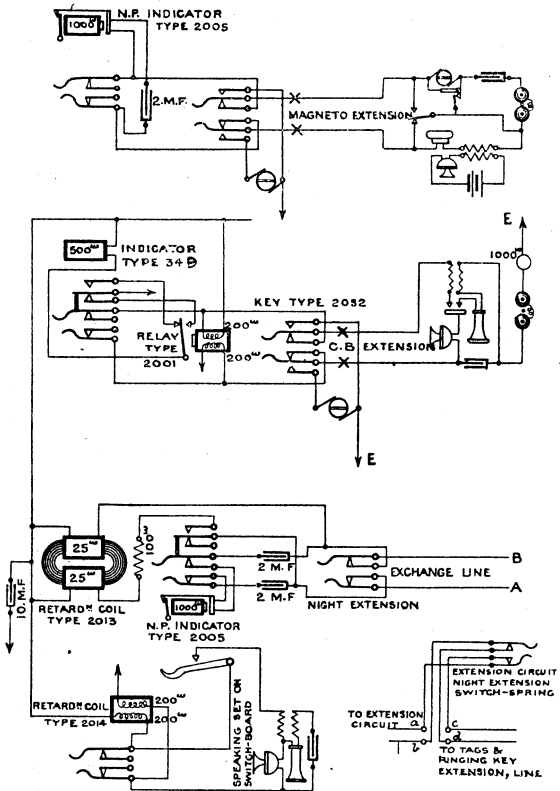


Plate 26.

Plate 26—*cont.*

for speaking circuit purposes. When the Exchange operator calls by Generator, the shutter of the Indicator drops, thus indicating a call. The insertion of a peg in the Switchspring cuts out the Indicator, but throws across the lines by means of the upper springs a 100-ohms Resistance Spool (Type 2200) in series with a Retardation Coil of high inductance (Type 2013). At the centre point of this inductance is connected the power distribution lead between the Exchange line and the various Extension circuits, as well as one side of a Condenser, metal-cased, 10 m.f., the other side of which is earthed. The Retardation Coil and Resistance Spool joined across the Exchange lines "engage" the Exchange, and at the same time the distribution point is thrown into practically a symmetrical position with respect to the two Exchange wires.

A C.B. Extension calls the Board by raising the Receiver from the hook. This operation closes the circuit of the Common Battery through Earth on the positive pole, one coil of Relay, Type 2001, Extension A line, Extension Set, Extension B line, second coil of Relay, Type 2001, Distribution lead, one limb of Retardation Coil, Type 2013, to Exchange B line and negative pole. The armature of Relay, Type 2001, is attracted to the "marking" stop, which is connected to Earth through the inner and long springs of the Switchspring associated with the calling Extension, thus joining up a derived circuit in which is connected the calling and clearing Indicator (Type 34).

The insertion of a peg in the Switchspring breaks the derived circuit, and the armature of the Indicator resumes its normal position. Connections between the various circuits are made by means of simple 3-way pegs, and 2-way cords.

When both Extensions hang up their Receivers, the Relay circuits are disconnected, and the armatures fall back upon the "spacing" stops, closing the Indicator circuits, thus giving a clearing signal which disappears when the pegs are withdrawn.

The operator's Set is on the same principle as a C.B. Extension. The Relay, however, is replaced by a Retardation Coil of equal resistance (Type 2014), as no signalling apparatus is required. The Exchange is called by the insertion of a peg in the Exchange Switchspring, the other pair of the peg being inserted in the speaking Switchspring. A clearing signal is sent by withdrawing the peg from the Exchange Switchspring. The Receiver should be hung up when the clearing signal has been sent, and the peg withdrawn from the speaking Switchspring.

One side of the Generator mounted on the board is earthed, and both sides are teed to the outer springs of the Ringing Keys (Type 2052). The Extensions are called by Generator ; Magneto Extensions on the loop, and C.B. Extensions on the A line and Earth. A Magneto Extension calls and clears to the board by means of the Generator fitted in the set, the signals being received on the Non-polarised Indicator, 1,000 ohms, Type 2005, which is joined permanently across the lines.

When a Night Service is required, the Exchange Night Service Switchspring is joined to the Extension Night Service Switchspring by a pair of pegs and cords, the Extension circuit being joined up in the manner explained on page 68.

When fitted on Exchanges where B line feeding is not provided for, 8 Cells, Dry, Z, will be connected to the terminals to which the 10 m.f. Condenser is wired, and the tap to the centre of the Coil Ret. 2013 taken off locally.

Plate 27.

C.B. Diagram No. 152.

CONNECTIONS OF C.B. WALL AND TABLE TELEPHONES, WHEN USED UPON EXTENSION CIRCUITS FROM "SWITCHBOARDS, BRANCH EXCHANGE, C.B., $\frac{5}{10}$, $\frac{10}{10}$, $\frac{1+4}{5}$, and $\frac{1+9}{10}$," AND FROM "SWITCHBOARDS, BRANCH EXCHANGE, C.B. AND MAGNETO, $\frac{1+2+2}{5}$, $\frac{1+3+1}{5}$, AND $\frac{1+5+4}{10}$."

APPARATUS SCHEDULE.

Fig. 1.—Wall Set.

Telephone No. 1.

Coil, Bridging, 1,000 ohms, $\frac{1}{1}$.*Fig. 2.—Table Set.*

Telephone No. 2.

Bell Set No. 1.

Coil, Bridging, 1,000 ohms, $\frac{1}{1}$.

The connections of the "A" and "B" lines are the reverse of those used when the Telephones are joined up upon direct subscribers' circuits.

When Wall Telephones are used, the Bridging Coils should be screwed underneath the projecting case containing the Magneto Bell. In the case of Table Telephones, the Bridging Coil should be screwed to the underside of the case containing the Magneto Bell and Induction Coil.

See Plates 55 and 56 for the connections of a Magneto Extension Set. No earth connection is required, however, as this circuit is called on the loop.

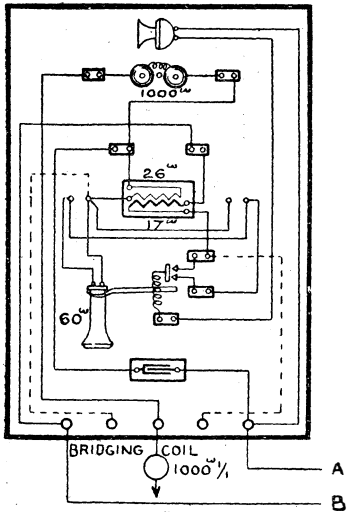


FIG. 1. WALL SET

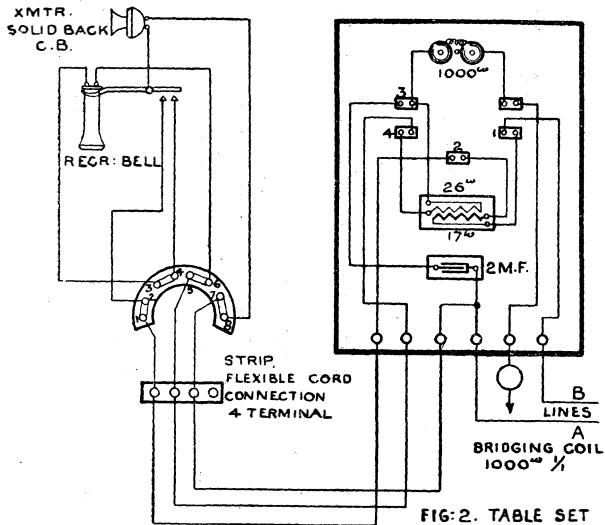


FIG. 2. TABLE SET

Plate 27.

Plate 28.

C.B. Diagram No. 17.

WIRING DIAGRAM OF SWITCHBOARDS,
 BRANCH EXCHANGE, C.B., $\frac{3 + 10}{25}$,
 $\frac{3 + 20}{25}$, $\frac{5 + 30}{60}$, and $\frac{5 + 50}{60}$.

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, C.B., $\frac{3 + 10}{25}$,
 $\frac{3 + 20}{25}$, $\frac{5 + 30}{60}$, or $\frac{5 + 50}{60}$.

If a Night Bell is required, the following additional apparatus will be required:—

Bell, Trembler, Small.

New $\frac{3 + 10}{25}$ and $\frac{3 + 20}{25}$ Boards are fitted
 with 3 Exchange Circuits; $\frac{5 + 30}{60}$ and $\frac{5 + 50}{60}$
 with 5 Exchange Circuits and an ultimate
 capacity of 10.

The number of Extension circuits fitted in each case is given by the second figure in the numerator of the fraction.

See Plate 29 for Circuit Arrangements. .

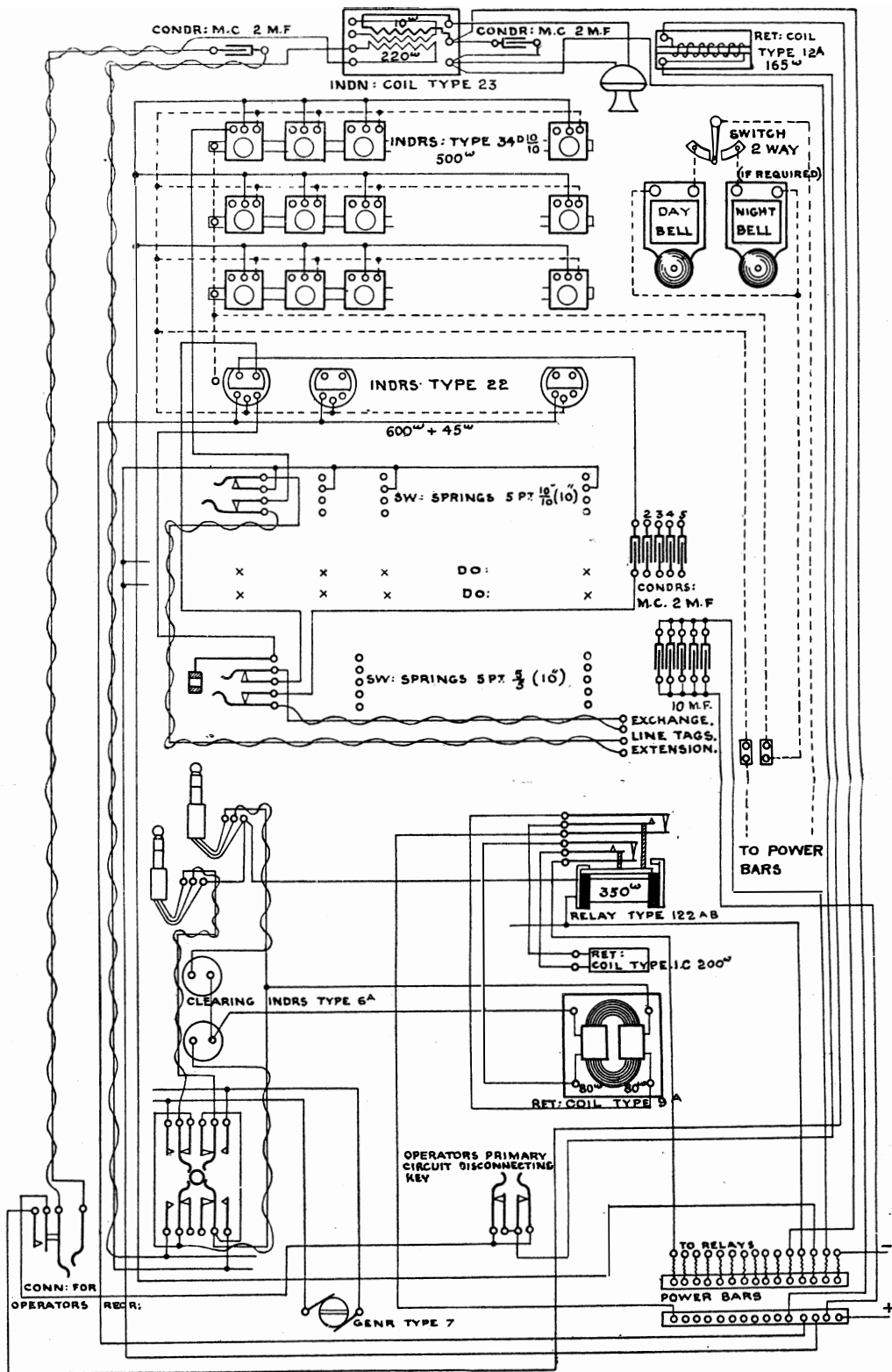


Plate 28.

Plate 29.

C.B. Diagram No. 16.

CIRCUIT ARRANGEMENTS ON SWITCH-BOARDS, BRANCH EXCHANGE, C.B.,
 $\frac{3 + 10}{25}$, $\frac{3 + 20}{25}$, $\frac{5 + 30}{60}$, and $\frac{5 + 50}{60}$.

Fig. 1.—Extension Circuit.—Ordinary Wall, or Table, C.B. Sets are used at Extension points. Extension lines terminate on 5-point Switchsprings, the inner springs of which are connected (the B line through an Indicator, 500 ohms (Type 34)) to the Power Bars. An Extension calls the Board by lifting the Receiver from the hook, thus completing the circuit from the Power Bars through the Calling Indicator and Extension Lines and Set.

Fig. 2.—Exchange Circuit.—The Exchange lines are terminated at the Exchange in a similar manner to those of an ordinary subscriber, and calling signals are indicated and sent from there in the usual way. At the Board the lines are terminated on a 5-point Switchspring, the inner springs of which are connected through a Condenser, metal-cased, 2 m.f., to the line coil of a self-restoring Indicator (Indicator, Type 22). When the Board is called by Generator from the Exchange, the armature is attracted, and the projection of the shutter indicates the call.

ORDINARY WALL
OR TABLE SET.

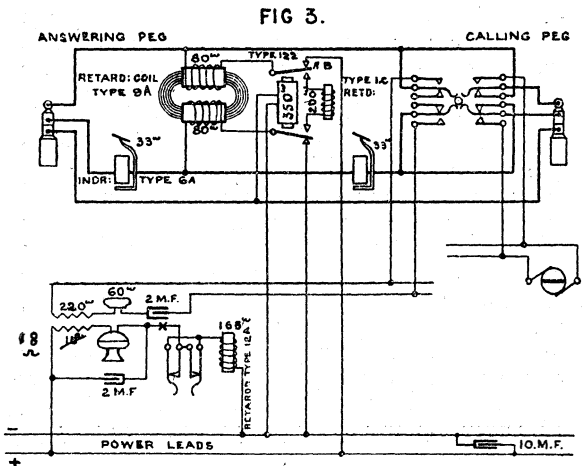
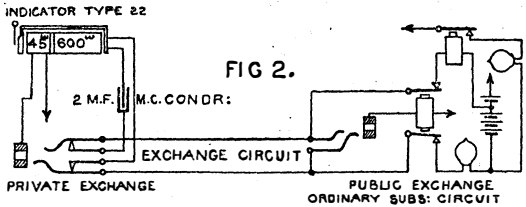
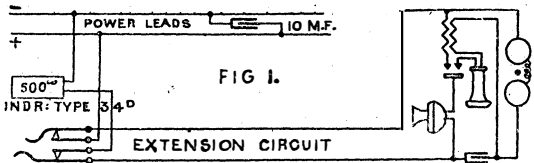


Plate 29.

Plate 29—cont.

Fig. 3.—Cord Circuit.—To call the Exchange the operator inserts the Calling Peg in the Switchspring associated with the Exchange line to be used. This operation closes the circuit of the restoring coil of Indicator, Type 22, from Earth through the bush of the Switchspring, the sleeve of the Peg, Relay, Type 122AB, to the Negative Power Lead. The current flowing in the circuit locks the Indicator, Type 22, and brings the double armature of the Relay in contact with the inner contacts, which are connected to the coil ends of the Retardation Coil, Type 9A, between which is now connected Retardation Coil, Type 1c. The Clearing Indicators (Type 6A) are permanently connected in the B Cord of each pair of Pegs and Cords, and since they are fitted in the speaking circuit, each Indicator Coil is shunted by a non-inductive resistance of 100 ohms. The Magnet coil is wound to 50 ohms, the joint resistance being thus approximately 33 ohms.

Extension Sets are called by Generator, which is teed across the outer springs of the "ringing" sides of the Speaking and Ringing Keys; they clear to the Board by hanging up the Receiver, thereby causing the discs of the Clearing Indicators (which show during speech) to disappear. The Board clears to the Exchange by withdrawing the peg from the Exchange line Switchspring.

When two Extensions are connected through to each other a current flows from the Positive Power Lead through the upper limb of Retardation Coil, Type 9A, to the Extension A lines, through both Extension Circuits in parallel to the B lines, and back through the Clearing Indicators and lower limb of Retardation Coil, Type 9A, to the Negative Power Lead. Speaking currents pass

between the Extensions when the potential equilibrium is disturbed by one of the Extensions altering the resistance of his circuit by speaking into the Transmitter.

The operator's Set is similar to that described on page 105, but in this instance a Key for the purpose of disconnecting the operator's primary circuit when necessary is mounted on the horizontal keyboard.

See Plate 28 for Wiring Diagram.

In recent deliveries the diagram of the operator's circuit shown in Plate 28 has been modified. On sizes up to $\frac{3 + 20}{25}$ no connector is fitted, the Bell Receiver being hung on a Switchhook. On larger sizes, a Connector, Type 48A, is fitted, and a Receiver, Headgear, connected to a Peg, 4-pin, Type 47, is used.

Plate 30.

C.B. Diagram No. 105.

WIRING DIAGRAM OF SWITCHBOARD,
 MAGNETO, $\frac{n + n'}{N}$, AND CASES, FOR
 CONDENSERS AND BATTERY.

These Switchboards are intended for use on C.B. Exchange circuits which are too long to permit of C.B. working on the Extension circuits, or when the Extension circuits are too long for C.B. working; also when the Exchange circuits are themselves Extensions from a C.B. private Branch Exchange, or when the circuits are of a mixed character and may include National Telephone Company's Exchange or private lines. For conditions of service in the last-mentioned condition, see Circular Memo. 9.2.03 "Intercommunication with Extension Lines, National Telephone Company," and Circular Memo. 26.3.03 "Private Wires on Switchboards which also accommodate Exchange circuits."

A second Switchspring is provided on each Exchange circuit for the purpose of joining it through to an Extension circuit for night service. It is fitted, as shown, beneath the ordinary line Switchspring, and replaces the Key, Type H 3 Oval (or its equivalent), used on Extension circuits. When night service is not required, the additional Switchspring should be plugged up by means of a Plug, No. 1, Ebonite.

"Cases for Condensers and Battery, n inches" accommodate 1 Coil, Retardation, Type 9A (80 + 80 ohms), and 2 Condensers, metal-cased, 2 m.f., for each Exchange circuit, and 1 Condenser, metal-cased, 2 m.f., for each Extension circuit to which an Exchange circuit is liable to be connected

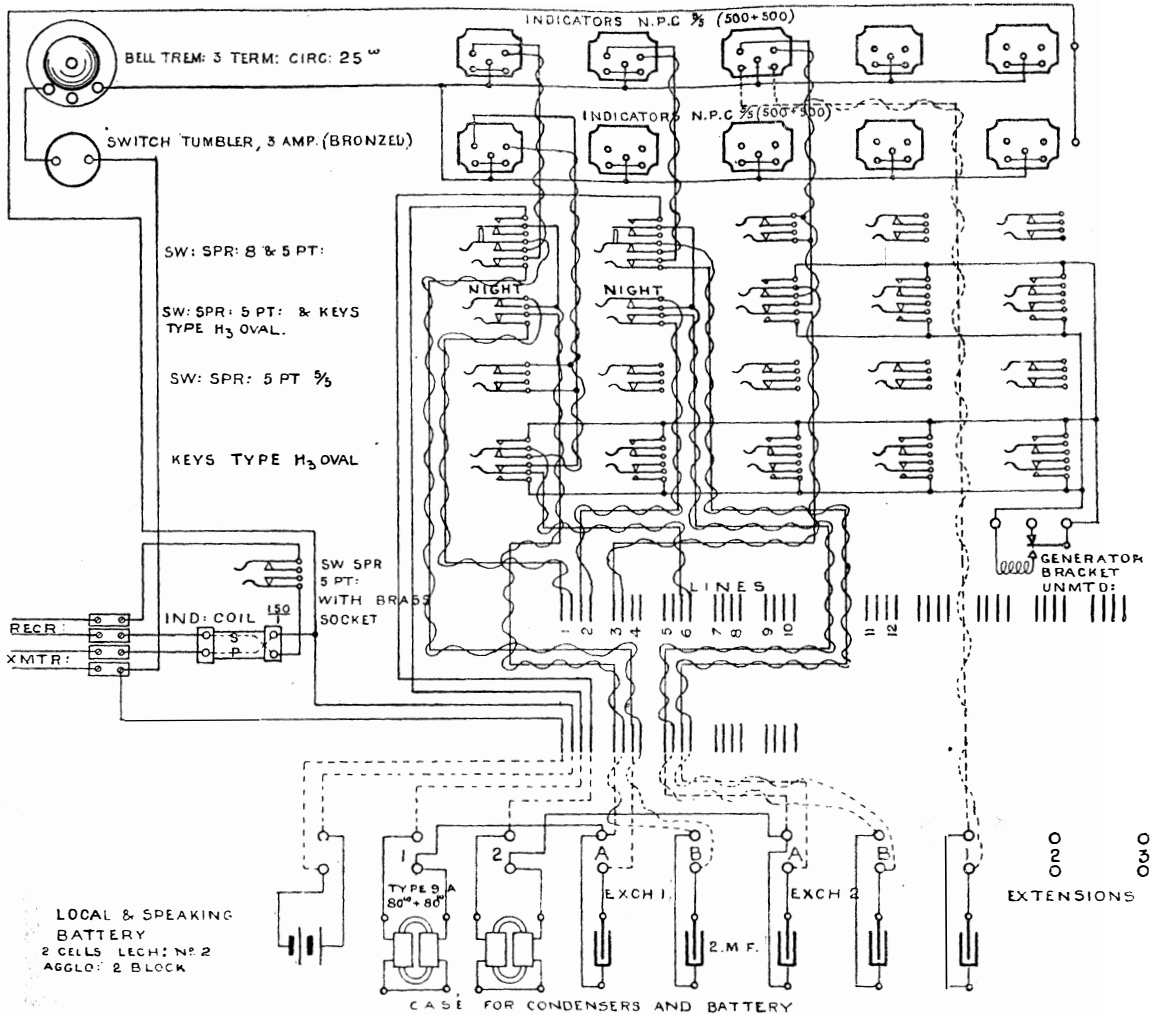


Plate 30.

through for night service. The Case, which will also accommodate the speaking and local Battery, should be fitted with the interconnecting leads towards the wall if placed immediately beneath the Switchboard. The single Condensers necessary for each Extension circuit with night service should be wired direct to the corresponding Indicator, the wire which normally joins together the two lower terminals of the Indicator being removed.

At the Extension Offices "Telephones No. 16," or "Telephones No. 11." should be used, and in those cases where a night service is required a Condenser, metal-cased, 2 m.f., must be placed in series with the Magneto Bell.

The wiring between the tags on the Board and the apparatus in the Case must be done locally.

Normally, the Exchange lines are bridged by the Condensers in series with the Non-polarised Indicator "C." The Exchange calls the Board in the usual way by Generator, dropping the shutter of the Indicator.

To call the Exchange, a peg is inserted in the Exchange 8-point Switchspring; this operation cuts out the Indicator, which is connected to the inner springs of the Switchspring, and joins the Retardation Coil across the A and B lines, thereby completing the circuit of the Common Battery at the Exchange. The insertion of the other peg of the pair in the speaking Switchspring connects the secondary of the operator's Induction Coil and Receiver to the Exchange lines, through the 2 Condensers for speaking current purposes.

A clearing signal is sent to the Exchange by the withdrawal of the peg from the Exchange Switchspring.

Extensions call and clear to the Board by Generator, the signals actuating the Non-polarised Indicator associated with the circuit.

Plate 31.

C.B. Diagram No. 101.

CONNECTIONS BETWEEN P.O. SWITCHBOARDS FOR BRANCH EXCHANGES AND NATIONAL TELEPHONE COMPANY'S EXCHANGE CIRCUITS.

Fig. 1.—National Telephone Company's Circuits on $\frac{5}{10}$ and $\frac{10}{10}$ Switchboards, when the Company provide an Exchange Circuit only.

The Switchspring, 5-point, Type 118, should be fitted on P.O. Switchboard; the Connection Plates, 2-link, with Cover, at some convenient point for testing purposes only. These items together with two Condensers, metal-cased, 2 m.f. (one connected in each line as shown in the diagram), have to be provided by the P.O.

Fig. 2.—Connections of Junction Circuits between a $\frac{5}{10}$ or $\frac{10}{10}$ P.O. Switchboard and a National Telephone Company's Switchboard—the Boards being in the same room.

In addition to the position on the P.O. Switchboard, the Department has to provide the two Condensers, metal-cased, 2 m.f.

The National Extension's clearing signal is received on the Company's Board.

Fig. 3.—Connections of Junction Circuits between a $\frac{3+10}{25}$, $\frac{3+20}{25}$, $\frac{5+30}{60}$, or $\frac{5+50}{60}$

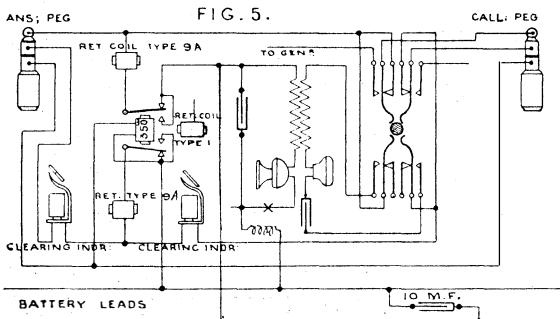
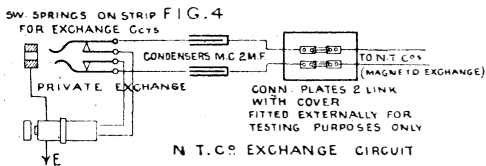
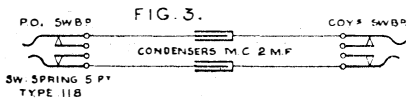
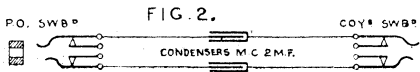
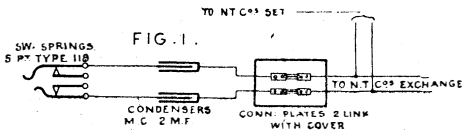


Plate 31—cont.

P.O. Switchboard and a National Telephone Company's Switchboard—the Boards being in the same room.

In addition to the position on the P.O. Switchboard, the Department has to provide the 2 Condensers, metal-cased, 2 m.f.

When a P.O. Exchange Circuit is connected to a National Extension Circuit, the clearing signal from the latter is received on the National Board only. When the Switchboards are in different rooms special arrangements will be made for junction working.

Fig. 4.—Connection of National Telephone Company's Exchange Circuit (Magneto) when such is connected direct to a $\frac{3 + 10}{25} - \frac{5 + 50}{60}$ P.O. Switchboard.

The Company's lines after being brought through the Connection Plates, 2-link, with Cover, and Condensers, are terminated on a Switchspring fitted on the strip for Exchange Circuits, the inner springs of which are connected to the line coil of the Self-restoring Indicator associated with the Switchspring used. *See* Plate 29.

Fig. 5.—Special pair of Connecting Cords and Pegs when a National Exchange Circuit is terminated upon a $\frac{3 + 10}{25} - \frac{5 + 50}{60}$ Switchboard.

Connections between National Circuits and P.O. Extensions must be made by these Cords only.

It will be observed that the Coil, Retardation, Type 1, is cut out, and that the Connections of the Relay, Type 122AB, are altered.

Plate 32.

C.B. Diagram No. 90.

**CONNECTIONS OF EXTENSION INSTRUMENT
C.B. 90.**

For providing communication between C.B. Exchange Circuit and "A to A" Circuits on existing Private Telephone Switchboards. Each of the "A to A" Lines should be led through a Switchspring as shown.

APPARATUS SCHEDULE.

Instrument, Extension, C.B. 90. The title includes Case for Extension Instrument, C.B. 90; 2 Coils, Bridging, 250 ohms; 2 Condensers, metal-cased, 2 m.f.; 1 Indicator, N.P., 1,000 ohms; 1 Switchspring, 8-point, $\frac{1}{1}$, 6-inch; n Switchsprings, 5-point, $\frac{5}{5}$, 6-inch.

Fig. 1.—Connections of "A to A" Circuits when Main Switchboard is of old form.

Fig. 2.—Connections of Pegs and Cords for use on Extension Instrument. Pegs, Circular, 3-way, Red; Cords, Flexible, No. 201. These Cords cannot be used on Main Switchboard.

"A to B" Circuits connected to Main Switch must not be joined to a Switchspring on the Extension Instrument.

INSTRUMENT EXTENSION C.B. 90.

MAIN SWITCHBOARD.

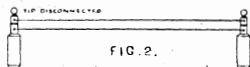
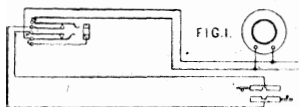
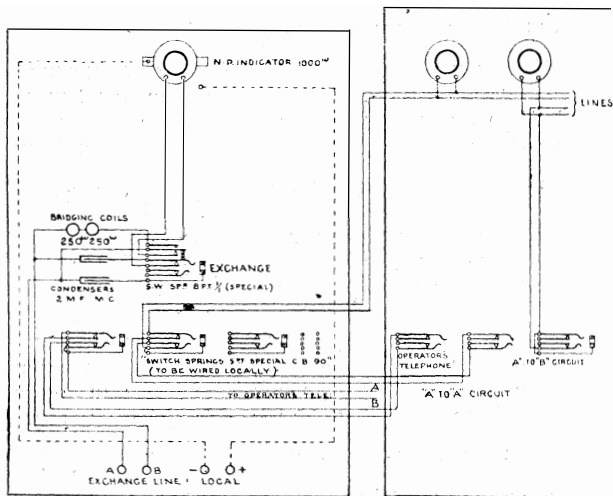


Plate 33.

C.B. Diagram, No. 341.

WIRING DIAGRAM OF SWITCHBOARDS,
 CORDLESS, $\frac{1+3}{4}$, $\frac{2+4}{6}$, AND $\frac{3+7}{10}$.

APPARATUS SCHEDULE.

Switchboard, Branch Exchange, Cordless, C.B., $\frac{n+n'}{N}$. The description includes the operator's Induction Coil, Type 20, Mounted (similar to Type 2203), and Condenser, m.c., 2 m.f. It also includes a Buzzer, Type 90849, which is fitted in the local circuit of the calling Indicators.

Telephone No. 2.

The lower key of the combination associated with the operator's Telephone is utilised as a switch to cut off the local Buzzer when necessary.

On the $\frac{3+7}{10}$ board an extra row of keys is interpolated between the upper and lower rows shown in this diagram for the purpose of providing two additional connecting circuits. Each connecting circuit is equivalent to a pair of pegs and cords; on the $\frac{1+3}{4}$ two of these circuits are provided, on the $\frac{2+4}{6}$ three, and on the $\frac{3+7}{10}$ five. See Plate 34 for the circuit connections on this type of board.

The wiring shown dotted between the Coil, Induction, Mounted, and the Strip, Flexible Cord Connection, 4-terminal, has to be done locally.

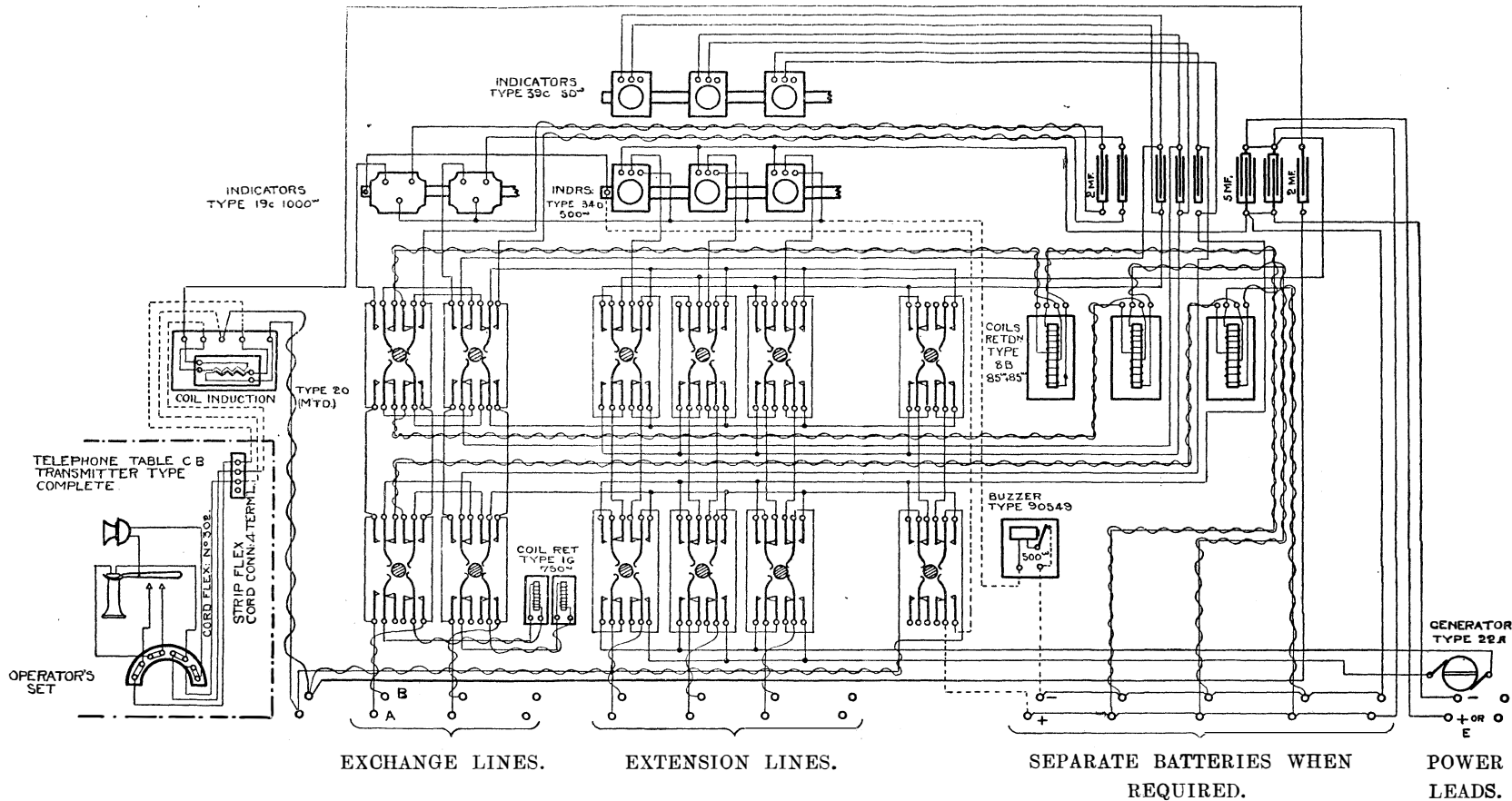


Plate 33.

Plate 34.

C.B. Diagram No. 340.

CIRCUIT ARRANGEMENTS ON SWITCHBOARDS, CORDLESS, $\frac{1+3}{4}$, $\frac{2+4}{6}$, AND $\frac{3+7}{10}$.

An Indicator and a pair of 3-position Keys, or 3 Keys in the case of the $\frac{3+7}{10}$ board, are associated with each line. The operator's Set is practically an Extension circuit without Indicator.

Fig. 1 shows how the various connecting circuits are wired to the Keys of the lines and operator's Set, so that they can be utilised for connecting any two lines together. It will be observed that when any one of the Exchange Keys is operated—except in the bottom position of the lowest Key—the leads from the Retardation Coils, through which the power leads, or battery, are connected, are cut off and the Exchange lines joined direct to the connecting circuit.

Fig. 2 represents the connections when an Exchange line is connected to an Extension.

Fig. 3 shows two Extensions connected together.

It will be seen that in both combinations the clearing signals are negative in character, *i.e.*, the signal shows during conversation, and disappears when the Receiver is hung upon the rest.

FIGURE 1.

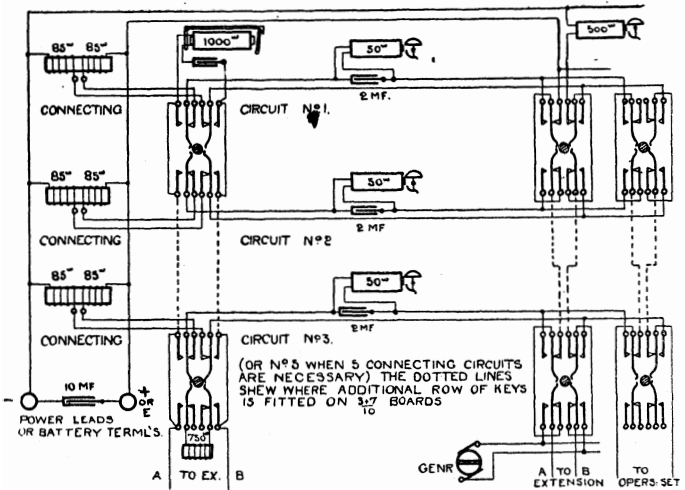


FIGURE 2

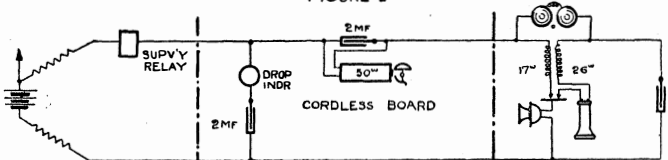
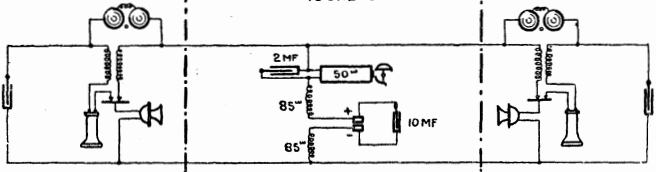


FIGURE 3



SECTION 5.

PARTY LINE AND CALL OFFICE
CIRCUITS.

Plate 35.

C.B. Diagram No. 135.

PARTY LINES ; CONNECTIONS OF SUBSCRIBERS' INSTRUMENTS, WHEN TELEPHONES WITH RELAYS, TYPE 85, ARE USED.

APPARATUS SCHEDULE.

Wall Sets.

Fig. 1.—Telephone No. 9. The description includes Cord, Flexible, No. 222 ; Bell, Magneto, 2,400 ohms ; Relay, Type 85, 2,400 ohms ; Coil, Induction, Type 2203 ; Condenser, metal-cased, 2 m.f. ; Transmitter, C.B., and Receiver, Bell.

Box, Coin Collecting, Complete.

Table Sets.

Fig. 2.—Telephone No. 2.

Bell Set No. 2. The description includes Condenser, metal-cased, 2 m.f. The Bell and Relay are each 2,400 ohms ; the Induction Coil is Type 2203 ; Primary, 17 ohms, Secondary, 26 ohms.

Box, Coin Collecting, Complete.

Two-Station Party Lines should be connected up as shown.

TELE. WALL C.B. PARTY LINE.

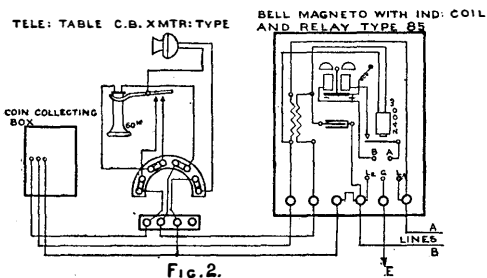
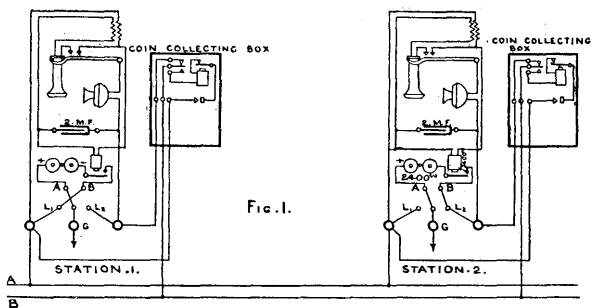


Plate 35—cont.

On Ten-Station Party Lines, Stations 3, 5, 7, and 9, should be connected up as Station 1 shown in Fig. 1; Stations 4, 6, 8, and 10 as Station 2. When Table Sets are used the internal connections of the Bell, Magneto, with Induction Coil and Relay 85 should be:—

Station 1.—B to L_1 , and A to G.

Station 2.—B to L_2 and A to G.

Subscribers' Exchange Numbers.

Stations 1, 3, 5, 7, and 9 will be given the circuit number with the addition of X1, X2, X3, X4, and X5 respectively.

Stations 2, 4, 6, 8, and 10 similarly have the circuit number with the addition of Y1, Y2, Y3, Y4, and Y5.

Ringings at Exchanges taking Two-Station Party Lines only.

The X subscriber (Station 1) is called in precisely the same way as an ordinary subscriber. The Y subscriber is called from the Subscribers' Board by turning the Party Line Key into position 1, and then ringing with the ordinary Key on the Cord Circuit. Y subscribers are called on the Junction Board by the Key marked "— to B Line" on the Junction diagram; this Key is engraved with the letter "Y."

Ringings at Exchanges taking Two and Ten-Station Party Lines.

On the Subscribers' Board X subscribers are called by ordinary ringing Keys, Y subscribers by

turning the Party Line Key into position 1 and then using ordinary Key.

On the Junction Board X subscribers are called by Keys marked “— to A line,” and Y subscribers by Keys marked “-- to B line.” These Keys are engraved with the letters X and Y respectively.

In each case the number of rings given should agree with the figure following the prefix letter in the subscriber's number.

Four Party Lines.—These sets can also be used on 4-Party Lines. The wiring of the ringing circuits at all C.B. No. 1 Exchanges, except Central and City, is suitable for this type of circuit. The internal connections of the sets would be as follows :—

Station 1.—B to L_2 and A to G.

Station 2.—A to L_2 and B to G.

Station 3.—B to L_1 and A to G.

Station 4.—A to L_1 and B to G.

Station 1 is called by negative pulsations on the B line; Station 2 by positive pulsations on the B line; Station 3 by negative pulsations on the A line; Station 4 by positive pulsations on the A line. The second line is in each case connected to earth by the ringing key.

Plate 36.

C.B. Diagram No. 48.

**CALL OFFICE ARRANGEMENTS AT CALL
OFFICES WITH ONE CIRCUIT.****APPARATUS SCHEDULE.***Counter.*

Telephone No. 1.

Switch, 6-terminal, 2-position.

Bell, Trembler, Circular, 100 ohms.

Coil, Resistance, various, 100 ohms.

Cabinet.

Telephone No. 1.

The lever of the Cabinet Telephone must be plugged up permanently.

The Counter Instrument is always in circuit. Switch in Position "1" (Normal position) cuts off Cabinet Instrument and Trembler Bell; in Position "2" Switch puts circuit through to Cabinet and connects Trembler Bell between "B" line and earth. When Caller is seated Bell and Earth Connection is cut off. All Fees are collected by Attendant.

*Method of dealing with "Local" Calls.**Outwards.*

Caller furnishes Attendant with particulars of Local Connection wanted, which Attendant passes

LEVER OF CABINET TELEPHONE MUST BE PLUGGED UP PERMANENTLY.

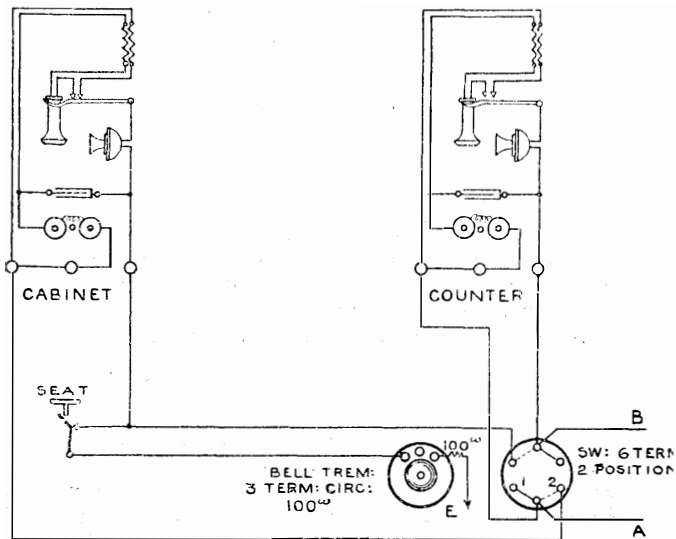


Plate 36.

Plate 36—cont.

to Exchange Operator, and directs Caller to enter Cabinet. Exchange Operator takes up control of call. Counter Attendant then turns Switch to Position "2," and replaces Telephone after hearing that Caller has entered circuit. When conversation terminates Caller replaces Receiver on hook and rises from seat; bell at Counter rings and Operator turns Switch to Position "1," thereby sending Clearing Signal.

Inward Calls.

Exchange rings in ordinary way, actuating bell of Counter Instrument. Attendant takes demand, directs Caller to Cabinet, and, when satisfied that latter has been entered and door closed, turns Switch to Position "2." Clearing effected as before.

Trunk Calls.

Caller communicates his requirement to Attendant. Latter records particulars, collects Fee, calls Local Exchange, is put through to Trunk Exchange, gives particulars to Record Operator, and then hangs up Receiver. When call matures Trunk Circuit is put through to Local Exchange on Junction Circuit, Junction Operator at Local Exchange rings up Call Office, actuating bell on Counter Telephone. Attendant replies, directs Caller to enter Cabinet, and, while doing so, *lets Receiver hang by means of cord without replacing it on hook*. When Caller has entered Cabinet and closed the door Attendant turns the Switch to

Position "2" and listens on Telephone to hear that Caller has come in circuit. Attendant then hangs up instrument. Clearing effected as before.

If Fee to be returned, Exchange Operator requests Caller to leave Cabinet and ask Counter Attendant to speak on Telephone.

Plate 37.

C.B. Diagram No. 50.

**WIRING DIAGRAM OF WALLBOARD
FOR CALL OFFICE WITH TWO OR MORE
CIRCUITS.**

APPARATUS SCHEDULE.

Wallboard, 33'' × 18'', wired to C.B. No. 50,
and fitted with:—

1 Case, Switch and Indicator, 17 $\frac{1}{4}$ ''.

1 Indicator, Non-Polarised, 1,000 ohms, $\frac{n}{5}$.

1 Indicator, Non-Polarised, 100 ohms, $\frac{n}{5}$.

1 Switchspring, 8-point, $\frac{5}{5}$.

1 Switchspring, 5 and 8-point, $\frac{1+5}{6}$.

n Coils, Bridging, 500 ohms.

n Condensers, metal-cased, 2 m.f.

1 Strip, Cross Connection, 5 × 4.

1 Strip, Trembler Bell Connection, 4-plate.

1 Bell, Trembler, Circular, 25 ohms.

Battery, 3-cell, Leclanché, No. 1 C.Z.

n + 1 pairs Pegs, 201, Red, with 18'' Cord,
Flexible.

Counter Telephone.

Telephone No. 1.

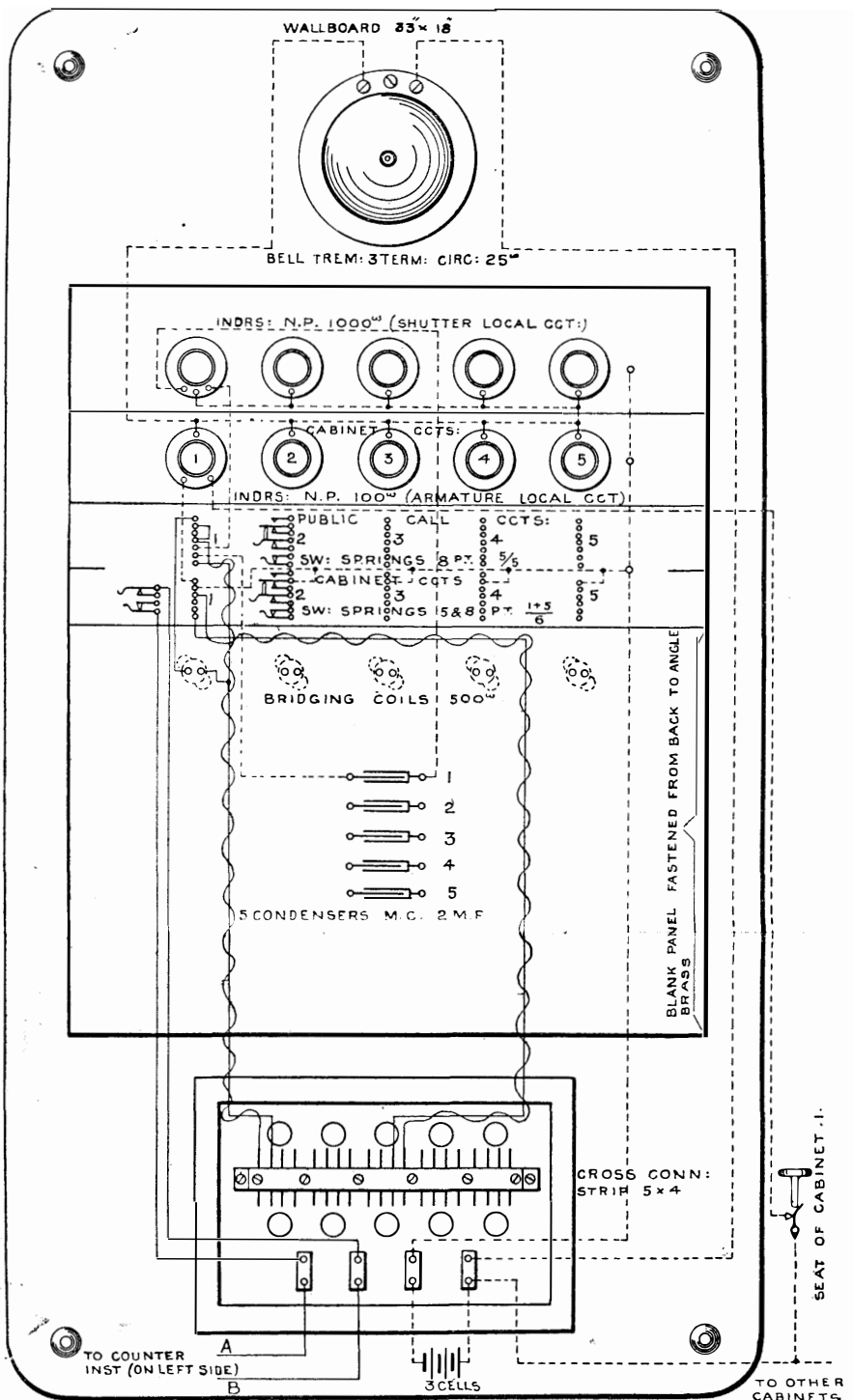


Plate 37.

For each Cabinet.

Telephone No. 1.

The various circuits terminate upon the Switch and Indicator Case, which is fixed in a position accessible only to the Counter Attendant who controls the service. Each Exchange Circuit terminates upon an 8-point Switchspring, and is normally bridged by means of a metal-cased Condenser, 2 m.f., and a Non-Polarised Indicator, 1,000 ohms. The normal condition is thus similar to that of an ordinary subscriber's circuit so far as the Exchange is concerned.

When a peg is inserted in a Switchspring the corresponding Indicator and Condenser are cut out of circuit, and a Bridging Coil (500 ohms) is automatically substituted. The function of the Bridging Coil is to prevent false Clearing Signals at the Exchange by maintaining the Clearing Relays there in their engaged condition while switching operations are in progress at the Call Office.

The Cabinet Circuits are terminated upon 8-point Switchsprings on the Switch and Indicator Case. The circuits of the corresponding Cabinet seats are also connected to these springs in such a way that when a peg is inserted into any Cabinet Switchspring the circuit of the seat is joined up through a Non-Polarised Indicator (100 ohms). When a seat is in its normal position and a peg is inserted into the corresponding Switchspring the Indicator is actuated and the bell rings.

The methods of operating are as follows :—

Local Calls, Outwards.

Caller furnishes Attendant with particulars of connection desired. Attendant collects Fee, selects a disengaged Circuit, connects it to Telephone by means of pegs and cord, passes particulars of call

Plate 37—cont.

to Exchange Operator, directs Caller to a disengaged Cabinet, and puts the Exchange Circuit through to that Cabinet by transferring the peg from the Counter Telephone Switchspring to the Cabinet Circuit Switchspring. If the connection at the Counter be put through before the Caller sits down, the Cabinet Circuit Indicator will be actuated, causing its shutter to drop and the bell to ring. The bell will cease ringing as soon as the Caller is seated, and the Indicator should then be restored to normal.

When the conversation terminates and the Caller rises, the Switch beneath the seat will be closed, actuating the Indicator and ringing the bell. The Attendant will then withdraw the pegs (thereby sending the Clearing Signal to the Exchange), and finally will restore the Indicator Shutter.

In the case of Local Outward Calls, it is essential that the Operator to whom the call is tendered by the Call Office Attendant should see it completed, in order that it may be possible to determine whether a Fee should or should not be returned.

Local Calls, Inwards.

The Exchange Operator calls in the usual way by Generator, actuating the Exchange Circuit Indicator, the shutter of which falls, closing the Bell Circuit. The Attendant in response replaces the Indicator Shutter, connects the circuit through to the Counter Telephone, ascertains the requirement, directs the Caller to a disengaged Cabinet, and connects the Cabinet selected to the Exchange Circuit by transferring the peg from the Counter

Instrument Switchspring to the Cabinet Circuit Switchspring.

Subsequent operations are similar to those in the preceding case.

Trunk Calls.

The Caller communicates his requirement to the Attendant, who records particulars, collects the Fee, calls the Local Exchange by connecting the Counter Telephone to an Exchange Circuit, asks for "Trunk," gives particulars to the Record Operator at the Trunk Exchange, then hangs up the Counter Receiver, and removes the pegs.

When the call matures the Trunk Circuit is put through to the Local Exchange on a Junction Circuit; the Junction Circuit Operator at the Local Exchange rings up the Call Office Attendant. The latter connects the Exchange Circuit to the Counter Telephone, restores the Indicator Shutter, ascertains demand, directs the Caller to a disengaged Cabinet, and connects the latter to the Exchange Circuit by transferring the peg from the Counter Telephone Switchspring to the Cabinet Circuit Switchspring.

Clearing is effected as before.

At the Exchange.

The connections of Public Call Office Circuits are effected similarly to those of ordinary subscribers' circuits.

Returning Fee.

In the event of a Fee having to be returned, the Exchange Operator must request the Caller to go to the Counter and ask the Attendant to speak.

SECTION 6.
EXCHANGE CONNECTIONS.

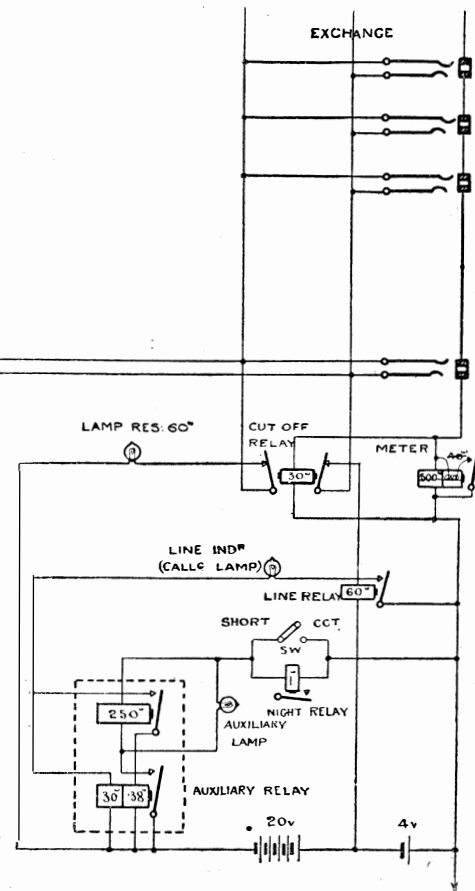
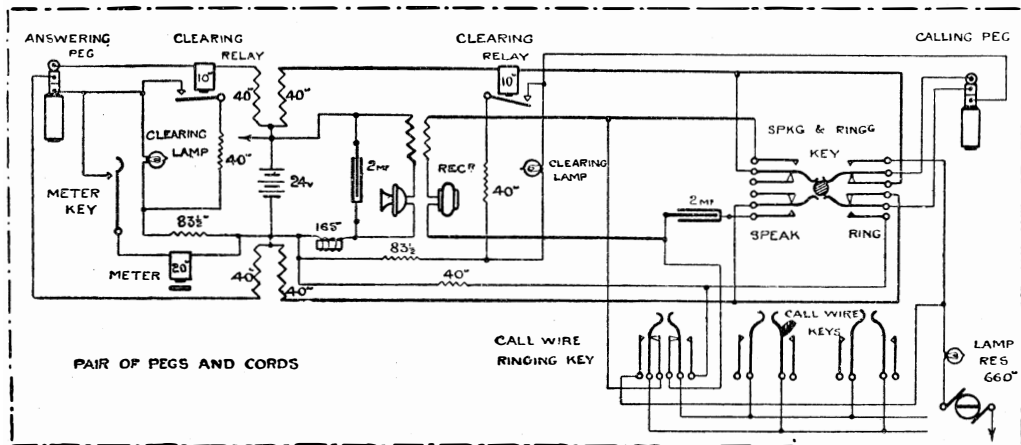
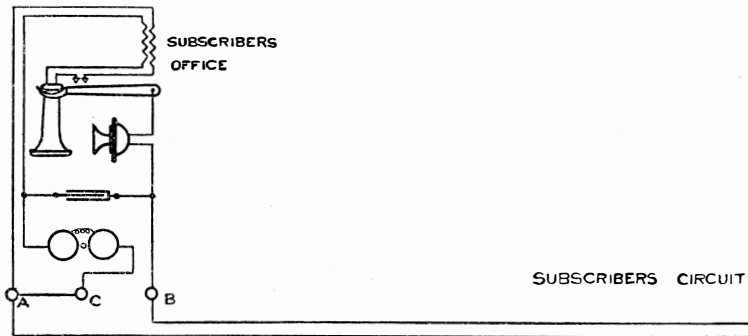
Plate 38

C.B. Diagram No. 70

**CONNECTIONS OF SUBSCRIBERS' AND
CORD CIRCUITS AT CENTRAL EXCHANGE,
LONDON. ORIGINAL INSTALLATION.**

The diagram shows in skeleton form the connections of a subscriber's circuit, and also the cord circuits at the Central Exchange.

When the subscriber raises his Receiver from the hook, he closes the circuit of the 20 volts through his apparatus by means of his Transmitter, and the primary of his Induction Coil. A current consequently flows round the circuit and actuates the Line Relay. The closing of the contacts of the Line Relay completes the circuit of the Calling Lamp and Auxiliary Relay. A current then flows from the positive pole of the 24 volts to the tongue of the Line Relay, thence through the lower contact of the latter, the Calling Lamp, and 30-ohms coil of the Auxiliary, or Pilot, Relay, to the negative pole. The lower tongue of the Auxiliary Relay closes, allowing a current to flow through the 250-ohms coil of the Auxiliary Relay and the Auxiliary, or Pilot, Lamp (which are joined in multiple), by way of the Night Relay or the Switch across it. The Auxiliary Lamp glows and the armature of the 250-ohms coil closes upon its contact. The latter operation brings in the 0.38-ohms coil as a shunt upon the 30-ohms coil already mentioned. This reduces the resistance of the Calling Lamp Circuit, and increases the



voltage across the Lamp itself, causing it to glow (if not already in that condition), and thereby indicating the Call.

To answer the Call, the Exchange Operator inserts the Answering Peg of a pair in the Switchspring associated with it, and fitted immediately above the Calling Lamp. The tip of the peg makes contact with the A spring, the ring of the peg with the B spring, and the third point of the peg with the socket of the Switchspring. The last-mentioned connection completes a circuit from the positive pole of the battery through the Cut-off Relay and subscriber's meter in parallel, the socket of the Switchspring, third point of peg, Clearing Lamp, and $83\frac{1}{2}$ -ohms Resistance Spool to the negative pole. The Cut-off Relay is actuated (the current at this stage is, however, insufficient to operate the meter), the movement of the Relay armature breaks the battery circuit, but the contact of the tip and ring of the peg with the A and B springs, respectively, re-makes the circuit through the repeating coil shown between the Cords. The current now flowing out on the lines actuates the Clearing Relay, and the attraction of its armature throws a 40-ohms shunt across the Clearing Lamp, which remains darkened.

By throwing the Ringing and Speaking Key into the "speaking" position, the operator joins her Receiver, in series with the secondary of the Induction Coil and a 2-m.f. Condenser, across the Cords for the purpose of receiving the number of the required subscriber. This being done, and having first ascertained that the subscriber is not engaged by making the engaged test on the Switchspring of the multiple panel, she inserts the Calling Peg of the pair in the Switchspring, and throwing her Key into the "ringing" position connects the Generator to the lines. One side of

Plate 38—cont.**Plate 38a.**

the Generator is earthed, and the other is connected through a Lamp Resistance to the top outer spring of the "ringing" Key. The top spring of the Key now makes contact with the spring connected to the tip of the Peg, and the current may be traced as going out on the A line, through the subscriber's Magneto Bell and 2-m.f. Condenser, back on the B line to the lower outer spring, through the 40-ohms resistance and the battery to Earth. The alternating currents cause the Bell to ring. When the required subscriber answers by lifting his Receiver, a current flows out on his lines and actuates the Clearing Relay on the Calling Side. The armature of the Relay throws a 40-ohms shunt across the Clearing Lamp, which is accordingly darkened. At the close of the conversation, the subscriber's Receivers are replaced on the hooks; the line circuits are thereby broken and the armatures of the Clearing Relays fall back, breaking the shunt circuits across the Clearing Lamps, which now glow. The operator thereupon depresses the Effective Meter Key on the answering side, and severs the connection by withdrawing the pegs from the Switchsprings. Should the operator be unable to complete the required connection the Ineffective Meter Key is depressed. It will be seen that by this operation the subscriber's meter is not actuated. See Plate 38A.

In certain recent Exchanges, the foregoing method of operating has been modified. At the "home" positions or "A" board, the outgoing junctions to other Exchanges and transfer circuits

Plate 38A shows the Cord Circuit at the Central Exchange; Plate 40 the Cord Circuit at Cardiff Exchange. The Cord Circuit at Hampstead and other London Exchanges are practically the same as that shown on Plate 38A; the Supervisory, or Clearing, Relays are wound to 20 ohms resistance, and shunted by a non-inductive resistance of 30 ohms for speaking purposes.

Plate 40.

C.B. Diagram No. 162.

**CONNECTIONS OF SUBSCRIBERS'
CONNECTING PEGS AND CORDS AT
CARDIFF EXCHANGE.**

The diagram shows the connections of the operators' pegs and cords circuits at Cardiff Exchange.

The main points of difference between these circuits and those shown on Plate 38, are the omission of the repeating coils between the Cords and the 24-volt battery; the increased resistance of the Clearing Relays, which are wound to 100 ohms in this case; and the introduction of the 2-microfarad Condensers shown connected across the Clearing Relays and Retardation Coils in the B Cords. The Retardation Coils are interpolated in the B Cords in order to maintain equal the resistances of the two halves of the circuit. Operators' speaking sets and clearing arrangements are practically identical with those given on Plate 38A.

For Subscribers' Circuit Connections, see Fig. 3, Plate 39.

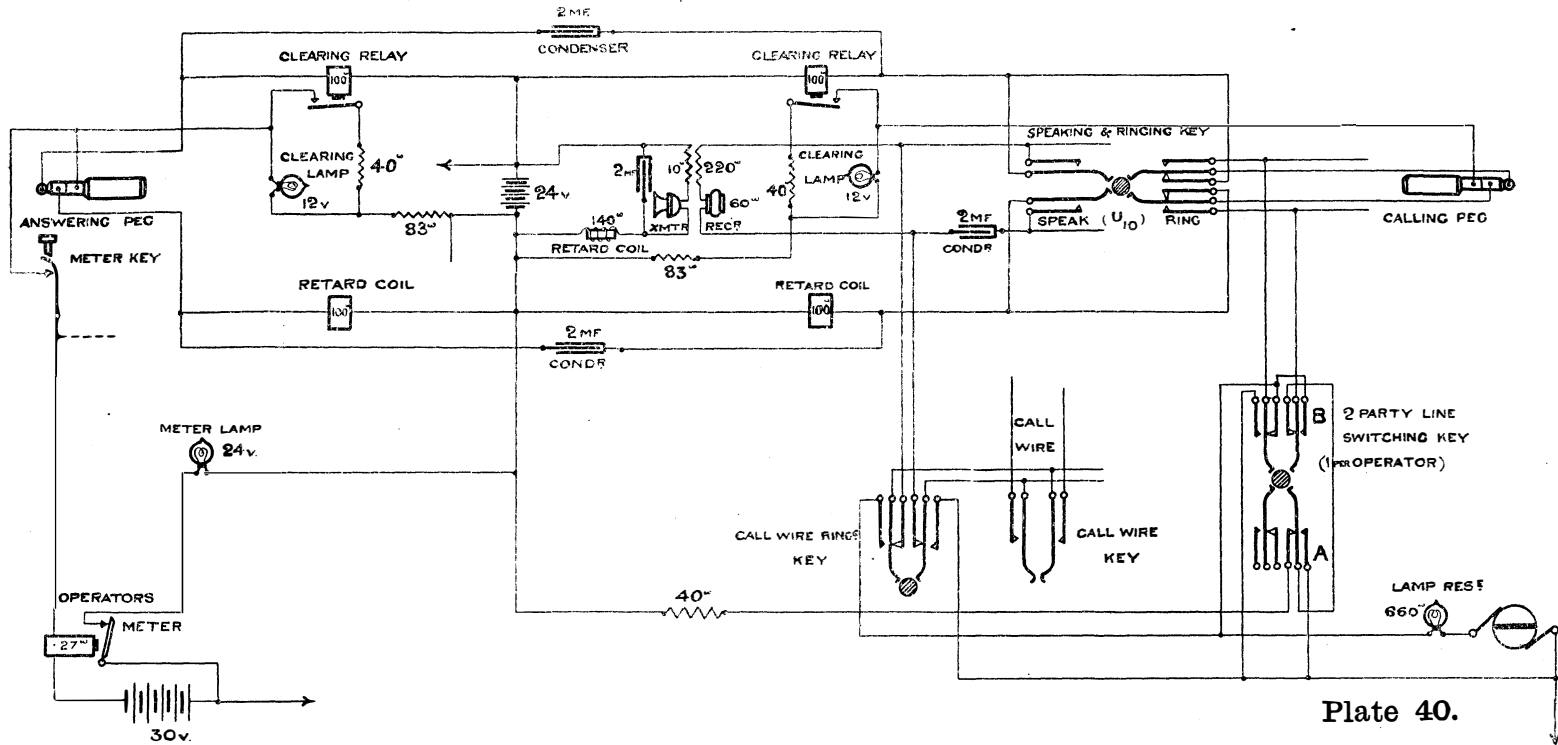


Plate 40.

Plate 40A.

C.B. Diagram No. 525.

Subscribers' Line and Cord Circuits at Central Exchange, Glasgow.

The diagram shows in skeleton form the connections of the above circuits at the Central Exchange, Glasgow. It will be observed that the line relay is placed with one winding of 200 ohms in each line. At Exchanges on this system where B line feeding is required, the B line winding of the relay will be a non-inductive one. For a similar purpose the supervisory relays will have but one winding, viz., the one in the A conductor; in the B conductor a retardation coil of 200 ohms resistance and inductance equal to that of the relay will be fitted, so as to provide current for extension working.

The resistances in the various parts of the circuits have been arranged to suit the higher voltage used on this system. The supervisory lamps in the cord circuits are "36 volt" and are connected through the back contact of the supervisory relays to battery, the circuits being completed when the subscribers hang up their receivers, and the armatures of the supervisory relays fall back.

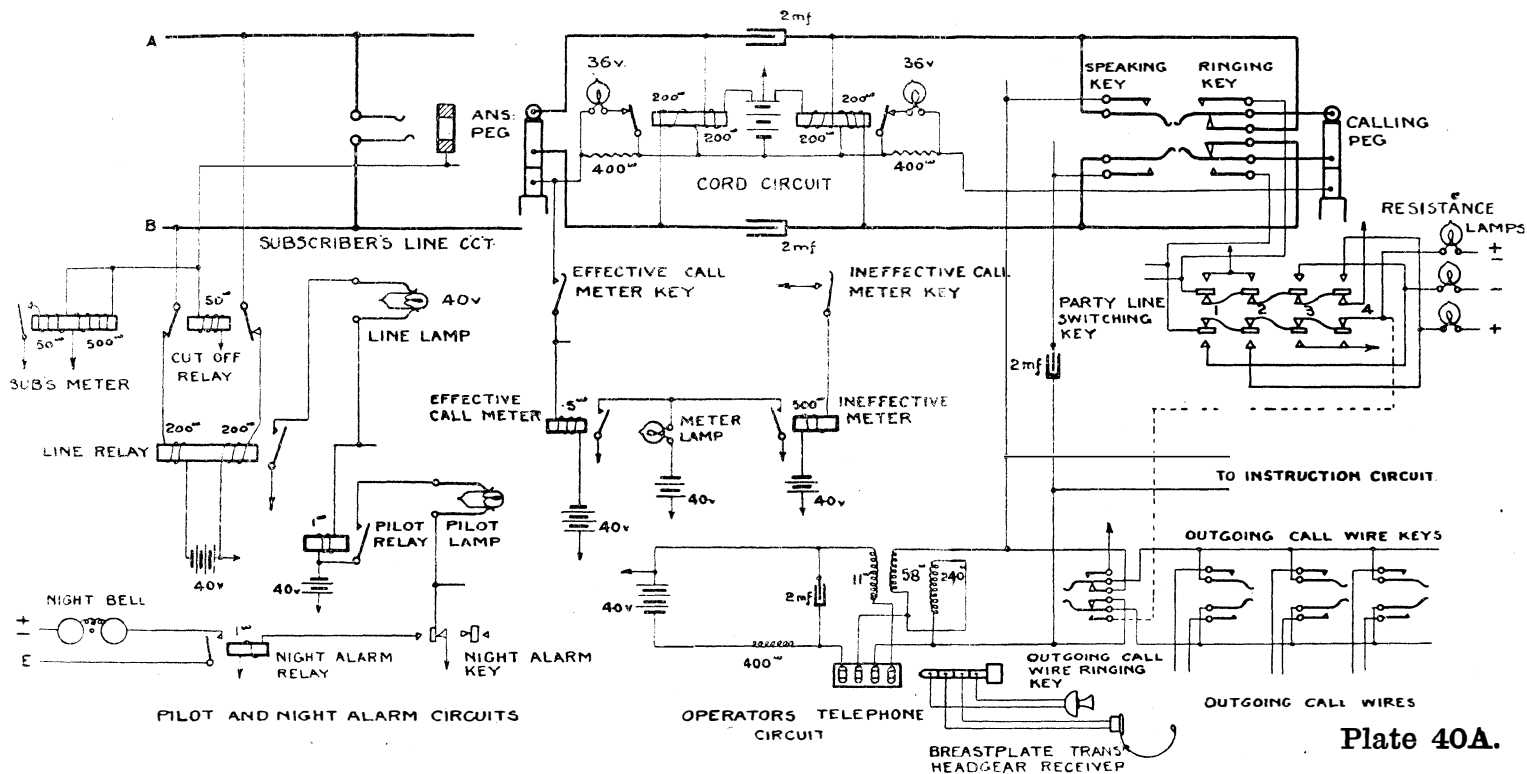


Plate 40A.

Plate 41.

C.B. Diagrams Nos. 243 and 246.

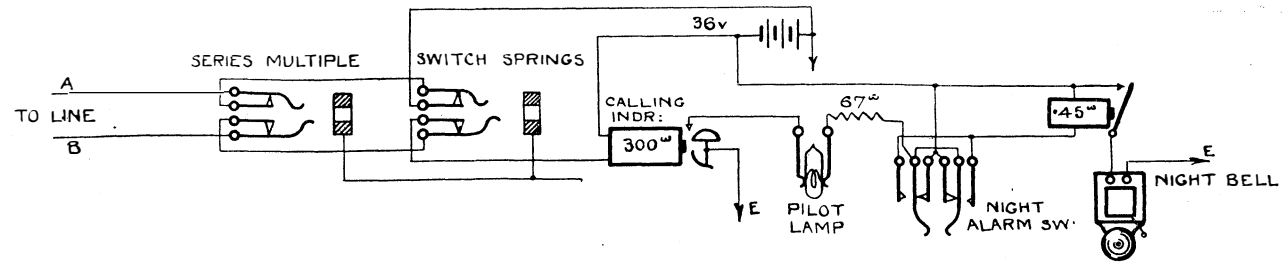
CONNECTIONS OF SUBSCRIBERS' CIRCUITS
AND PEGS AND CORDS CIRCUITS AT
MINOR C.B. EXCHANGES (No. 9 SWITCH-
BOARDS).

Fig. 1.—Explanatory diagram of a Subscribers' Circuit. When the subscriber raises his Receiver, the Circuit from the Battery is closed through the Calling Indicator (Type 34, 300 ohms), in the local circuit of which is placed the Pilot Lamp.

Fig. 2.—Cord Circuit. Current is supplied to the speaking subscribers through the coils of the Supervisory Indicators, the armatures of which are attracted and the "eyeballs" show during the conversation. The 2-m.f. Condensers joined across the Indicators provide a direct path for the speaking currents between the subscribers. When the conversation is finished and the Receivers placed on the hooks, the circuits through the Indicators are broken and the Supervisory signals disappear.

Ordinary C.B. Telephones are fitted at subscribers' offices, but the arrangement does not provide for the installation of Branch Exchange Switchboards and Intercommunication sets on which the principle of B line current supply obtains.

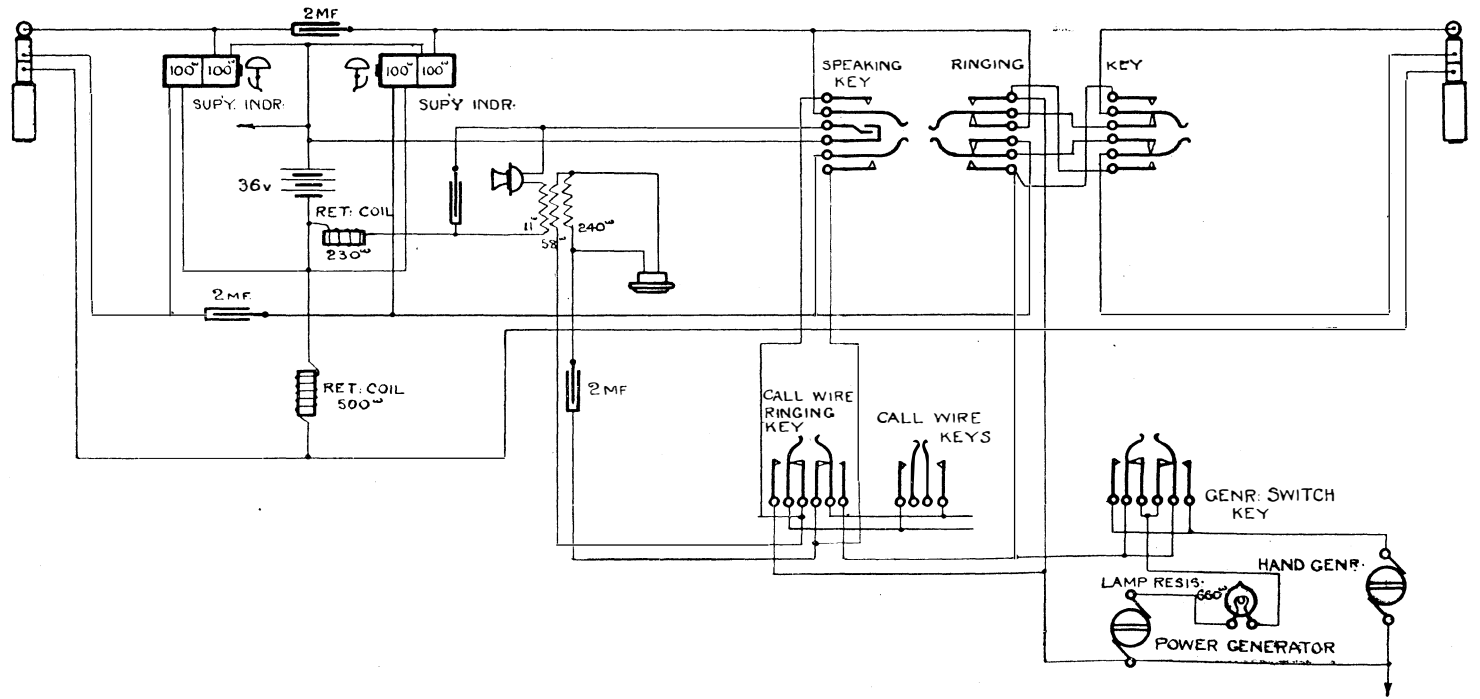
FIG. 1.



ANSWERING
PEG.

FIG. 2.

CALLING
PEG.



PART II.—COMMON BATTERY
SIGNALLING.

SECTION 1.

SUBSCRIBERS' APPARATUS
ON DIRECT EXCHANGE CIRCUITS.

Plate 42.

C.B.S. Diagram No. 1.

COMMON BATTERY SIGNALLING.

CONNECTIONS OF SUBSCRIBERS' INSTRUMENTS. TABLE TELEPHONE (WITH MICRO TELEPHONE).

FIG. 1.—ORDINARY ARRANGEMENT.

APPARATUS SCHEDULE.

Telephone No. 26. The description includes Cord, Flexible, No. 402; Strip, Flexible, Cord Connection, 4-terminal; Coil, Induction, $\frac{25}{1}$; and Telephone, Micro (*see* page 230, Telephone No. 28).

Receiver, Watch, D, Complete (if required only). The description includes the Cord, Flexible, No. 222, when "complete" is specified.

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

See Plate 85 for wiring diagram of the Instrument.

FIG. 2.—TABLE SET WITH EXTENSION BELL.

APPARATUS SCHEDULE.

In addition to the above items:—

Bell, Magneto, 100 ohms.

Switch, Tumbler, 3 ampères (bronzed).

TELEPHONE, TABLE, WITH
MAGNETO BELL.

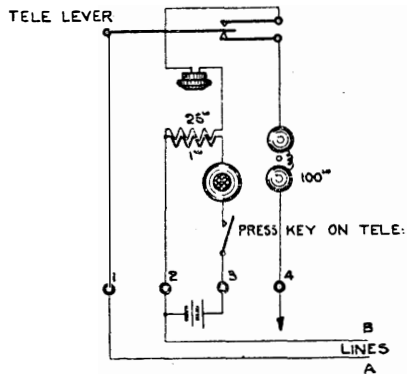


FIGURE 1

TELE. LEVER.

BELL,
MAGNETO.

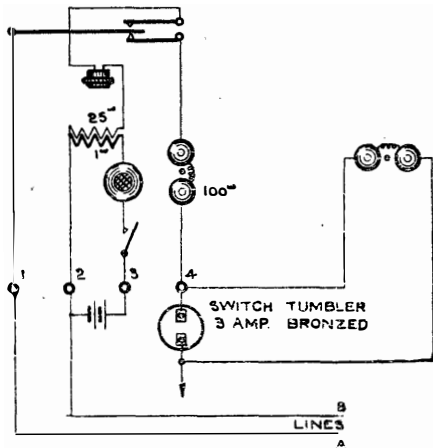


FIGURE 2

Plate 42.

The Telephone should stand on the desk or table in the position indicated by the subscriber. The Cord Connection Strip should be fixed to the ledge underneath desk or table in the vicinity of the user's position ; the actual position must be arranged with the subscriber. The Battery Box should be placed as near to the Telephone as possible, without being in close proximity to a fire or other source of heat, but in a position to suit the convenience of the subscriber.

The Switch, Tumbler, 3 ampères (bronzed), should be fitted at the Telephone, or at the Extension Bell, according to the subscriber's desire.

Plate 43.

C.B.S. Diagram No. 166A.

CONNECTIONS OF SUBSCRIBERS'
INSTRUMENTS. TABLE TELEPHONE,
TRANSMITTER TYPE.

APPARATUS SCHEDULE.

Telephone No. 4. The description includes Cords, Flexible, Nos. 222 (Receiver), 223 (Transmitter), and 605 (Strip); Strip, Flexible Cord Connection, 6-terminal; Transmitter, "Inset"; Receiver, Bell, "D"; and Label No. 78, 78A, or 78B. *See* Plate 88 for wiring of Telephone.

Receiver, Watch, "D," Complete (if required only).

Bell Set No. 5. The description includes
Coil, Induction, ²⁵₁.

Battery, Leclanché, Agglomerate, 6-block.
2-cell.

When an Extension Bell is required the following additional items should be requisitioned:—

Bell, Magneto, 100 ohms.

Switch, Tumbler, 3 ampères (bronzed).

The fitting particulars given on page 117 apply also in this case. The Bell Set should be mounted on the wall in a position indicated by the subscriber.

TELE., TABLE,
P.B. TRANSMITTER
TYPE.

TRANSMITTER
INSET.

BELL SET,
MAGNETO P.B.

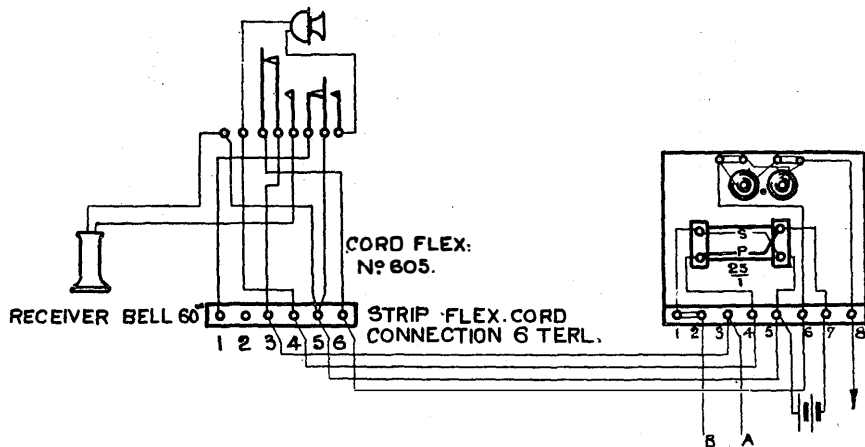


Plate 43.

Plate 44.

C.B.S. Diagram No. 16A.

CONNECTIONS OF SUBSCRIBERS' SET WITH WALL SOCKETS AND PLUG.

ARRANGEMENT No. 1. TABLE SET WITH MICRO
TELEPHONE.—FIG. 1.

APPARATUS SCHEDULE.

Telephone No. 26.

n Sockets, Wall, 4-hole.

Plug, Wall, 4-pin.

Bell,	Magneto,	} for calling purposes, if Plug is inadvertently left out of socket.
1,000 ohms.		
Condenser, metal- cased, 2 m.f.		

Battery, Leclanché, Agglomerate, 6-block,
2-cell, No. 1.

See Plate 85 for wiring diagram of the
instrument.

C.B.S. Diagram No. 166A.

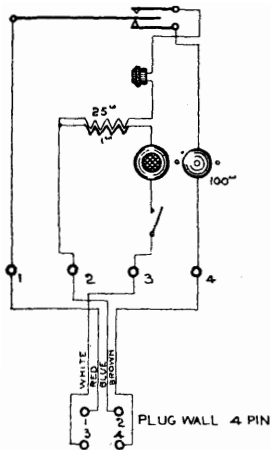
ARRANGEMENT No. 2. TABLE SET, TRANSMITTER
TYPE.—FIG. 2.

APPARATUS SCHEDULE.

Telephone No. 4.

Bell Set No. 5.

n Sockets, Wall, 4-hole.



TELE: TABLE PB.
TRANSMITTER
TYPE.

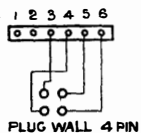
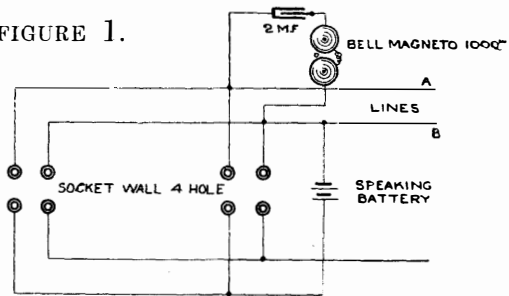
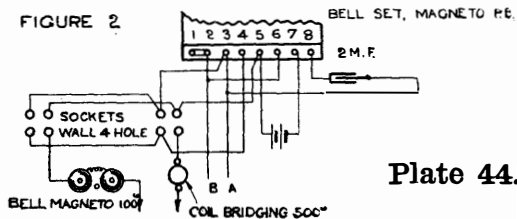


FIGURE 1.



TELEPHONE, TABLE, WITH MAGNETO BELL.

FIGURE 2.



Plug, Wall, 4-pin.

Bell, Magneto, 100 ohms (on second socket).

Coil, Bridging, 500 ohms (on first socket for clearing purposes).

Condenser, m.c., 2 m.f., for calling purposes, in series with Bell, if Plug is inadvertently left out of socket.

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

Plate 45.

C.B.S. Diagram No. 2A.

CONNECTIONS OF SUBSCRIBERS'
INSTRUMENTS. WALL TELEPHONES.

FIG. 1.—ORDINARY ARRANGEMENT.

APPARATUS SCHEDULE.

Telephone No. 3. The description includes Cord, Flexible, No. 222 (for Receiver); Receiver, Bell; Transmitter, Inset; Coil, Induction, $\frac{25}{1}$; Magneto Bell, 500 ohms + 500 ohms; and 3 fixing screws and washers.

2 Cells, 2-block, Agglomerate, Complete.

Label No. 53 (or 53B). The former is used when a "Busy Back" is fitted at the Exchange.

Receiver, Watch, "D," Complete (if required).

[See also Plates 45A and 55.]

FIG. 2.—SUBSCRIBER'S CIRCUIT WITH EXTENSION BELL.

APPARATUS SCHEDULE.

In addition to the above items:—

Bell, Magneto, 100 ohms.

Switch, Tumbler, 3 ampères (bronzed).

TELE., WALL, WITH MAGNETO BELL.

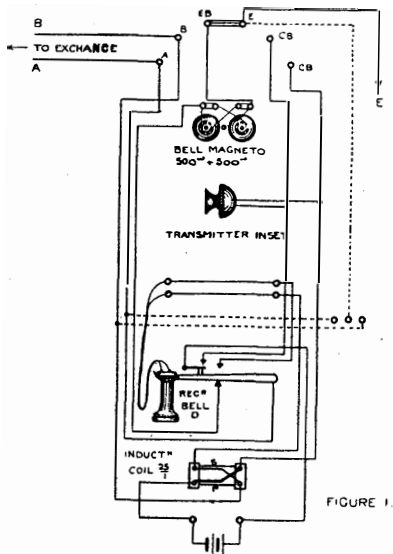


FIGURE 1.

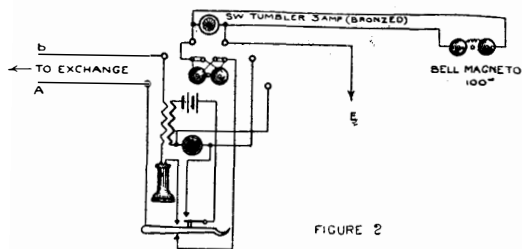


FIGURE 2.

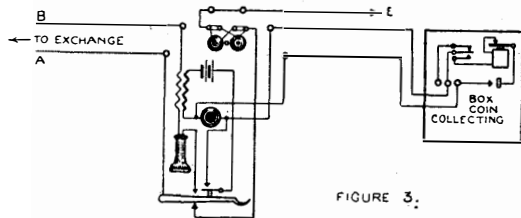


FIGURE 3.

Plate 45—cont.**FIG. 3.—SUBSCRIBER'S CIRCUIT WITH COIN
COLLECTING BOX.****APPARATUS SCHEDULE.**

In addition to the items under Fig. 1 :—

Box, Coin, Collecting, Complete. Description includes the Cash Box.

Except when otherwise specified by the subscriber, the Telephone should be fixed upon the wall with its lower edge 36 inches from the floor. Where it is necessary to plug the wall, care must be taken to avoid unnecessary damage.

The Tumbler Switch may be fitted either adjacent to the Telephone, or to the Extension Bell, as desired.

The Coin Collecting Box should be fixed close to the right-hand side of the Telephone.

Plate 45A.

T.L. Diagram No. 439.

Telephone No. 3. (Telephone Wall with Magneto Bell, Type 2.)

The diagram shows the internal connections of the later pattern of primary battery wall instrument. The switchhook is detachable and forms no part of the electrical circuit, but the contacts operated by the hook and the external connections give the same facilities as those of the earlier instrument.

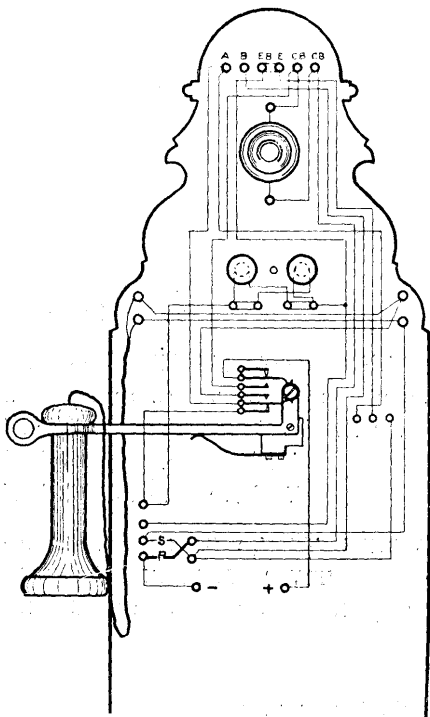


Plate 45A.

Plate 46.

C.B.S. Diagram No. 136.

**CONNECTIONS OF NORTHERN (FORMERLY
N.E.N.) DISTRICT WALL TELEPHONES
FOR WORKING TO C.B.S. EXCHANGES.***Fig. 1.*—Telephone No. 17.*Fig. 2.*—Telephone No. 17.*Fig. 3.*—Telephone No. 19. The description includes Cord, Flexible, No. 222; Coil, Induction $\frac{25}{1}$; Receiver, Bell; and Transmitter, Deckert.*See also* Plate 55.

FIG. 1.

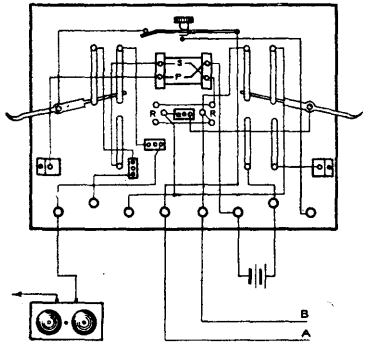


FIG. 2.

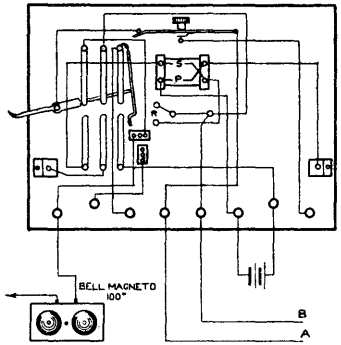


FIG. 3.

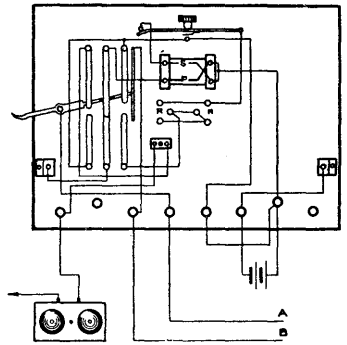


Plate 46.

SECTION 2.

SUBSCRIBERS' APPARATUS WITH
SIMPLE EXTENSIONS.

Plate 47.

C.B.S. Diagram No. 3A.

SUBSCRIBER'S CIRCUIT WITH ONE
ORDINARY EXTENSION.

ARRANGEMENT NO. 1.—TABLE TELEPHONE WITH
MICRO TELEPHONE AT EACH POINT.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 26.
Press Button "F."
Battery, Leclanché, Agglomerate, 6-block,
2-cell.
Receiver, Watch, "D," Complete (if required).

Extension Set.

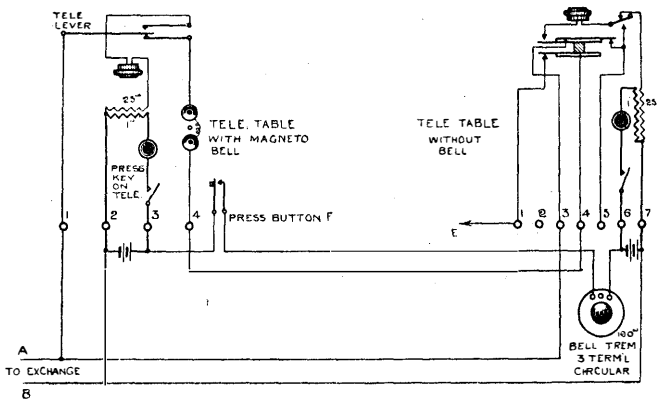
Telephone No. 24. The description includes Cord, Flexible, No. 702; Strip, Flexible Cord Connection, 7 terminals; Coil, Induction, $\frac{25}{1}$; and Telephone, No. 28. See Plate 86 for wiring diagram of instrument.
Receiver, Watch, D, Complete (if required).
Bell, Trembler, Circular, 100 ohms.
Battery, Leclanché, Agglomerate, 6-block,
2-cell.

The Exchange calls the Main Set, by generator on the A line and Earth, the latter point

MAIN SET.

FIGURE 1.

EXTENSION SET.



MAIN SET

EXTENSION SET

FIGURE 2

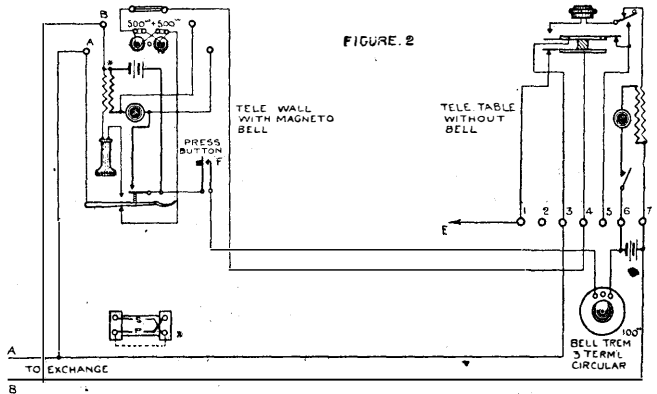


Plate 47.

Plate 47—cont.

being connected to terminal No. 1 on the Extension Strip. Either point calls the Exchange by lifting the Micro Telephone from the cradle, thereby joining the Receiver and Secondary across the lines.

The Main Set calls the Extension by depressing the Press Button "F" This operation joins the two speaking batteries in series through the Trembler Bell and B line. A clearing signal is sent to the Exchange by the replacement of the Micro Telephone on the cradle.

ARRANGEMENT NO. 2.—WALL TELEPHONE AT MAIN SET, TABLE TELEPHONE WITH MICRO TELEPHONE AT EXTENSION.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 3.

Press Button "F."

Receiver, Watch, "D," Complete (if required).

Label, No. 53.

2 Cells, 2-block, Agglomerate, Complete.

The two windings of the Induction Coil are not ordinarily connected; the connections shown dotted in the small figure should therefore be made locally.

Extension Set.

Same as in Arrangement No. 1.

The fitting instructions given on pages 117 and 124 apply also in these cases. The Press Button "F" should be fitted on desk or table, and the Trembler Bell on the wall in positions agreed upon with the subscriber.

Plate 48.

C.B.S. Diagram No. 167.

SUBSCRIBER'S CIRCUIT WITH ONE
ORDINARY EXTENSION.

ARRANGEMENT No. 3.—TABLE TELEPHONE, TRANSMITTER TYPE, AT EACH POINT.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 4.
 Bell Set No. 5.
 Press Button "G."
 Battery, Leclanché, Agglomerate, 6-block,
 2-cell.
 Receiver, Watch, "D," Complete (if required).

Extension Set.

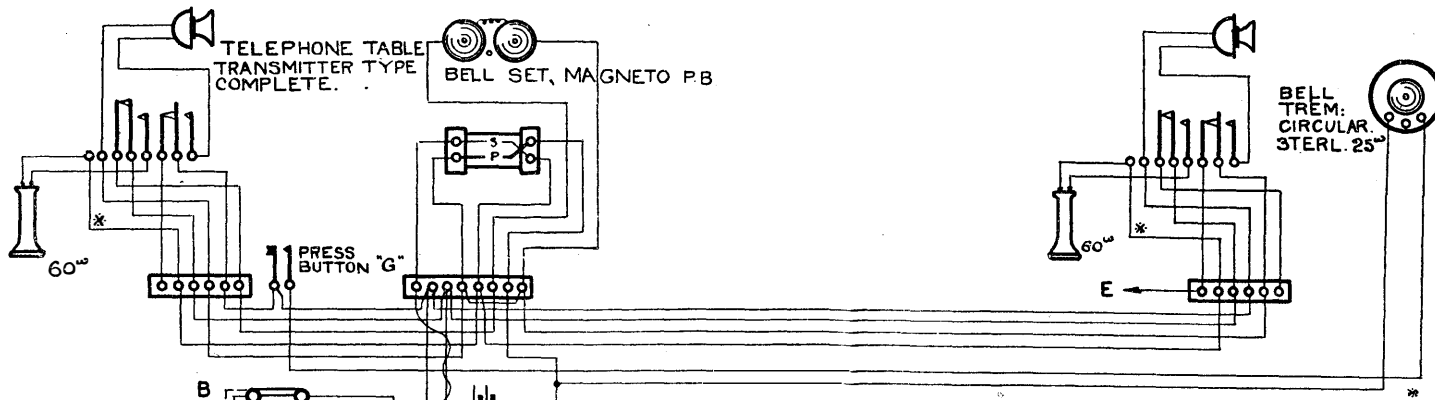
Telephone No. 4.
 Bell, Trembler, Circular, 25 ohms.
 Receiver, Watch, "D," Complete (if required).

This arrangement, which makes use of the Main Set battery for calling the Extension, and utilises both the Main Set battery and Induction Coil for speaking at the Extension, should only be adopted when the Extension is not over 100 yards from the Main Set. See Plate 50 for longer distance arrangement.

MAIN SET.

FIGURE 1.

EXTENSION.



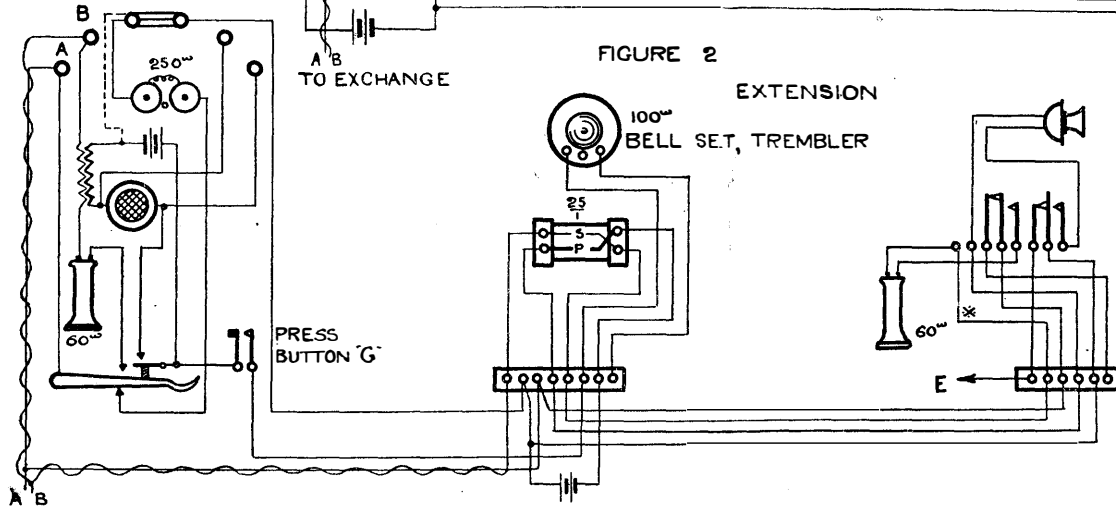
TELE., TABLE, P.B., TRANSMITTER TYPE COMPLETE.

MAIN SET.

FIGURE 2

EXTENSION

TELEPHONE, WALL, WITH MAGNETO BELL COMPLETE.



TELE., TABLE, P.B. TRANSMITTER TYPE COMPLETE.

TO EXCHANGE.

ARRANGEMENT NO. 4.—WALL TELEPHONE AT MAIN
SET; TABLE TELEPHONE, TRANSMITTER TYPE,
AT EXTENSION.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 3.

Press Button "G."

Receiver, Watch, "D," Complete (if required).

2 Cells, 2-block, Agglomerate, Complete.

The connection between the E.B. terminal and the negative battery terminal must be made locally.

Extension Set.

Telephone No. 4.

Bell Set No. 6 (Bell Set Trembler). The description includes a Coil, Induction, $\frac{25}{1}$.

The flexible lead (green binding) shown terminating on the second terminal of the Strip is connected to Terminal 5 when the Telephone is issued from stock, and the alteration should be made locally. See Plate 88 for wiring diagram of instrument.

Plate 49.

C.B.S. Diagram No. 4B.

**SUBSCRIBER'S CIRCUIT WITH TWO
ORDINARY EXTENSIONS.****ARRANGEMENT NO. 1.—TABLE TELEPHONE WITH
MICRO TELEPHONE AT EACH OF THE THREE POINTS.**

APPARATUS SCHEDULE.

Main Set.

Telephone No. 26.
 2 Press Buttons "F."
 Receiver, Watch, "D," Complete (if required).
 Battery, Leclanché, Agglomerate, 6-block,
 2-cell, No. 1.

Extension Set.

Telephone No. 24.
 Bell, Trembler, Circular, 100 ohms.
 Receiver, Watch, "D," Complete (if required).
 Battery, Leclanché, Agglomerate, 6-block,
 2-cell, No. 1.

**ARRANGEMENT NO. 2.—WALL TELEPHONE
AT MAIN SET, TABLE TELEPHONE WITH MICRO
TELEPHONE AT EACH EXTENSION.**

APPARATUS SCHEDULE.

Main Set.

Telephone No. 26.
 2 Press Buttons, "F" (one for each extension).

MAIN SET.

EXTENSION SET NO. 1.

EXTENSION SET NO. 2.

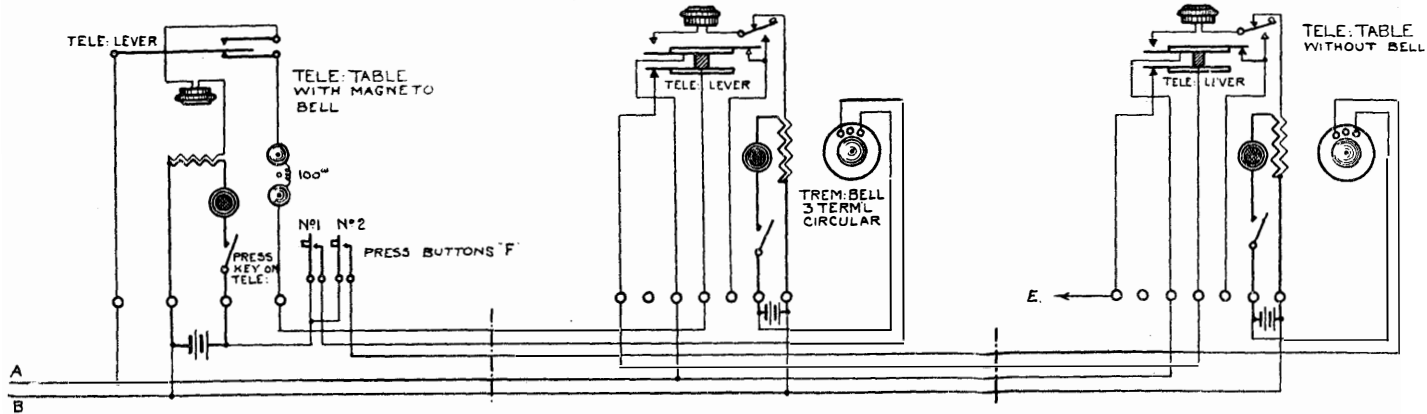


FIGURE 1

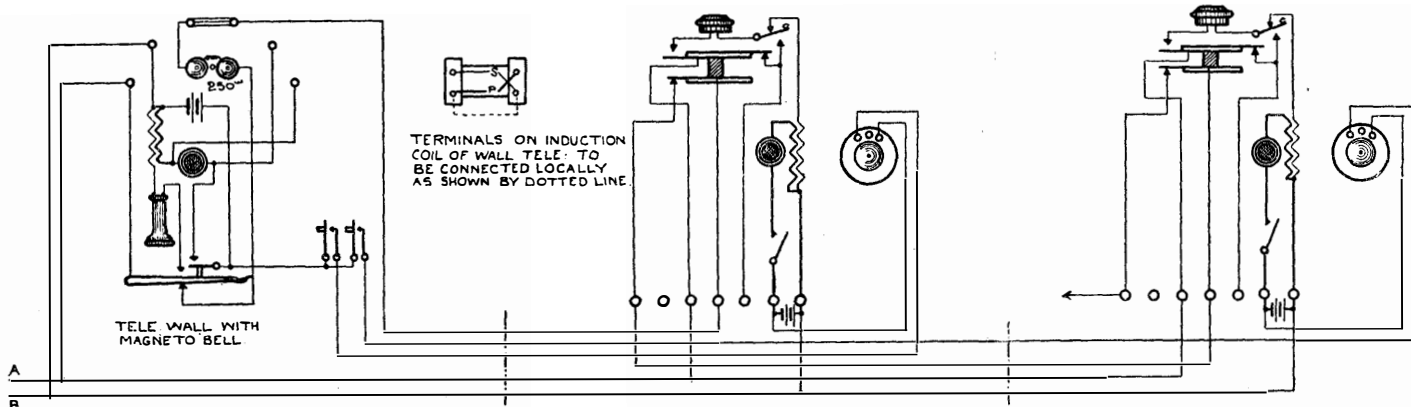


FIGURE 2

Receiver, Watch, D, Complete (if required).
2 Cells. 2-block, Agglomerate, Complete.

Extension Sets.

Same as Arrangement No. 1.

Calling and clearing arrangement similar to that of Plate 47.

Plate 50.

C.B.S. Diagram No. 168.

SUBSCRIBER'S CIRCUIT WITH TWO
ORDINARY EXTENSIONS.

ARRANGEMENT 3.—TABLE TELEPHONE (TRANSMITTER
TYPE) AT EACH OF THE THREE POINTS. FIG. 1.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 4.
Bell Set No. 5.
2 Press Buttons "G."
Battery, Leclanché, Agglomerate, 6-block,
2-cell.
Receiver, Watch, "D," Complete (if required).

Extension Set.

Telephone No. 4.
Bell Set No. 6.
Battery, Leclanché, Agglomerate, 6-block,
2-cell.
Receiver, Watch, "D," Complete (if required).

ARRANGEMENT NO. 4.—WALL TELEPHONE
AT MAIN SET, TABLE TELEPHONES, TRANSMITTER
TYPE, AT EACH EXTENSION. FIG. 2.

APPARATUS SCHEDULE.

Main Set.

Telephone No. 3.
2 Press Buttons "G."

FIGURE 1.

MAIN SET.

BELL SET,
MAGNETO, P.B.

EXTENSION NO. 1.

BELL SET,
TREMBLER.

TELE., TABLE, P.B.
XMTR. TYPE.

EXTENSION NO. 2.

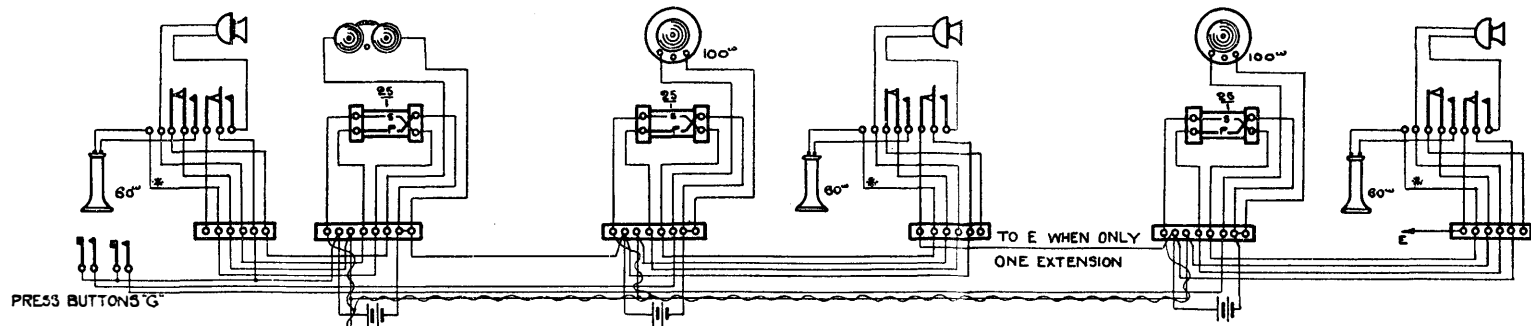
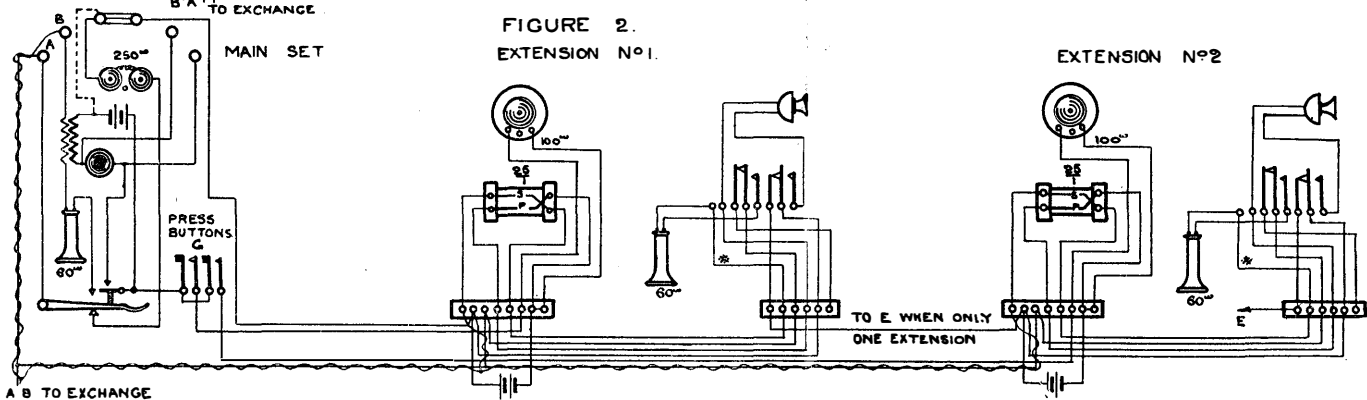


FIGURE 2.
EXTENSION NO. 1.

TELE., WALL,
WITH MAGNETO
BELL, COMPLETE.



Receiver, Watch, "B," Complete (if required).
2 Cells, 2-block, Agglomerate, Complete.

The connection between the E.B. terminal and the negative battery terminal must be made locally.

Extension Sets.

Same as Arrangement 3.

The flexible lead (green binding) shown as terminating on the second terminal of the Strip is connected to Terminal 5 when the Telephone is issued from stock. The alteration should be made locally. See Plate 88 for wiring diagram of instrument.

SECTION 3.

SUBSCRIBERS' APPARATUS
WITH ONE EXTENSION AND
INTERCOMMUNICATION.

Plate 51.

C.B.S. Diagram No. 5A.

SUBSCRIBER'S CIRCUIT
WITH EXTENSION, INTERCOMMUNICATION,
AND WITH OR WITHOUT SECRECY.

FIG. 1.—WIRING OF INTERMEDIATE SET.

APPARATUS SCHEDULE.

Telephone No. 15. The description includes Cord, Flexible, No. 222; Coil, Induction, $\frac{25}{1}$; Switch; Relay, E₁, 4,000 ohms; Transmitter, Inset; Generator, Bracket, 3-terminal, unmounted; Condenser, m.c., 1 m.f.; Receiver, Bell; and 4 fixing screws and washers.

2 Cells, 2-block, Agglomerate, Complete.

The tags of the Switch are shown as viewed from the back, E₁ being on the left. Switch Positions: Left Position, "Exchange," Keys E₁ and E₂ are actuated. Central Position, "Extension," none of the keys is actuated. Right Position, "Through," Keys T and T₂ are actuated. Plate 52 gives the circuit connections in the various positions of the keys.

Wiring Colours: A Exchange Line, red, R; B Exchange Line, blue, B; A Down Line, red and white, R & W; B Down Line, blue and white, B & W; Speaking Circuit Secondary, yellow, Y; Signalling, green, G.

In earlier patterns of this Instrument the Short Circuit Piece, shown in the diagram in the 4,000-ohms Relay Circuit, was fitted in the circuit of the Trembler Bell.

FIGURE 1.

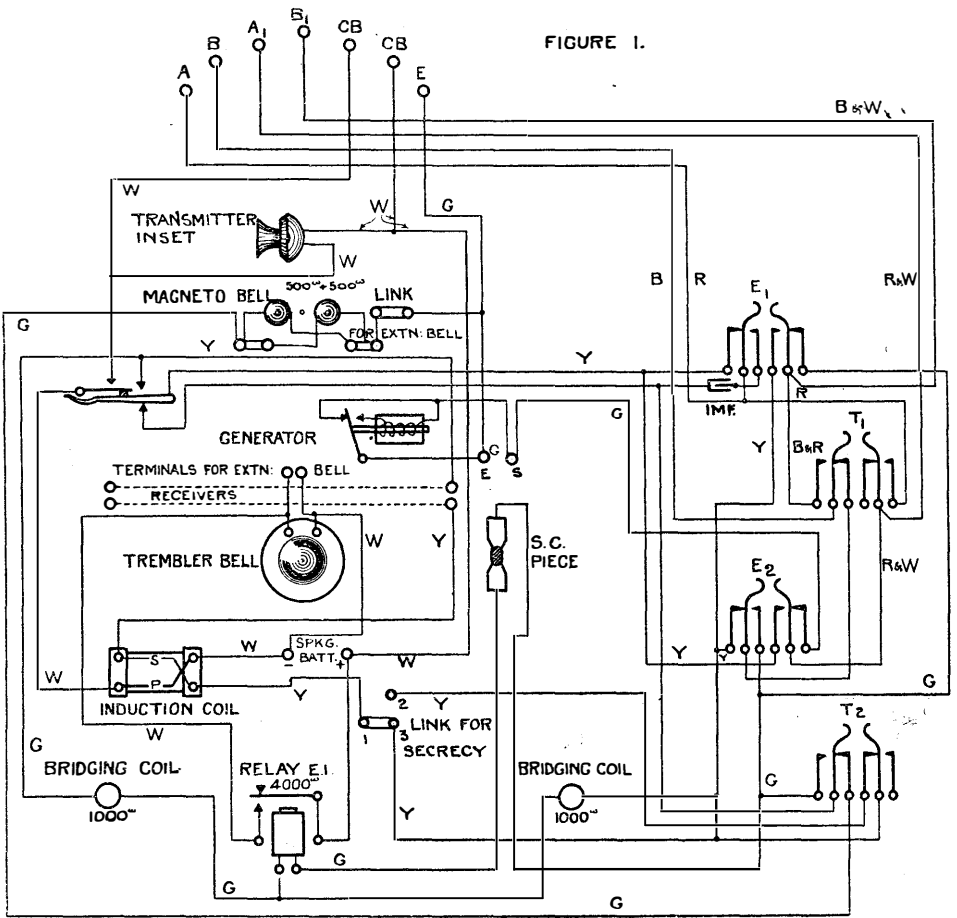


FIGURE 2.

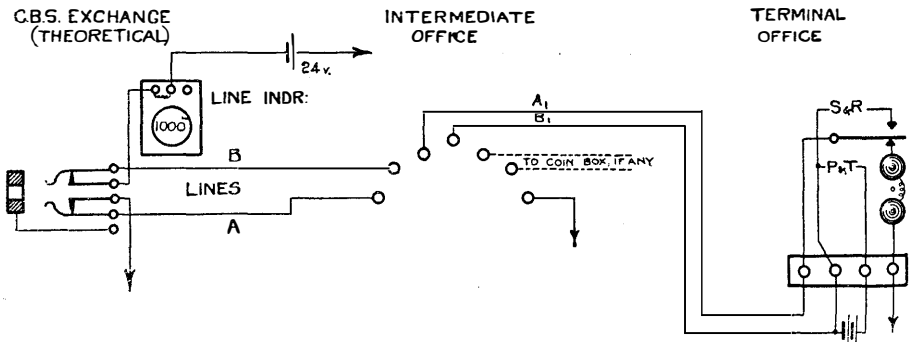


FIG. 2.—CONNECTIONS OF CIRCUIT.

At the Terminal Office an ordinary C.B.S. Set is fitted, *i.e.*, a Telephone, No. 26; a Telephone, No. 3; or a Telephone, No. 4, with Bell Set No. 5. See Plates 42, 45, and 43 respectively.

Plate 52.

C.B.S. Diagram No. 6B.

EXTENSION CIRCUIT WITH INTERCOMMUNICATION. CIRCUIT CONDITIONS IN THE VARIOUS POSITIONS OF THE INTERMEDIATE SWITCH.

Fig. 1.—Left Position, Exchange (Normal). The Exchange calls the Intermediate Office by Generator, ringing the Magneto Bell. To call the Exchange, the Intermediate Office raises the Receiver from the hook, and thereby connects the Receiver and Secondary across the Exchange Lines. The Intermediate Office calls the Extension by Generator through Earth and the Extension A Line. To give a call, the Extension, or Terminal, Office raises the Receiver from the hook, thereby connecting the Receiver and Secondary across the Extension Lines. A current then flows from the Earth on the positive pole of the Exchange Battery, through the short-circuited Generator at the Intermediate Office, the A Extension Line, Extension Set, Extension B Line, 4,000 ohms Relay, 1,000 ohms Bridging Coil, Exchange B Line, and Line Relay to the negative pole. This current is insufficient to operate the Line Relay at the Exchange, but actuates the 4,000 ohms Relay at the Intermediate Office, closing the Local Circuit in which is placed the Trembler Bell.

Fig. 2.—Central Position, Extension. Intermediate Office through to Terminal, both Receivers

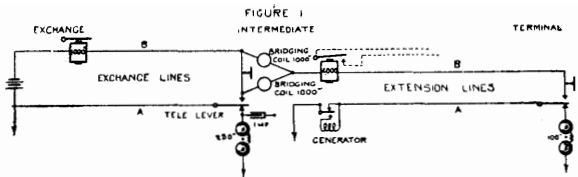


FIGURE 2

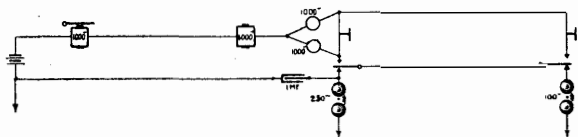


FIGURE 3

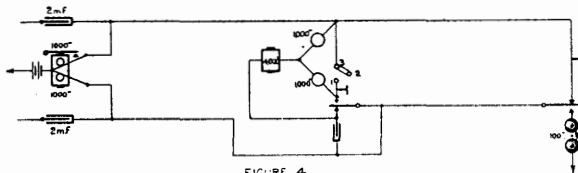


FIGURE 4

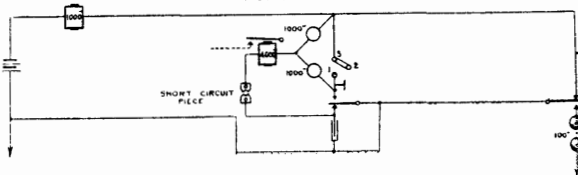


Plate 52—cont.

on hooks. It will be seen that, when these two Stations are speaking, the former is still in a position to be called by the Exchange, the Magneto Bell in series with the Condenser being connected between the Exchange A Line and Earth.

Fig. 3.—Right Position, Through. Exchange through to Terminal Office (Day). The figure shows the clearing arrangements in the cords at the Exchange. When the Terminal Office hangs up the Receiver, the Clearing Indicator is actuated by the current which flows from the earthed Battery through the Magneto Bell, A Lines, and one coil of the Clearing Indicator. On withdrawing the peg, the Exchange conditions represented in Fig. 1 are restored; the 4,000 ohms Relay is actuated, and a Clearing Signal thereby sent to the Intermediate Office.

Fig. 4.—Right Position, Through. Exchange through to Terminal Office (Night). Same as Fig. 3, but in the Night extended condition the Short Circuit Plug, which normally completes the Relay Circuit, should be taken out. The condition of a Terminal Office is then that of an ordinary subscriber.

The Link and Terminals are shown in the "Secrecy" position. For triple communication 1 and 3 should be connected together, as shown on Plate 51.

SECTION 4.

PRIVATE BRANCH EXCHANGES.

Plate 53,

C.B.S. Diagram No. 89.

CONNECTIONS OF SWITCHBOARDS,
 MAGNETO, C.B.S. $\frac{n + n'}{N}$; AND CASES FOR
 CONDENSERS AND BATTERY, 18" OR 24".

APPARATUS SCHEDULE.

Switchboard, Magneto, C.B.S. $\frac{n + n'}{N}$.

*Telephone, Micro, with Hook Suspension
 (Telephone No. 28) (with hook).

Case for Condensers and Battery, n inches.

n Condensers, m.c., 4 m.f.

n' Condensers, m.c., 2 m.f.

2 Cells, 2-block, Agglomerate, Complete.

Factory wiring is shown by full lines.

The wiring from the Battery and Condensers
 in the Case to the tags on the board must be done
 locally.

Standard sizes are $\frac{1 + 4}{5}$, $\frac{2 + 3}{5}$, $\frac{1 + 9}{10}$,
 $\frac{2 + 8}{10}$, $\frac{2 + 13}{15}$, and $\frac{2 + 18}{20}$. A Condenser,

* In certain areas where the use of Micro Telephones
 on Exchange circuits has been discontinued this item is
 replaced by a "Telephone Table, P.B., Transmitter Type,
 Complete" (Telephone No. 4), to be mounted on a "Base-
 board for Table Telephone, P.B.," and attached to the wall
 by means of a "Bracket for Table Telephone." A later
 pattern of Switchboard is fitted with a "Hook Receiver F.
 with Switch Complete" and a fixed "Transmitter, Inset."

BELL TREM 3 TERML
CIRCULAR 25"

SW TUMBLER
3AMP(BRONZED)

INDRS. N.P.C.

INDRS N.P.C

SW SPRING 5PT

KEY RINGING TYPE
H3 OVAL

SW SPRING 5PT

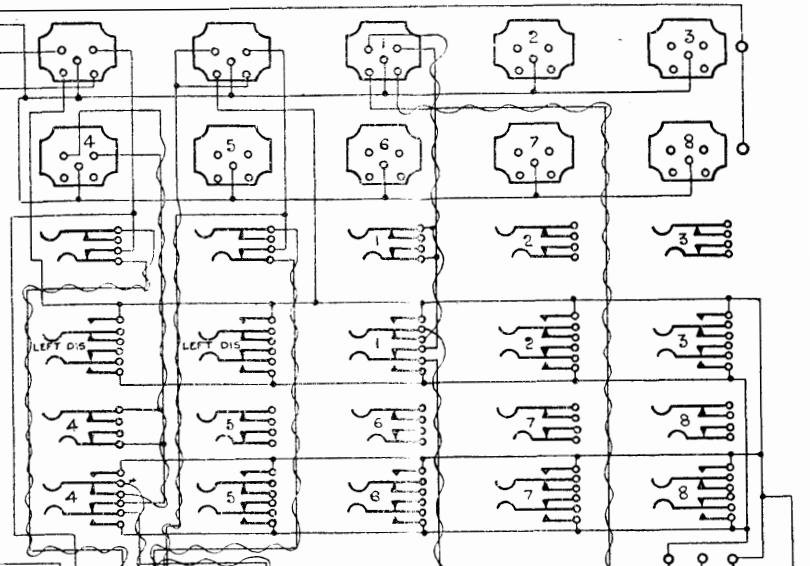
KEYS RINGING TYPE
H3 OVAL

RECF

XMTR.

SW SPRING
5PT WITH BRASS
SOCKET

INDN COIL 150



EXCHANGE

EXTENSIONS

GENR BRACKET UNMTD

TREM. BELL
CON. PLATE

4mf

4mf

2mf

2mf

2mf

2mf

2mf

2mf

2mf

2mf

EXCHANGE

EXTENSIONS

CASE FOR CONDENSERS AND BATTERY.

4 m.f., should be requisitioned for each Exchange line, and a Condenser, 2 m.f., for each Extension. The 18'' Case will accommodate the equipment required up to the $\frac{2+8}{10}$ board, for larger sizes a 24'' Case will be necessary.

Plate 54 shows the circuit arrangements.

A larger type of Switchboard, Magneto, C.B.S., $\left(\frac{n+n'}{50}\right)$, has the apparatus fitted in a "Frame for Local Switch Section"; Drawing E.-in-C. 135, and wired to Diagram C.B.S. 130A. In this case 10 pairs of Pegs and Cords, with a corresponding number of Keys, Speaking and Ringing, Type U9, are fitted. Requisitions should include Case for Condensers, 21'', and two 2-m.f. Condensers (in parallel), which are used for each Exchange line, and one 2-m.f. Condenser for each pair of Pegs and Cords.

Plate 54.

C.B.S. Diagram No. 89.

CIRCUIT ARRANGEMENTS ON SWITCH-BOARDS, MAGNETO, C.B.S., PLATE 53.

Signalling from the Exchange to the Switchboard is in the standard way, *i.e.*, on the A line and Earth. The windings of the Exchange Indicator on the private Switch are connected differentially in series, but across one winding a 4-m.f. Condenser is connected. This arrangement has the effect of upsetting the differentiability of the Indicator to alternating currents, and thereby causing it to be operated by Generator but not by direct current from the clearing battery.

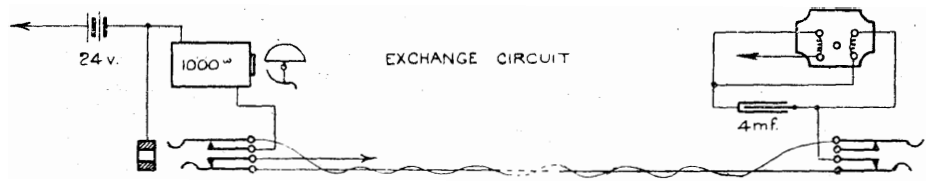
The board calls the Exchange automatically by inserting a peg in the Exchange Switchspring—the other peg of the pair being in the speaking Switchspring—and the clearing signal is given by its withdrawal.

Calling and clearing between the board and the Extensions is by Generator. The Extensions clear automatically to the Exchange by the replacement of the Receiver on the hook, and at the same time “ring off” to the board by turning the handle of the Generator fitted in the set. Any Extension point may be connected to the Exchange for Night service by means of a pair of pegs and cords, and the ordinary Switchsprings.

A “Telephone No. 11,” or its equivalent, should be used at an Extension Office. See Plates 55 and 56.

LOCAL (CBS) EXCHANGE

PRIVATE SWITCH



EXTENSION INSTRUMENT

EXTENSION CIRCUIT

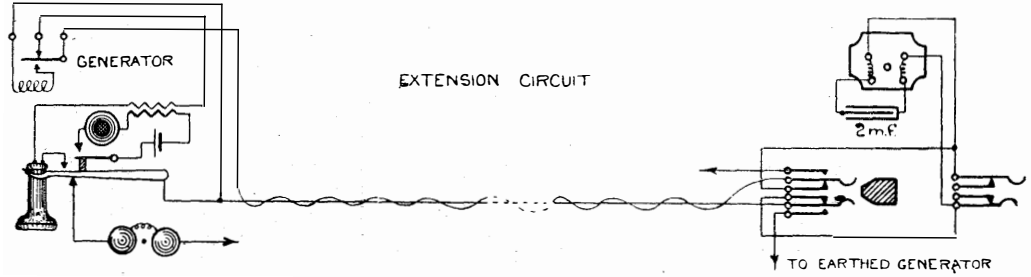


Plate 54.

Plate 55.

C.B.S. Diagram No. 94.

CONNECTIONS OF TELEPHONE SETS
WORKING TO SWITCHBOARDS, MAGNETO,
C.B.S., FIGS. 1 AND 2. *See also* PLATE 56.

FIG. 1.—P.O. TELEPHONE FOR GRANULAR
TRANSMITTER C.

APPARATUS SCHEDULE.

Telephone No. 21. The title includes Cord, Flexible, No. 222; Coil, Induction, $\frac{25}{1}$; Receiver, Bell; and Transmitter, Deckert, or Inset, Ebonite, Complete.

Bell, Magneto, 100 ohms.

Generator, Bracket, 3 terminals.

Battery, Leclanché, Agglomerate, 6-block, 2-cell, No. 1.

Arm, Bell Receiver	} for second Receiver if required only.
Receiver, Bell	
Cord, Flexible, No. 222	

This Figure shows the method of connecting up a P.O. Telephone set for C.B.S. working generally. In the ordinary case, however, the Generator is omitted, the A and B lines being led direct to terminals 4 and 5 respectively of the Telephone.

The combination given above is now available mounted, under the description "Telephone No. 25." The Case provides accommodation for a Speaking Battery of 2 Cells, 2-block, Agglomerate, Complete.

FIGURE 1.

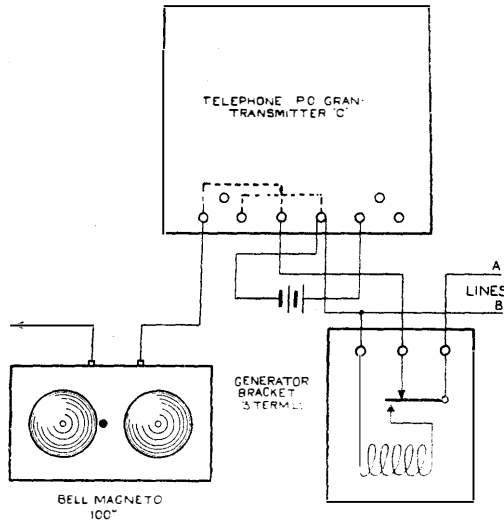
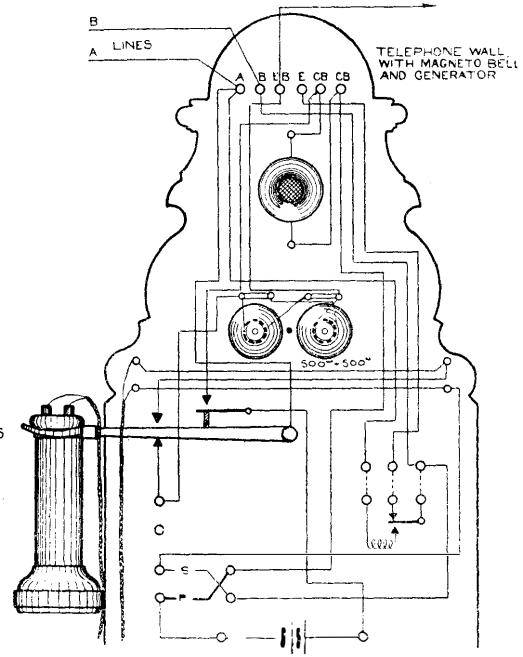


FIGURE 2.



TELE., TABLE, P.B. TRANSR. TYPE.

FIGURE 3.

BELL SET, MAGNETO, P.B.

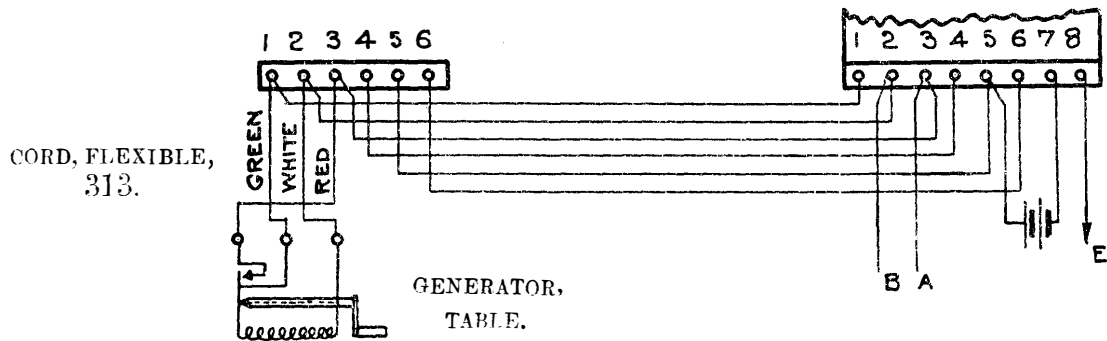


FIG. 2.—FOR GENERAL USE. TELEPHONE, WALL,
WITH MAGNETO BELL AND GENERATOR.

APPARATUS SCHEDULE.

Telephone No. 11. The title includes Cord, Flexible, No. 222; Transmitter, Inset; Coil, Induction, $\frac{25}{1}$; Generator, Bracket, 3 terminals, Unmounted; Bell, Magneto, 500 ohms + 500 ohms, coils in multiple; Receiver, Bell; and 3 fixing screws and washers.

Label 53c.

2 Cells, 2-block, Agglomerate, Complete.

If an Extension Bell is required, the following additional items must be requisitioned:—

Bell, Magneto, 100 ohms.

Switch, Tumbler, 3 ampères (bronzed).

This instrument should also be fitted for working on long Extension lines from Switchboards, Magneto (C.B.). See Plates 26 and 30.

See also Plate 56 for the equivalent Table Set, viz., Telephone No. 16 and Telephone No. 4, with Generator, Table shown in Fig. 3 of this Plate.

Plate 56.

C.B.S. Diagram No. 94, and
 ,, ,, No. 166, Fig. 4.

CONNECTIONS OF TELEPHONE
 SETS FOR WORKING TO SWITCHBOARDS,
 MAGNETO, C.B.S.

TABLE TELEPHONE, WITH GENERATOR, B.

APPARATUS SCHEDULE.

Telephone No. 16. The title includes Cord, Flexible, No. 604; Strip, Flexible Cord Connection, 6-terminal; Bell, Magneto, 1,000 ohms; Generator, 500 ohms; Coil, Induction, $\frac{25}{1}$; and Telephone No. 28.

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

Hook, Receiver, "C" } (if required
 Receiver, Watch, "D," Complete } only).

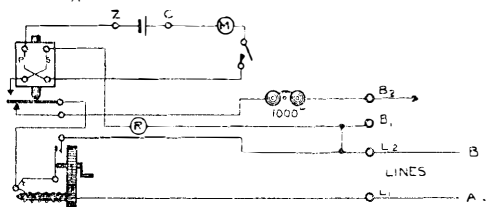
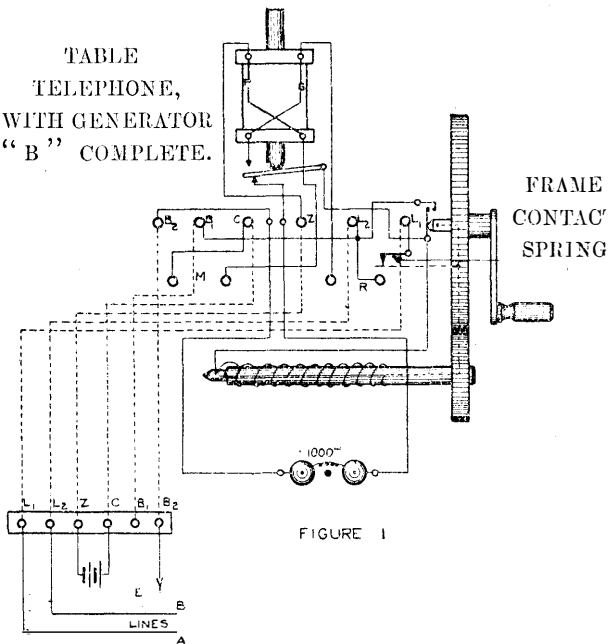
If an Extension Bell is required, a Bell, Magneto, 100 ohms, and Switch, Tumbler, 3 ampères (bronzed), should be requisitioned and connected between Terminal B2 and Earth.

Fig. 1 is a wiring diagram of the instrument, which is similar externally to that shown in Plate S7, but with the connections altered to suit the conditions of the system. Future deliveries of Table Telephones, with Generator (Telephones No. 18), will be wired to this diagram.

Fig. 2.—Explanatory diagram of the above.

This instrument should also be fitted (when a table set is required) for working on long extension lines from Switchboards, Magneto (C.B.). See Plates 27 and 30.

TABLE
TELEPHONE,
WITH GENERATOR
" B " COMPLETE.



SECTION 5.

PARTY LINE AND CALL OFFICE
CIRCUITS.

Plate 57.

T.L. Diagram No. 106.

PROVINCIAL PARTY LINE
CIRCUIT, TWO TO TEN SUBSCRIBERS.
OLD ARRANGEMENT.

APPARATUS SCHEDULE.

For each Station.

Telephone No. 21.
Bell, Magneto, 1,000 ohms.
Condenser, metal-cased, 2 m.f. } See Notes.
Box, Coin Collecting, Complete }
Battery, Leclanché, Agglomerate, 6-block,
2-cell, No. 1.

At the terminal station, the earthed Magneto Bell must be connected to the A line *viâ* terminal 4 of the Telephone, and the Condenser omitted.

A Coin Collecting Box should not be fitted unless in exceptional circumstances. When the box is fitted, the additional internal connection shown dotted in the Telephone should be made by means of a piece of covered wire, one end being fixed to the screw of the Induction Coil and the other clamped below the lower contact of the Press Button.

Y Subscribers 1, 2, 3, 4, and 5 (shown in the diagram above the lines) are called by Generator on the B line and Earth; X Subscribers 1, 2, 3, 4, and 5 (shown in the diagram below the lines) are called by Generator on the A line and Earth. Calling, and clearing to the Exchange are performed automatically by raising the Receiver from, and replacing it on the hook. It is for the

latter purpose that the Condenser is omitted at the terminal station.

See Plate 58 for new arrangement.

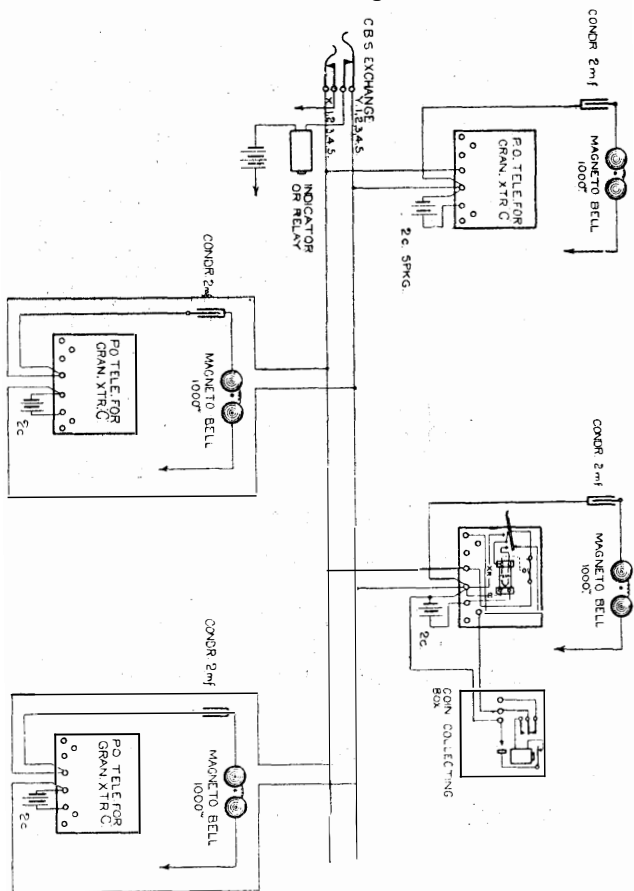


Plate 57.

Plate 58.

C.B.S. Diagram No. 141A.

PROVINCIAL PARTY LINE CIRCUIT,
TWO TO TEN SUBSCRIBERS. ARRANGEMENT
FOR NEW CIRCUITS.

APPARATUS SCHEDULE.

For each Station.

Telephone No. 3.

Condenser, metal-cased, 2 m.f. } Box, Coin Collecting, Complete } 2 Cells, 2-block, Agglomerate, Complete.	} See Notes.
--	--------------

In order to obtain clearing signals at the Exchange at the close of a conversation, the Magneto Bell at the furthest office must be connected with the "A" line and the Condenser omitted; the connection to Earth being made direct to the terminal marked "E."

A Coin Collecting Box should not be fitted unless in exceptional circumstances.

This diagram supersedes the arrangement shown on Plate 57. X Subscribers 1, 2, 3, 4, and 5 (shown above the lines) are called by Generator on the A line and Earth; Y Subscribers 1, 2, 3, 4, and 5 (shown below the lines) are called by Generator on the B line and Earth. Calling and clearing to the Exchange are performed automatically by raising the Receiver from, and replacing it on the hook.

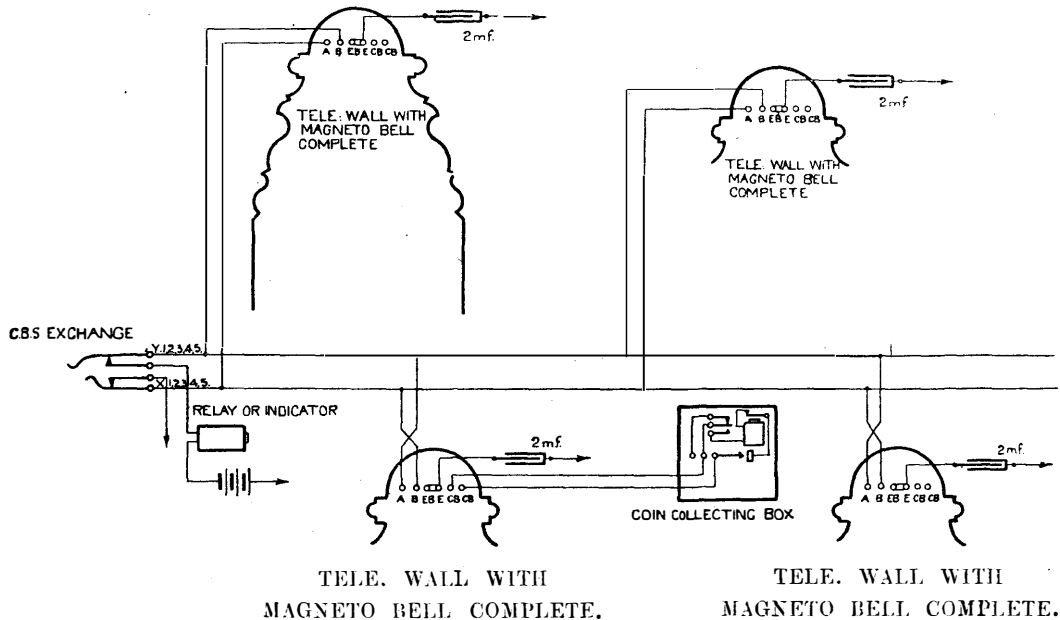


Plate 58.

" 58087.

M

161

Plate 59.

C.B.S. Diagram No. 145.

CALL OFFICE SWITCH ; FIG. 1, CONNECTIONS FOR ONE TELEPHONE ; FIG. 2, CONNECTIONS FOR TWO TELEPHONES.

APPARATUS SCHEDULE.

Fig. 1.—The apparatus to be fitted on Wallboard and wired locally.

Wallboard, 15" × 14".

Bell, Magneto, 100 ohms.

Bell, Trembler, Circular, 25 ohms.

Switch, 6-terminal, 2-position.

Cabinet.

Telephone No. 21.

Receiver, Bell, "D "

Arm, Bell Receiver

Cord, Flexible, No. 222

} for extra Receiver.

Battery, Leclanché, Agglomerate, 6-block, 2-cell, No. 1.

Fig. 2.—Wallboard, Diagram C.B.S., No. 145, Fig. 2.

The description includes the Wallboard, 24" × 16"; wired and fitted with Telephone, No. 21 ; Bell, Magneto, 100 ohms ; Bell, Trembler, Circular, 25 ohms ; and Switch, 6-terminal, 2-position.

Battery, Leclanché, Agglomerate, 6-block, 2-cell, No. 1.

FIGURE 1.

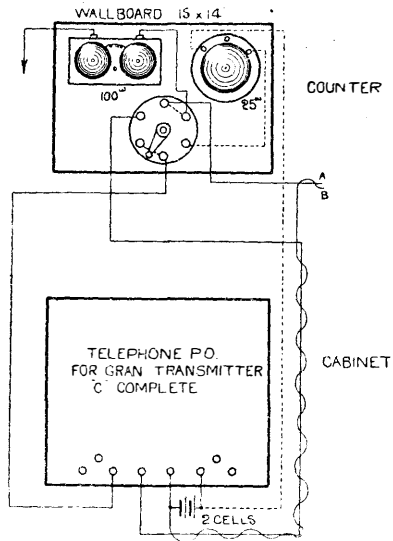
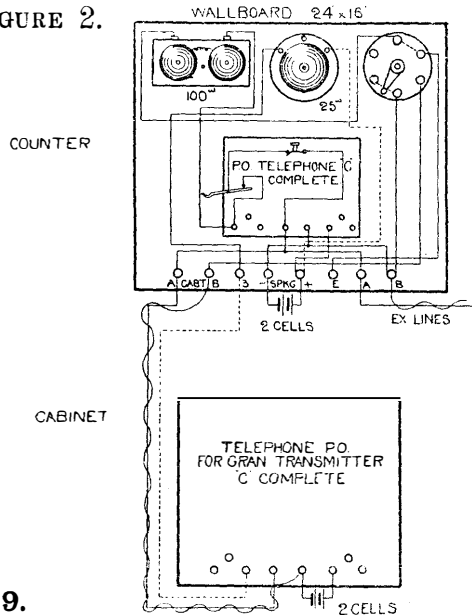


FIGURE 2.



Cabinet.

Telephone No. 21.

Receiver, Bell, "D "

Arm, Bell Receiver

Cord, Flexible, No. 222

} for extra Receiver.

Battery, Leclanché, Agglomerate, 6-block,
2-cell.

The methods of operating in both cases are similar. Calls are received on the Magneto Bell, one terminal of which is earthed. In Fig. 1, to call the Exchange, the Switch is turned to the Cabinet position and the Receiver raised from the hook. In this position the replacement of the Receiver causes the Trembler Bell to ring.

In Fig. 2, where a Telephone is provided at the Counter, the raising of the Receiver cuts off the Magneto Bell and calls the Exchange. By turning the Switch to the Cabinet position, the Cabinet Telephone is connected to the Exchange lines in parallel with the Counter Telephone. The Trembler Bell will ring when the Receiver of the Cabinet Telephone has been replaced on the hook.

In both cases a clearing signal is sent to the Exchange by turning the Switch to "Normal," the A line being thereby earthed through the Magneto Bell.

For connections of Call Office Switch connected with Trunk Switch Section "D," see Plate 72 and full description in Circular E 11.

Plate 60.

C.B.S. Diagram No. 146.

CALL OFFICE SWITCHBOARD
WITH TWO TO FIVE CIRCUITS, INCLUDING
NATIONAL TELEPHONE COMPANY'S.

APPARATUS SCHEDULE.

Wallboard, Diagram C.B.S. 146. The description includes the Wallboard, 24'' × 16'', fitted with the following:—

Case, Switch, and Indicator, $13\frac{1}{4}$ ''.

Indicator, N.P., 100 ohms, $\frac{1}{5}$ (Line Indicators).

Indicator, N.P., 100 ohms, $\frac{2}{5}$ (Cabinet Indicators).

Switchspring, 5-point, $\frac{5}{5}$.

„ 5-point and 8-point, $\frac{1+5}{6}$.

Key, Type H₃ (Oval), 14'', $\frac{5}{5}$.

5 Coils, Bridging, 120 ohms.

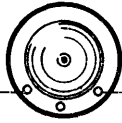
Coil, Induction, $\frac{150}{1}$.

4 Plates, Connection, Trembler Bell.

Bell, Trembler, Circular, 25 ohms.

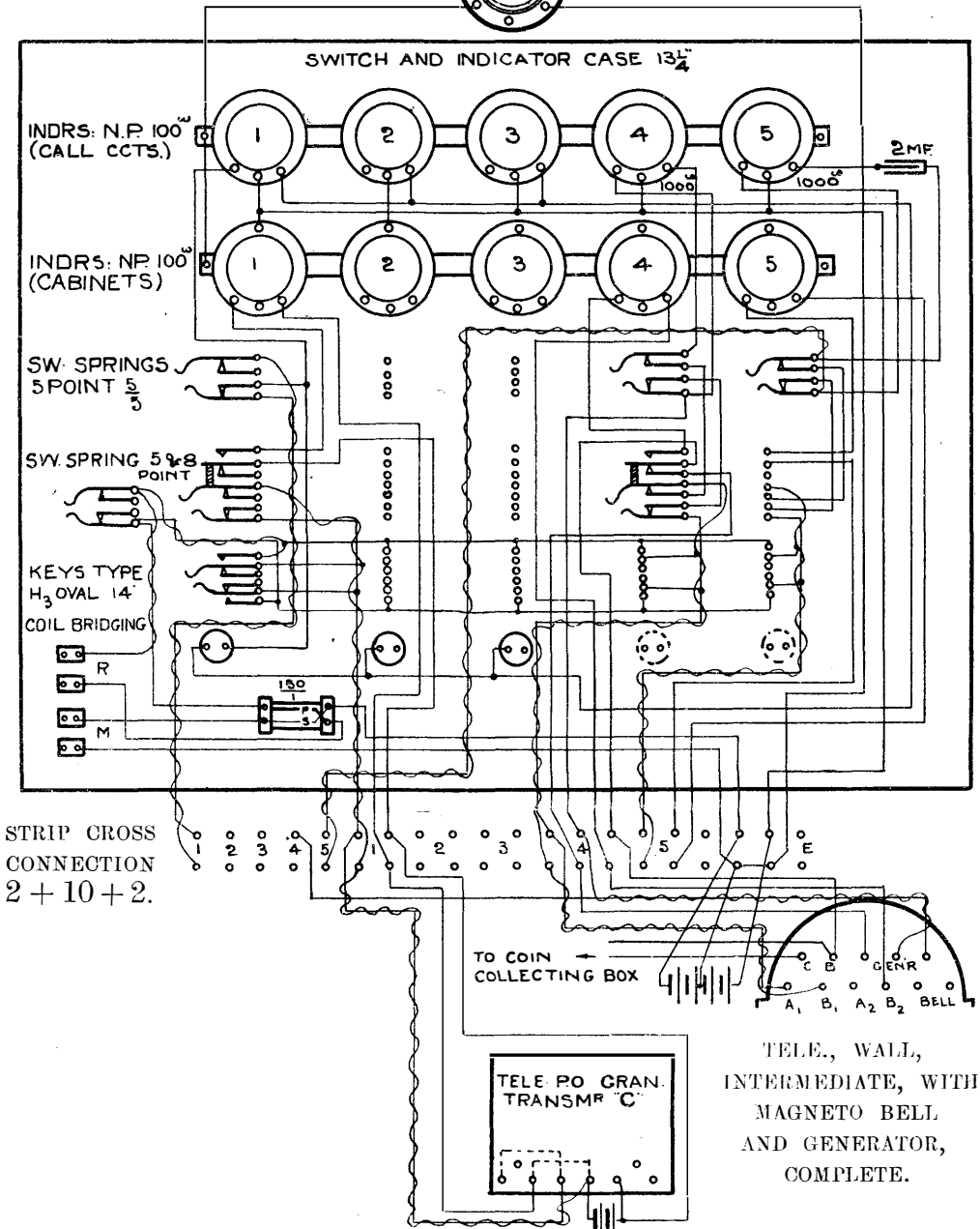
Suspender for Micro Telephone.

Strip, Cross Connection, 2 × 10 × 2.



BELL, TREMBLER, CIRCULAR.

25''



STRIP CROSS CONNECTION 2 + 10 + 2.

TO COIN COLLECTING BOX

TELE PO GRAN. TRANSMR "C"

TELE., WALL, INTERMEDIATE, WITH MAGNETO BELL AND GENERATOR, COMPLETE.

Telephone No. 28 (with hook).
n pairs Pegs 201, Black or Red, with Cord 16".
Battery, Leclanché, Agglomerate, 6-block,
4-cell.

The Wallboard as issued from Store will be wired for 5 P.O., C.B.S. Exchange circuits similar to No. 1. Arrangements for circuits to the Company's Magneto and C.B. Exchanges are shown in positions Nos. 4 and 5 respectively, and will be altered locally where required. The additional fittings for the alterations are as follows :—

- | | |
|---|------------------------------|
| 1 Indicator, N.P., 1,000 ohms, for each Magneto Exchange. | |
| 1 Indicator, N.P., 1,000ohms
and | } for each C.B.
Exchange. |
| 1 Condenser, m.c., 2 m.f. | |

*P.O. Cabinets (including N.T. Co.'s
C.B. Cabinets if any).*

Telephone No. 21.
Arm, Bell Receiver
Receiver, Bell, " D " } Second Receiver.
Cord, Flexible, No 222 }
Battery, Leclanché, Agglomerate, 6-block,
2-cell.

N.T. Co.'s Magneto Exchange Cabinet.

Telephone No.13.
Receiver, Watch, " D," Complete.
2 Cells, 2-block, Agglomerate, Complete.

See Plate 92 for details of Telephone set.

For full details of the fitting and working of this Switchboard, see Circular E 11.

SECTION 6.

EXCHANGE CONNECTIONS.

Plate 61.

C.B.S. Diagram No. 150A.

SECTION, LOCAL SWITCH (PROVINCIAL),
50 AND 80 LINE, CIRCUIT CONNECTIONS,
WIRING DIAGRAM C.B.S. 132B.

Fig. 1.—Subscribers' Circuit. When the Receiver is raised, the battery circuit is completed from Earth on the inner A spring, A line, subscribers' apparatus, B line, and calling Indicator. The clearing circuit is completed through the switchspring socket and third point of the peg. See Fig. 3.

Fig. 2.—Transfer Circuit. The Local Section is called automatically by the insertion of a peg in the Transfer Switchspring on the Trunk Section, both Indicators being thereby joined in series with the battery. The Local Section operator replies by inserting one of the Special Answering Pegs of the two pairs provided for the purpose in the corresponding Switchspring on the Local Section. This causes both Indicators to disappear. The Indicator at the Trunk Section will, however, reappear when the corresponding Special Calling Peg is inserted in the required subscriber's Switchspring, and will continue to show, in the intervals between the rings, until the subscriber raises his Receiver in reply, see Fig. 3. The Transfer Circuits have to be fitted locally.

Fig. 3.—Pegs and Cords Circuit. The wiring of the ordinary cord circuits is shown in full lines. In the Special Cord Circuits (Nos. 1 and 10, the thimbles of the pegs of which are distinguished by a white ring) for use on Transfer circuits, the lead "C" is connected to the local contact of Indicator "I" (as shown by the dotted line) instead of to the middle point of the left Indicator.

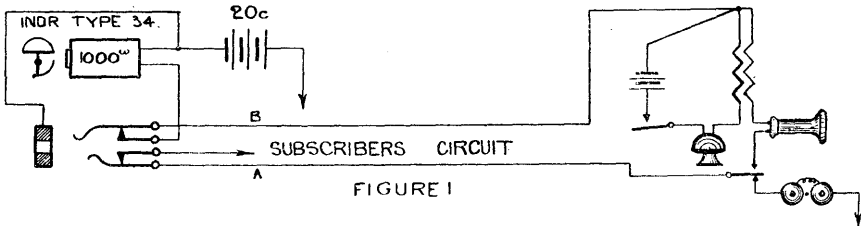


FIGURE 1

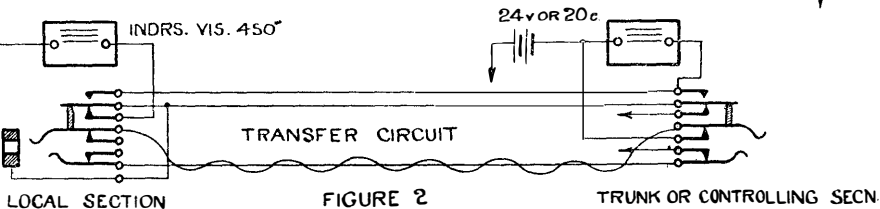
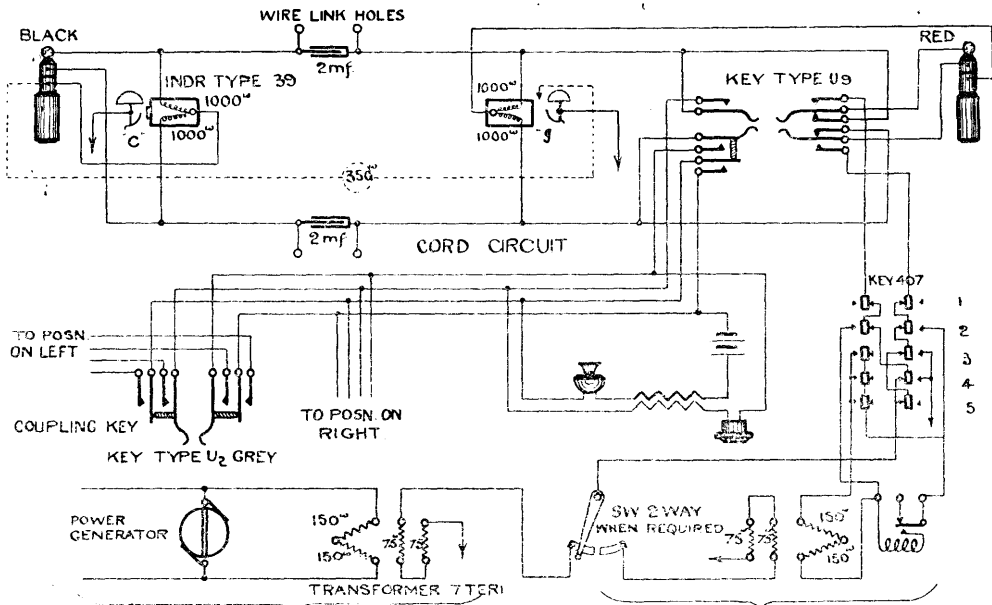


FIGURE 2



COMMON TO EXCHANGE.

1 SET PER SECTION.

FIGURE 3.

Subscribers clear automatically by earthing the A line through the Magneto Bell, the circuit being completed through the A coils of the Indicators, Type 39, the third point of the pegs, and switchspring sockets. When a subscriber is connected to a Trunk, by way of the Transfer circuit outlined in Fig. 2, the single clearing signal on the right Indicator is repeated by means of the armature contact to the visual Indicator on the Trunk Section. When the Trunk operator removes the peg from the Transfer Switchspring, the battery is applied to the A and B lines, and the left Indicator is then energised. A double-clearing signal is thus given as on the ordinary pair of pegs and cords.

The Coupling Key, Type U 2 Grey, is wired so as to enable one operator to attend to more than one position in the less busy portions of the day.

The wiring of the Party Line Ringing Key, Type 407, is arranged to provide for the following methods of Generator ringing:--

Key 1. Spare.

Key 2 depressed. Alternations on loop (from Bracket Generator).

Key 3 depressed. Alternations on A line and Earth. B line earthed. For ordinary and X Party Line subscribers.

Key 4 depressed. Alternations on B line and Earth. A line earthed. Y Party Line subscribers.

Key 5 depressed. Alternations on A line and Earth. B line disconnected.

For Party Line Subscribers' connections, see Plates 57 and 58.

Where a Power Generator is not fitted, the Switch, 2-way, is not required, the lead from the Key being connected direct to the unearthed primary winding of the Transformer.

Plate 62.

C.B.S. Diagram No. 60.
E.C. Diagram No. 451.

CONNECTIONS OF SUBSCRIBER'S CIRCUITS ON 200-LINE BOARDS.

Fig. 1.—Connections of Subscriber's Circuit on Local Switch Sections, 200 Line, C.B.S. for Trunk Exchanges.

Normally, the Subscriber's A line is earthed through a 100-ohms Magneto Bell. When the Receiver is raised from the hook, a loop is made across the lines by way of the Receiver and Secondary of the Induction Coil. The connection between the A and B lines closes the battery circuit through the coils of the Relay, Single Vertical Coil, in the local circuit of which is placed in series the Calling Lamp and 30-ohms coil of the Pilot Relay. The latter is actuated, and the lower contact is closed, joining up in parallel the Pilot Lamp and the 250-ohms coil of the Pilot Relay (Type 37) on the battery. The closing of the upper contact of the latter short circuits the 30-ohms coil by the 38-ohm coil, and the Calling Lamp receives practically the full pressure of the battery and lights up if it has not already done so. Relay E₁, 1,000 ohms + 1,000 ohms, is substituted for the Pilot Lamp at night time by the movement of the Switch, a Trembler Bell being fitted in the local circuit to give an audible signal.

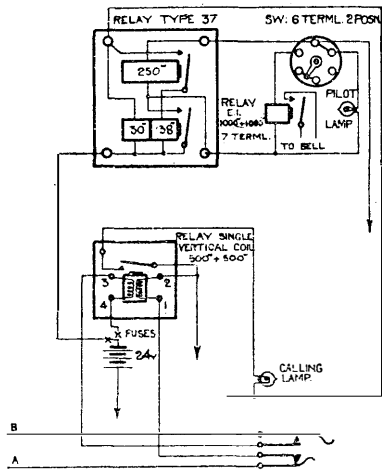


FIGURE 1.

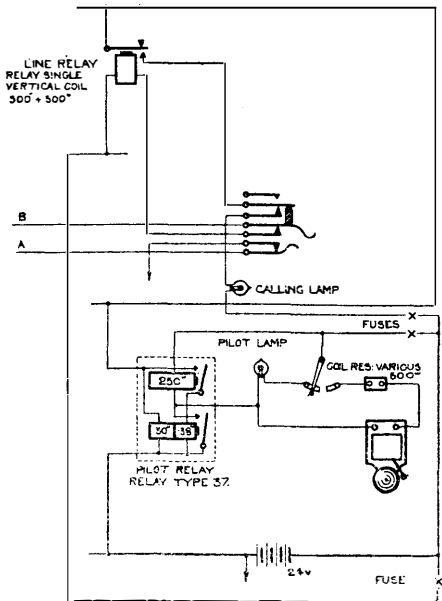


FIGURE 2.

Plate 62—*cont*

The insertion of a peg in the Line Switchspring breaks the circuit through the Relay, Single Vertical Coil, and the lamps are extinguished.

Fig. 2.—Connections of Subscriber's Circuit on Local Switch Sections, 200 Line C.B.S. (Permanent Current Converted), London.

The arrangement is similar to that described under Fig. 1, the only differences being the use of 8-point Switchsprings instead of 5-point, and the omission of the Night Relay—the Bell being connected direct to the Battery with a 500-ohms Resistance Block in series. The Calling Lamp circuit is completed through the medium of the upper springs of the 8-point Switchspring; when a peg is inserted in the Switchspring, the circuits of both the Calling Lamp and the Line Relay are therefore broken and the lamp extinguished.

The clearing arrangements on the Cord Circuits of these boards are on similar lines to those described on page 169 with, however, differentially-wound Relays in place of the Indicators, Type 39, and fitted with clearing lamps in their local circuits.

PART III.—TRUNK CIRCUITS.

SECTION 1.

TRUNK CIRCUITS, TERMINAL
AND INTERMEDIATE.

Plate 63.

T.L. Diagram No. 1A.

TRUNK EXCHANGE SYSTEM.

EXPLANATORY DIAGRAM OF TRUNK
CIRCUITS.

Fig. 1.—Minor Exchanges: $\frac{5 + n}{45}$ Switch Sections and $\frac{3 + n}{23}$ Switchboards, Wall. See Plate 66 for Cord Circuits.

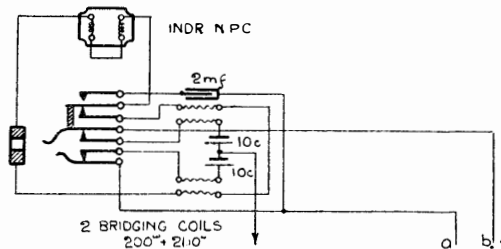
Fig. 2.—Switch Sections "C" (where Junction circuits not multiplied), Switch Sections "D," and Switch Sections "F." Switch Section "D" Cord Circuit, Plate 69; "F" Cord Circuit, Plate 71.

Fig. 3.—Trunk and Junction Switchboards, Switch Sections "C" modified for lamp signals, and Switch Sections "E." The diagram shows the arrangement for concentration working of the Trunks, also the Night Relay and Bell which indicate night calls. With the plugs in the Switchsprings as shown, the Trunks are being worked from the Ordinary Sections. Wiring Diagram, Switch Section "E," T.L. No. 241A.

Fig. 4.—Skeleton diagram of a Trunk Circuit; terminated on the left at a Minor Exchange as in Fig. 1, and on the right as in Fig. 3.

Calling is effected at both ends by Generator. At the Minor Exchange, the alternating currents operate the Indicator N.P.C. through the transformer action of the two Bridging Coils. At the larger Exchange, which is fitted for lamp

FIG. 1.



SW SPRING INDR. TYPE H, FIG 2

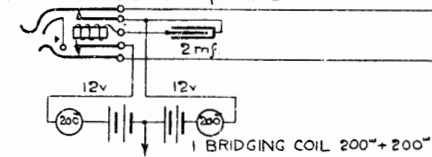


FIG. 4.

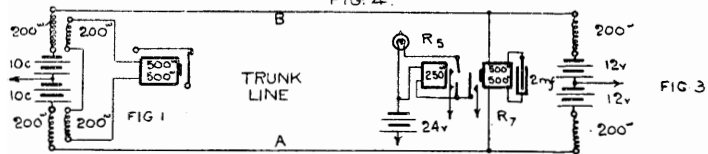
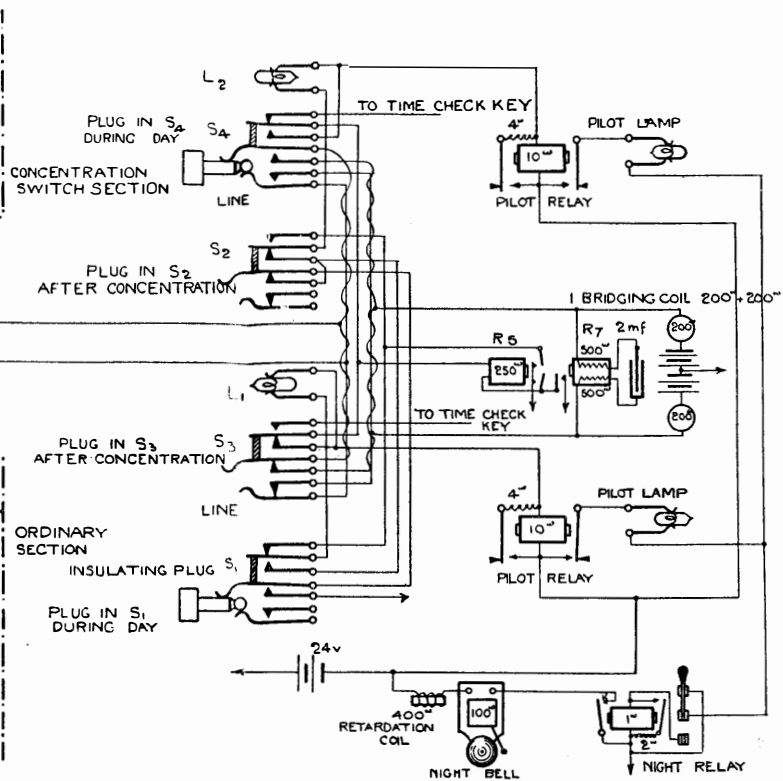


FIG. 3.



signalling, the following operation takes place. The alternating currents from the Generator at the calling station actuate Relay R 7, and its armature comes in contact with the lower stop. The latter point is connected to Earth, as are also the two lower contact springs of Relay R 5; the armature of R 7 and one spring of the armature of R 5 are teed together and connected to the coils of R 5. When the armature of R 7 comes in contact with the lower stop, a current flows from the positive pole of the 24-volt battery through these contacts, the Coils of R 5 and the Pilot Relay (see Fig. 3) to the negative pole. The armature of R 5 is attracted, bringing in the signalling lamp in parallel with R 5 which is now locked, both being in series with the low resistance Pilot Relay. The Pilot Lamp circuit is from Earth on the Night Relay (Fig. 3), 2-way Switch, Lamp, and Pilot Relay contacts to the negative pole. In the "Night" position of the 2-way Switch, the Night Relay is thrown in series with the Pilot Lamp; in the local circuit of the Night Relay are placed a Tumbler Bell and a Retardation Coil, 400 ohms. The insertion of a peg in the Switchspring extinguishes both lamps by breaking the lower and long spring contacts; by the same means, the Time Check Key is brought into circuit.

It will be seen from Fig. 3, that by removing the plug from S 1 and inserting it in S 3 the lamps at the Ordinary and Concentration Sections become incandescent (through the inner spring of S 1, which is connected to Earth, coming in contact with the B spring). The removal of the plug from S 4 and its insertion in S 2 extinguishes the lamps; the Trunk line is then terminated on the Concentration Section.

Plate 64.

T.L. Diagram No. 151A.

TRUNK SYSTEM, MINOR EXCHANGES; EXPLANATORY DIAGRAM OF TRUNK CIRCUIT WITH AN INTERMEDIATE OFFICE.

The connections at the Terminal Offices must only be considered as theoretical; the apparatus used may be any of those shown in Plate 63.

Normally the Terminal Offices are straight through to each other; generator ringing between the two pass round the loop at the Intermediate Office differentially through the coils of Relay E 1, 100 ohms + 100 ohms, each coil of which is shunted by 200 ohms non-inductive resistance.

Either Terminal Office calls the Intermediate by applying an earthed 24-volt battery to the A line, leaving the B line disconnected; the resulting current flows through one coil of Relay E 1, 100 ohms + 100 ohms, actuating its armature and thereby closing the circuit of the 20-cell battery through the coil of Indicator, Type 34, 1,000 ohms. Two rings should be given from the Up Station, and three rings from the Down.

When a peg is inserted in either of the Switchsprings, 10-point, at the Intermediate Office and conversation taking place between either of the Terminal Offices and the Intermediate, the 10 cell + 10 cell centre-earthed battery is automatically connected up to the disengaged section

TERMINAL.

INTERMEDIATE OFFICE.

TERMINAL.

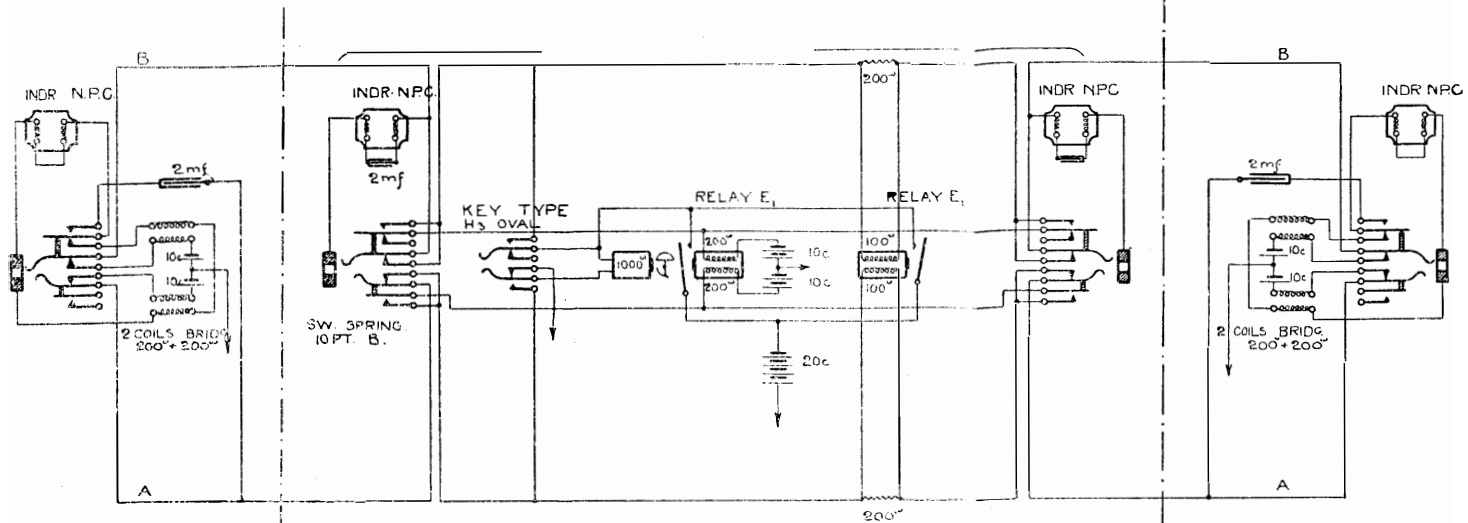


Plate 64.

of the line through the coils of Relay E 1, 200 ohms + 200 ohms, thus forming a complete Trunk Circuit of that section.

To ascertain whether the Trunk Circuit is engaged, the Key, Type H 3, at the Intermediate Office, should be pressed, thereby connecting the Indicator, Type 34, across the lines. If the line be disengaged, the "eyeball" of the Indicator will show.

Intermediate connections on Switch Sections "D" and "F" are shown on Plate 65.

Plate 65.

T.L. Diagram No. 61A.

TRUNK LINE SWITCH SECTIONS "D" AND "F"; EXPLANATORY DIAGRAM OF AN INTERMEDIATE TRUNK CIRCUIT.

The Terminal Offices are called by Generator round the loop. Relay R 1 is differential to currents circulating round the loop; each of its coils is shunted by 200 ohms non-inductive resistance to minimise the risk of false calls on leaky lines.

Either Terminal Office calls the Intermediate by applying an earthed 24-volt battery to the A line, and leaving the B line disconnected, the resulting current flows through one coil of Relay R 1 and actuates its armature. The latter closes the circuits of the Visual Indicators V_2 and V_3 . Two rings should be given from the Up Station and three from the Down.

To ascertain whether the Trunk Circuit is engaged, a spare peg should be inserted in the Switchspring S 1. If the Telephone Exchange Galvanometer in the cords shows a deflection, it indicates that the line is disengaged.

When a peg is inserted in the Switchspring S 2 or S 3, Relay R 3 or R 4 is actuated and the 10 cell + 10 cell centre-earthed battery is applied to the disengaged section of the line through Relay R 2, thus forming a complete Trunk circuit of that section.

TERMINAL.

INTERMEDIATE.

TERMINAL.

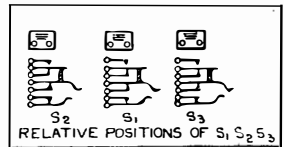
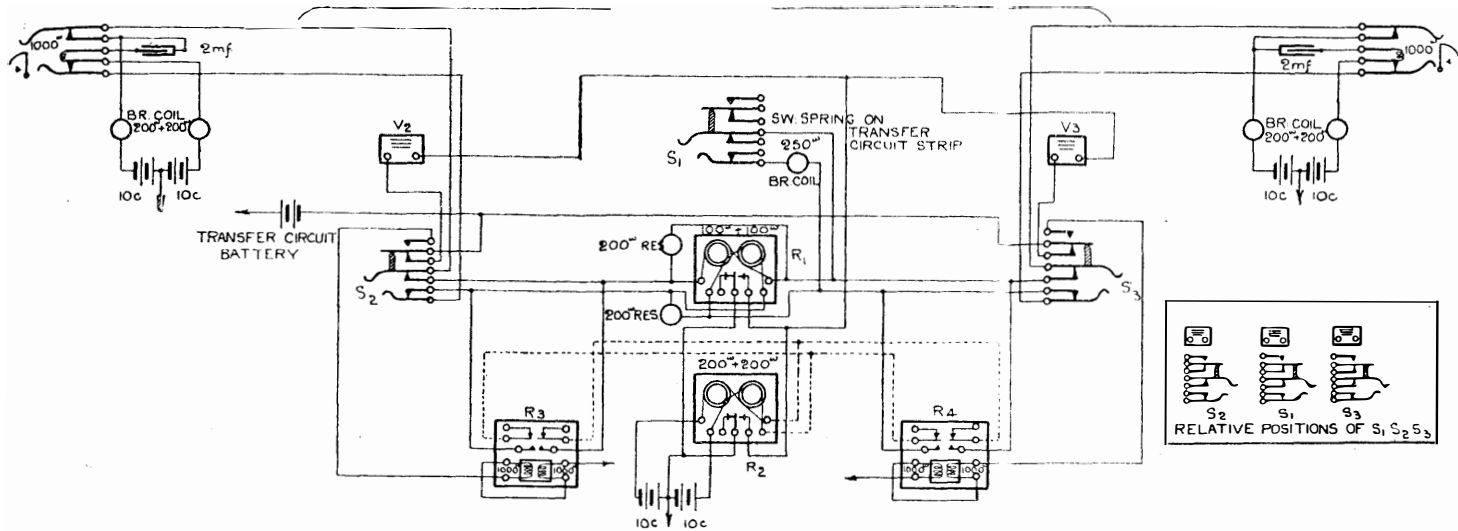


Plate 65.

The small figure at the right bottom corner shows the relative positions of Switchsprings S 1, S 2, and S 3, with the corresponding Visual Indicators, on the Transfer Strips. If one Intermediate circuit is connected to a section, Transfer Switchsprings 8, 9, and 10 will be utilised; if two circuits, Switchsprings 5, 6, 7, 8, 9, and 10.

Plate 66.

T.L. Diagram No. 150A.

TRUNK SYSTEM, MINOR EXCHANGES ;
 EXPLANATORY DIAGRAM OF CORD
 CIRCUITS ON $\frac{5 + 10}{45}$ SWITCH SECTIONS
 AND $\frac{3 + 10}{23}$ SWITCHBOARDS, WALL.

WIRING DIAGRAMS, $\frac{5 + 10}{45}$ T.L. No. 254A ; $\frac{3 + 10}{23}$
 T.L. 253A. APPARATUS SCHEDULES, CIRCULAR E. 11.

The upper portion of the diagram represents in skeleton form the circuit of the ordinary Cords, *i.e.*, those to be used in connecting subscribers' lines together. When a subscriber hangs up his Receiver, he connects his A line to Earth ; the clearing signal is received on the corresponding Indicator, Type 39, through the A Coil, the third point of the peg, and the socket of the Switch-spring, which is connected to the negative pole of the battery.

The lower portion of the diagram shows the circuit of the Cords for connecting Trunk to Trunk. A clearing signal is sent automatically round the loop and through both Coils of the Indicator, Type 39, by the withdrawal of the peg at the distant station.

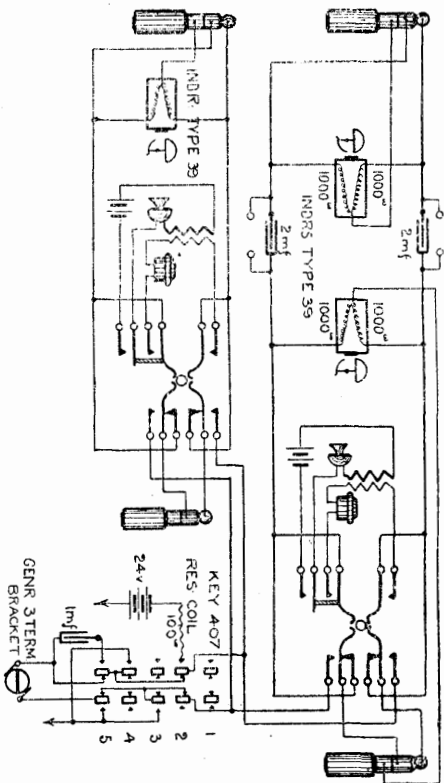
Ringing Circuits, Key, Type 407 :—

No. 1 (T.K. X) depressed. Generator on loop. To call on ordinary Trunk.

No. 2 (T.K. Int.) depressed. 24 volts on A line and Earth. To call Intermediate Trunk Station, *see* Plates 64 and 65.

- No. 3 (Sub X.P.) depressed. Generator on A line and Earth. To call Ordinary and Party Line X subscribers, see Plates 57 and 58.
- No. 4 (Y.P.) depressed. Generator on B line and Earth. To call Party Line Y subscribers, see Plates 57 and 58.
- No. 5 (Ter.) depressed. Generator on A line through 1-m.f. Condenser and Earth.

ORDINARY CORD CIRCUIT.
WIRE LINK HOLES.



CORD CIRCUIT FOR CONNECTING TRUNK TO TRUNK.

Plate 67.

T.L. Diagram No. 278A.

MINOR EXCHANGE CONVERSION ; DIAGRAM OF CIRCUITS ON WALLBOARDS, HINGED, 35" × 28", CONVERTED TO C.B.S. WORKING. DIAGRAM E.C. 617 MODIFIED.

Fig. 1.—Connections of Subscribers' Lines. When a subscriber raises his Receiver the calling signal is automatically indicated on the corresponding Indicator, Type 34. A clearing signal is received, when the Receiver is replaced, on the Relay J, Non-polarised, 500 ohms + 500 ohms, connected across the Cords. Both currents are supplied by the Main Signalling Battery, which consists of the two left-hand sets of 10 cells shown in the diagram. Subscribers are called by Generator on the A line and Earth. *See* Plate 68 for Cord Circuits.

Fig. 2.—Connections of Trunk Circuit. Ordinary Trunks are called by pressing the Key, Type H 3, Oval, marked "D," and turning the generator handle ; Intermediate Trunk Offices by pressing the Key marked "C." In the latter case, the negative pole of the 10-cell P.C. Battery is connected to the A line, and the B line disconnected. *See* Plates 64 and 65, Intermediate Trunk Circuit connections.

Fig. 3.—Connections of Junction Circuit to N.T. Company's Exchange. Calling is effected by Generator which is connected to the lines by pressing the Key H 3, Oval, marked "B." An automatic clearing signal is sent from the 20-cell battery through the Bridging Coil to the lines in parallel by withdrawing the peg from the Switch-spring.

For the position of the apparatus on the Board and Schedule, *see* T.L. Diagram No. 279A.

Plate 68.

T.L. Diagram No. 278A.

**MINOR EXCHANGE CONVERSION ; DIAGRAM
OF CORD CIRCUITS ON WALLBOARDS,
HINGED, 35" × 28", CONVERTED TO
C.B.S. WORKING. DIAGRAM E.C. 617
MODIFIED.**

The Indicator, N.P., 1,000 ohms, "e," and Relays, I, Non-polarised, 500 + 500 ohms, "f" and "g," are associated with the Trunk Cords, the Indicator "e" being fitted in the local circuit of Relay "f." The two A cords and the two B cords of the pair of pegs are connected to each other through the two Condensers, m.c., 2 m.f. Relays "f" and "g" are connected between the A and B cords of the Black and Red peg respectively.

A Relay, I, Non-polarised, 500 + 500 ohms, "h," is tied across each pair of ordinary cords for subscribers' clearing signals. The two A cords and the two B cords of these pegs are connected to each other through the Ringing Key associated with the pair.

In conjunction with the Ringing Keys belonging to the Pegs and Cords, the following facilities for calling are provided by the wiring of the Plug Ringing Keys :—

Y.P. pressed. Generator on B line and Earth.

To call Party Line Y subscribers. See Plates 57 and 58.

TER. pressed. Generator on A line and Earth.

To call Party Line X and Ordinary subscribers.

TK.X. pressed. Generator on the loop. To call on Trunk.

For the position of the apparatus on the Board and Schedule, see T.L. Diagram No. 279A.

RELAY I.N.P. 1000^w. RELAY I.N.P. 500^w + 500^w.

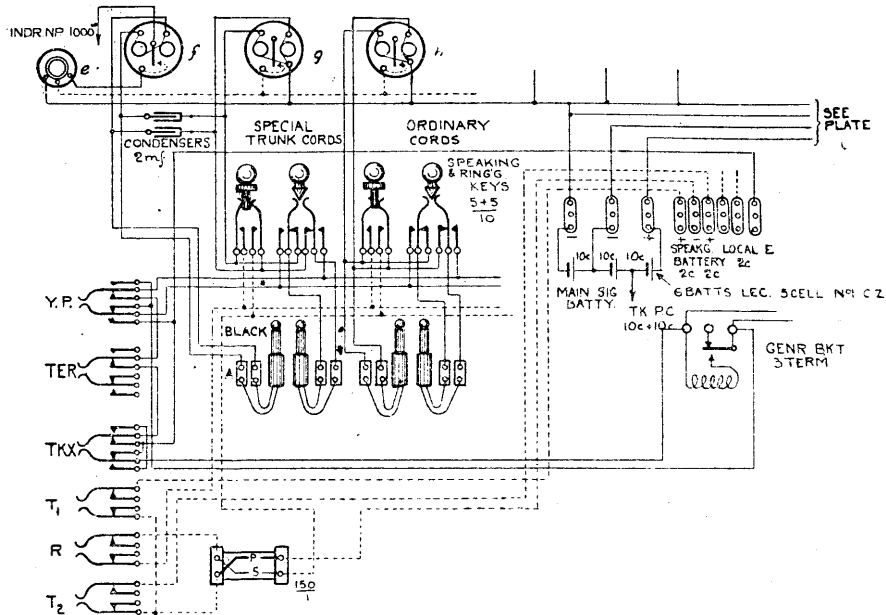


Plate 68.

Plate 69.

T.L. Diagram No. 60.

TRUNK LINE SWITCH SECTION "D";
EXPLANATORY DIAGRAM OF CORD
CIRCUIT.

WIRING DIAGRAM, DRAWING No. 1367; APPARATUS
SCHEDULE, CIRCULAR E 11.

Clearing signals are received on the Self-Restoring Indicator and Telephone Exchange Galvanometer, which are permanently teed in series across the cords. See Plate 63 for battery connections at Trunk ends.

Trunk Key U 14 (Black) provides for generator ringing on the Black Peg, and in the speaking position connects the battery to the restoring coil of the Self-Restoring Indicator, as well as the operator's set across the cords.

Junction Key U 7 (Red) provides for generator ringing on the Red Peg, and in conjunction with the Speaking Transfer and Battery Ringing Key U 11 provides for speaking to the line connected to the Red Peg, at the same time breaking the connection to the Black Peg. When the Keys U 14 and 7 are both in the speaking position the operator's set is connected to the Black Peg only, the Junction side being then disconnected.

Speaking, Transfer, and Battery Ringing Key, U 11 (Black, Switching Key on Wiring Diagram), in addition to the foregoing, provides for battery ringing in conjunction with the Black Peg on the A line and Earth, in order to call an Intermediate Trunk Station (see Plate 65).

Coupling Key U 2 is fitted for concentration purposes.

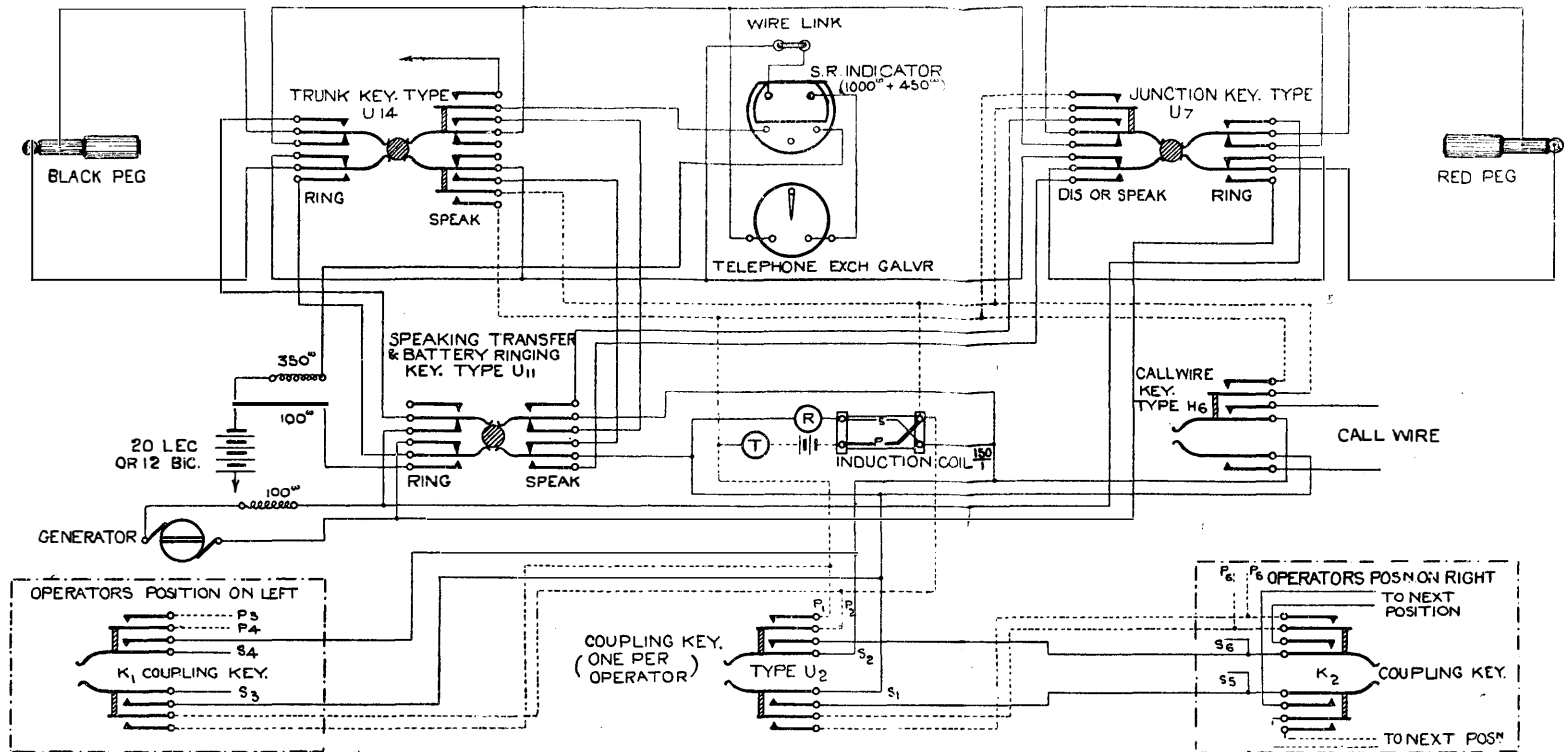


Plate 69.

Plate 70.

T.L. Diagram No. 251.

SWITCH SECTIONS "D"; NATIONAL TELEPHONE JUNCTION AND SERVICE CIRCUITS WHEN CALLING INDICATORS ARE REQUIRED.

The Switchsprings, 5-point, Strip No. 11, shown on E.-in-C.'s Drawing 1,367 (wiring diagram of Section Trunk Switch "D") will be replaced by Switchspring Indicators H 2, as in the diagram, when calling indicators are required. N refers to the number of working circuits.

An automatic clearing signal is sent to the Company's Exchange by withdrawing the peg from the Switchspring, the current passing through the coils of the Switchspring Indicator differentially and along both lines in parallel. Calling is effected by Generator.

SW. SPRING INDICATORS 500' + 500'. TYPE H 2 $\frac{N}{5}$ OR $\frac{N}{10}$.

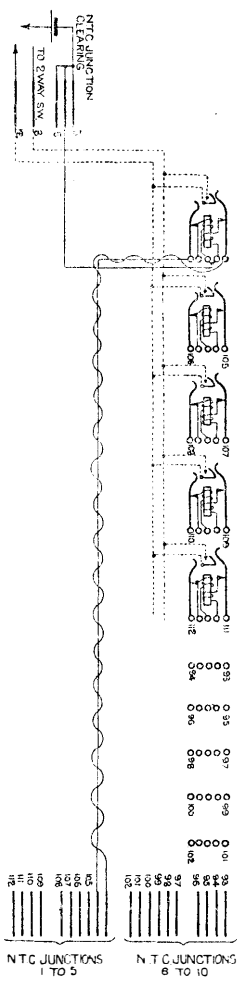


Plate 70.

Plate 71.

T.L. Diagram No. 248A.

TRUNK LINE SWITCH SECTION "F" ; EXPLANATORY DIAGRAM OF CORD CIRCUIT.

WIRING DIAGRAM T.L. 259A ; APPARATUS SCHEDULE,
CIRCULAR E 11.

This Section is practically a "D" Section with the Cord Circuits modified so that an operator may use the pegs for connecting Trunk Circuits terminating on the "F" Section to Subscribers' Circuits on an adjacent Local Section. See Plate 61. For this purpose a Relay H 1, 1,000 + 1,000 ohms, is connected to the third point of the Red Peg, so that when the Peg is inserted in a Switchspring on the Local Section, the Relay H 1 is operated and its springs close on the inner contacts. These contacts are connected to the Coils of an Indicator, Type 39, 1,000 + 1,000 ohms, to the middle point of which is joined the negative pole of the 20-cell battery. The Indicator, Type 39, is thus connected across the cords; when the local subscriber hangs up his receiver, thereby connecting his A line to Earth, a clearing signal is received on the Indicator.

The functions of the various keys are explained on page 186, Switch Section "D."

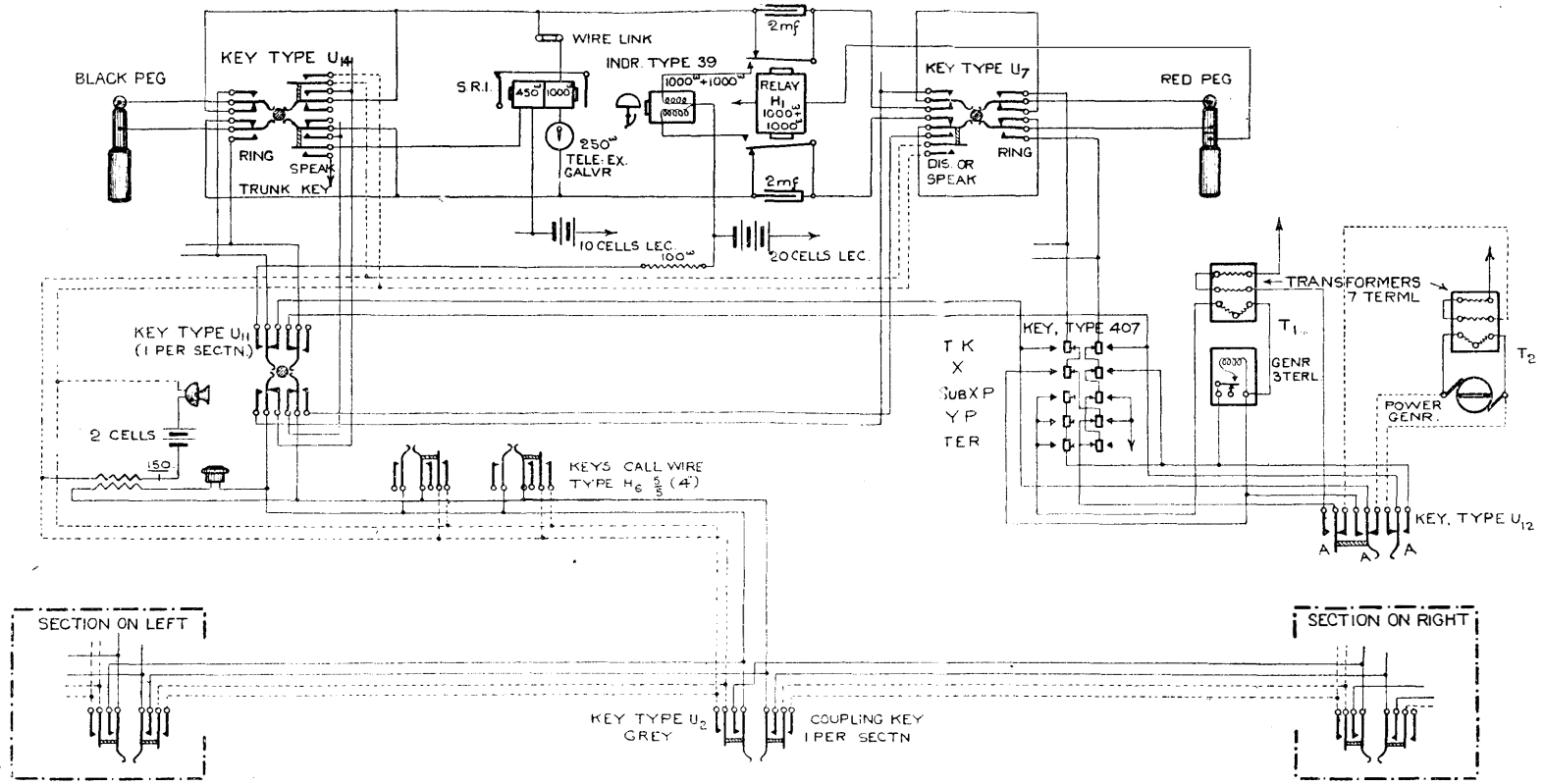


Plate 71.

Additional ringing facilities are provided by the Key, Type 407, as follows:—

T.K. depressed. Generator on Loop. Trunk ringing.

X depressed. Hand Generator on loop.

Sub X.P. depressed. Alterations on A line, B line to Earth. To call X Party Line and ordinary subscribers, *see* Plates 57 and 58.

Y.P. depressed. Alterations on B line, A line to Earth. To call Y Party Line subscribers, *see* Plates 57 and 58.

TER. depressed. Alterations on A line, B line disconnected.

When a Power Generator is not fitted, the Key U 12 will not be required; the connections made by the contacts at A should then be made direct.

The Power Generator and Transformer T 2 are common to the Exchange; Generator, Bracket, 3 terminals, and Transformer T 1, one of each per Section. Key, Type U 12 (1 per Section), to be mounted on Intermediate Panel.

The Condensers, 2 m.f., in the Cords are fitted in "Case with Condensers, Section, Trunk Switch, 2 m.f., 12," E.-in-C.'s Drawing, No. 1475.

Plate 71A.

T.L. Diagram No. 421.

**LAMP SIGNALLING TRUNK LINE SWITCH
SECTION. EXPLANATORY DIAGRAM OF
CORD CIRCUIT.**

The functions of the various keys are similar to those described on page 186.

Relay R is the equivalent of the Telephone Exchange Galvanometer on the older sections, and is operated by battery from the distant Trunk Exchange when the peg is withdrawn from the Switchspring. In its local circuit is connected Lamp L_1 , the earth connection for which is made through Relay R_1 . In the local circuit of R_1 Lamp L_2 is joined up so as to be lighted when either relay R or relay R_3 is operated. Relay R_1 remains locked until the operator short-circuits it by turning the Key K_1 into the speaking position.

Relay R_2 is not operated when Trunk is connected to Trunk, and in these circumstances Relays R_3 and R_4 and Lamp L_1 are not in circuit, and the condensers are short-circuited. When the red peg is inserted in a Junction Switchspring R_2 is energised, and its armatures connect R_3 in series across the cords with R_4 joined between the centre point of the coils of the latter and earth. R_3 is for the purpose of indicating a magneto clearing signal on the loop, and R_1 a clearing

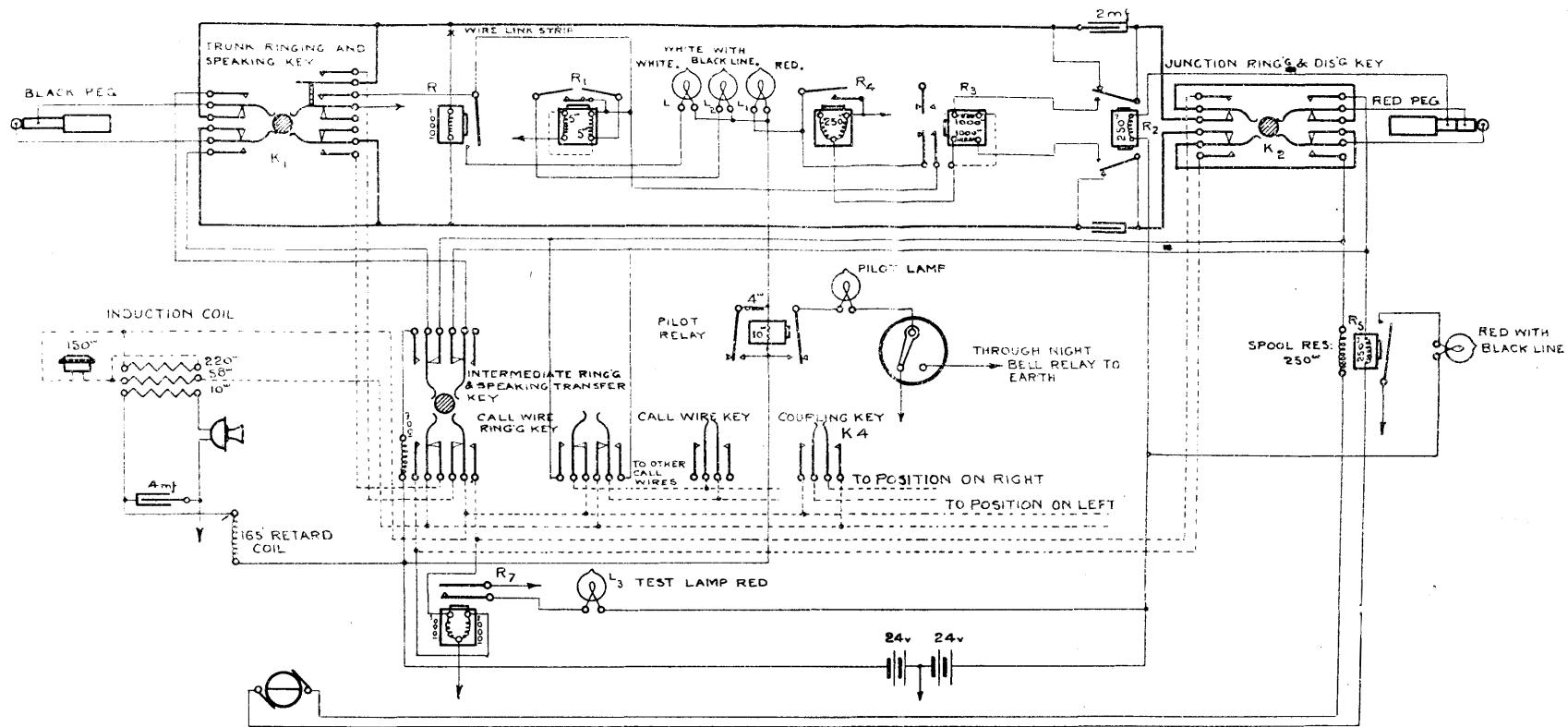


Plate 71A.

signal from a C.B. subscriber; the latter is energised by a current transmitted along both lines of the Junction in parallel and passing differentially through R_3

Relay R_7 provides an engaged test on multiplied junctions and transfer circuits, Lamp L_3 in its local circuit being additional to the ordinary "click" test. When key K_2 is thrown into the speaking position R_7 also acts as a supervisory relay in place of R_4 .

The operator's telephone set is wired for common battery working, with, however, a 150 ohms receiver to raise the impedance of the receiving apparatus when the operator is listening-in on the line, and a 4 m.f. condenser in the primary circuit, instead of 2 m.f., to increase the volume of speech.

A more recent arrangement provides for the connection of Relay R_3 across the cords on Junction Circuits not only when Key₂ is normal but also when thrown into the speaking position, in order that Relay R_4 may be kept in circuit in both positions of the key. A Coil, Bridging, 600 ohms + 600 ohms, takes the place of Relay R_7 , and Test Lamp L_3 is dispensed with.

SECTION 2.

CALL OFFICES ON TRUNK
SWITCH SECTIONS.

Plate 72.

Diagram T.L. No. 276.

CALL OFFICE SWITCH, CONNECTED TO
TRUNK SWITCH SECTION "D."

FIG. 1.—CONNECTIONS FOR ONE TELEPHONE.

APPARATUS SCHEDULE.

Counter.

Wallboard, 15'' × 14''.

Bell, Magneto, 100 ohms.

Bell, Trembler, Circular, 25 ohms.

Switch, 6-terminal, 2-position.

The apparatus should be requisitioned separately, and mounted on the Wallboard locally.

Cabinet.

Telephone No. 21.

Arm, Bell Receiver

Receiver, Bell

Cord, Flexible, No. 222

Battery, Leclanché, Combination, 4-cell.

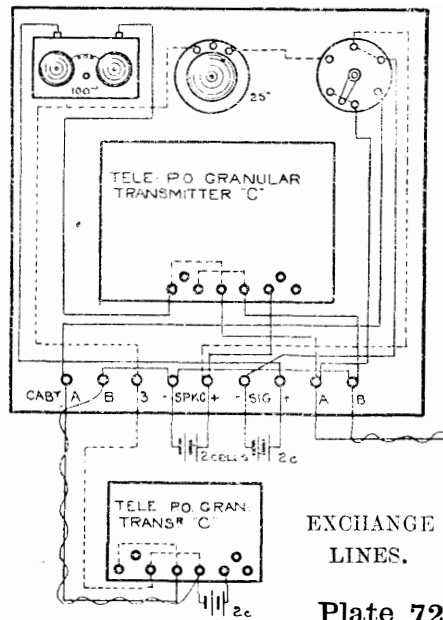
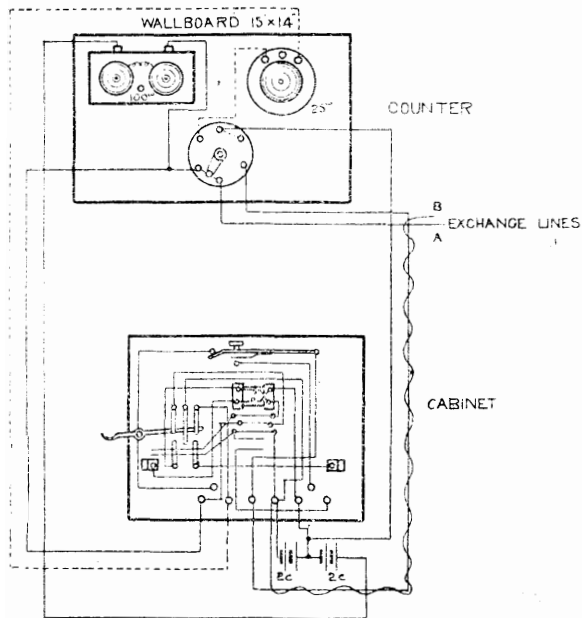
} Second Receiver.

Normally, the Combined Battery is applied to the Exchange Lines through the Magneto Bell, and the current holds up the shutter of an Indicator, Polarised, No. 2, fitted on the Trunk Switch Section. To call the Exchange the attendant turns the Switch to the other position and lifts the Receiver. This disconnects the Battery and causes the shutter of the Indicator to fall forward. When the Receiver is restored to the rest the P.C. Battery is automatically reconnected to the Exchange Lines, furnishing a Clearing Signal to the Exchange, and at the same time a current flows from the Speaking Battery through the Trembler Bell on the Wallboard. The bell will continue to ring until the Switch is restored to the normal position.

FIGURE 1.

WALLBOARD, 24" × 16".

FIGURE 2.



EXCHANGE
LINES.

Plate 72.

Calls are received on the Magneto Bell from Generator currents applied at the Exchange.

FIG. 2.—CONNECTIONS FOR TWO TELEPHONES.

APPARATUS SCHEDULE.

Counter.

Wallboard to Diagram T.L. 276, Fig. 2. The description includes the Wallboard (24'' × 16''), wired, and fitted with the following items:—

- Telephone No. 21.
- Bell, Magneto, 100 ohms.
- Bell, Trembler, Circular, 25 ohms.
- Switch, 6-terminal, 2-position.
- Battery, Leclanché, Combination, 4-cell.

Cabinet.

- Telephone No. 21.
 - Arm, Bell Receiver
 - Receiver, Bell
 - Cord, Flexible, No. 222
- } for Second Receiver.
- Battery, Leclanché, Agglomerate, 6-block, 2-cell.

The electrical arrangement is on the same lines as Fig. 1, but in this case the Call Office attendant is provided with a Telephone for the purpose of passing particulars of calls to the Exchange. The Clearing Signal from the Cabinet Telephone when the Receiver is hung up is received only upon the Trembler Bell on the Wallboard at the Counter, the Clearing Signal to the Exchange being given when the Switch is restored to the normal position. The Counter Telephone is joined up so as to enable the attendant to call the Exchange, and, when the Switch is turned to the reverse position to extend the Cabinet Telephone to the Exchange, the attendant can "listen in" on the circuit, if necessary, in order to assist the caller in case of difficulty arising.

Plate 73.

T.L. Diagram No. 239A.

COUNTER COMMUNICATION SWITCH FOR TRUNK AND LOCAL SERVICE.

APPARATUS SCHEDULE.

Counter.

Wallboard to Diagram T.L. 239A. The description includes the Wallboard (24" × 16"), wired, and fitted with the following apparatus:—

Telephone No. 21.

Switch, 6-terminal, 2-position.

Bell, Magneto, 100 ohms.

Bell, Trembler, Circular, 25 ohms.

Battery, Leclanché, Combination, 4-cell.

Cabinet.

Telephone No. 21.

Arm, Bell Receiver

Receiver, Bell

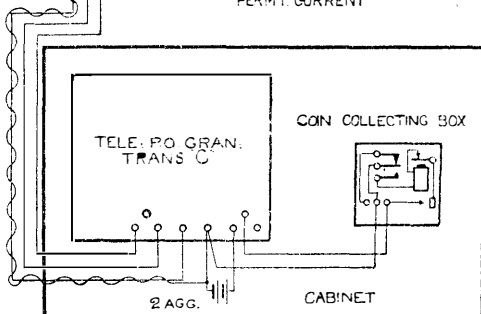
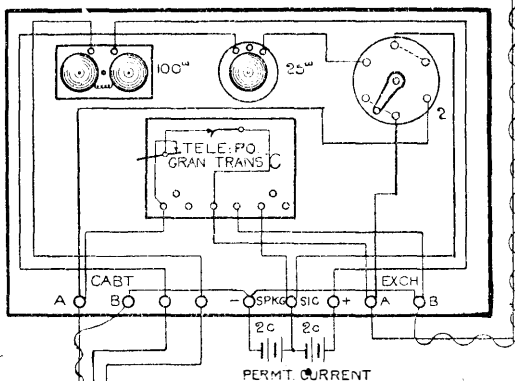
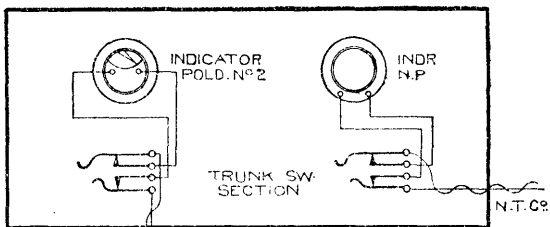
Cord, Flexible, No. 222

} for extra Receiver.

Box, Coin Collecting, Complete (when required).

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

The Cabinet is normally through to the Exchange. For a Trunk Call the Counter clerk obtains the attention of the Exchange by lifting



6. TERML.
2 POSITION



SWITCHES



7. TERML.
2 POSITION

the Receiver, and passes particulars of the call. When the call matures the Trunk operator calls the Counter. The Counter clrk tells the caller to enter the Cabinet, then turns the Switch to No. 2 position, listens for the conversation to begin, and then hangs up the Receiver. When the caller hangs up the Receiver in the Cabinet the Counter Bell will ring until the Switch is restored to No. 1 position. The movement of the Switch to No. 1 position will be indicated at the Switch Section on the Clearing Indicator in the Cord Circuit.

To complete the Coin Collecting Box Circuit an internal connection in the Cabinet Telephone must be made by means of a piece of covered wire; one end to be fixed to the lower left screw (Primary) of the Induction Coil, and the other clamped below the lower contact of the Press Button.

The small figure shows the corresponding connections of Switches. 6-terminal, 2-position, and 7-terminal, 2-position.

Plate 74.

Diagram T.L. No. 218.

COUNTER COMMUNICATION SWITCH FOR
 POST OFFICE P.C. AND NATIONAL
 TELEPHONE COMPANY'S MAGNETO
 SYSTEMS, WITH COIN COLLECTING BOX
 FOR LOCAL CALLS.

APPARATUS SCHEDULE.

Counter.

Wallboard to Diagram T.L. 218. The description includes the Wallboard (24" × 16"), wired, and fitted with the following apparatus:—

Bell, Trembler, Circular, 25 ohms.

Case, Switch and Indicator, 3½".

Coil, Resistance, Various, 100 ohms.

2 Condensers, m.c., 2 m.f.

Indicator, Non-polarised, 1,000 ohms, $\frac{2}{5}$.

Switchspring, 5-point and 8-point, $1\frac{5}{6}$.

Telephone No. 21.

Battery, Leclanché, No. 1 C.Z., 4-cell (P.C.).

 " " Agglomerate, 6-block, 2-cell
 (Speaking).

2 Pairs, Pegs, No. 201 (Red or Black) with cord, 16".

Cabinet.

Telephone No. 21.

EX. L. TO P.O. EX.
EX. L. TO N.T. CO. EX.

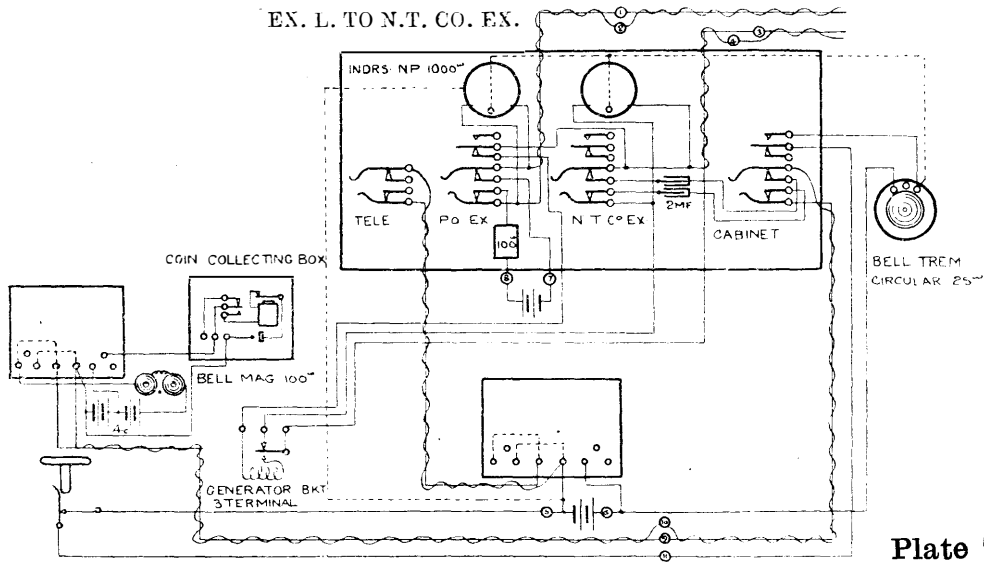


Plate 74.

Arm, Bell Receiver	}	for Second Receiver
Receiver, Bell		
Cord, Flexible, No. 222		
Bell, Magneto, 100 ohms.		
Generator, Bracket, 3-terminal.		
Battery, Leclanché Combination, 4-cell.		

The Coin Collecting Box will be supplied and maintained by the Company. When a Box is fitted, an additional internal connection must be made in the Cabinet Telephone by means of a piece of covered wire, one end of which should be fixed to the lower left screw of the Induction Coil, and the other clamped below the lower contact of the Press Button.

The Counter clerk will call the P.O. Exchange by simply inserting the connecting peg in the Exchange Switchspring which causes the shutter of the Indicator, Polarised, No. 2, at the Trunk Switch Section to fall. If a Vibrating Signal is required, owing to the inattention of the Switch operator, this may be sent by repeated insertion and withdrawal of the peg.

The restoration of the Receiver to the rest on the Telephone in the Cabinet will send a Clearing Signal to the P.O. Exchange. When the caller rises from the seat the Bell on the Counter Switch will continue to ring until the Cabinet connection has been severed.

The attention of the Company's Exchange will be gained direct by the caller turning the handle of the Generator fitted in the Cabinet, and a Clearing Signal should be sent in a similar manner.

The connections are arranged to disconnect the Generator during a Trunk call.

For Call Office arrangements on Local Switch Sections, *see* Plates 59 and 60, and for full particulars on the subject generally, *see* Circular E 11.

Plate 75.

Diagram C.B.S. No. 147.

**CALL OFFICE SWITCH FOR TRUNK AND
LOCAL SERVICE, INCLUDING NATIONAL
TELEPHONE COMPANY'S.**

The diagram shows the Circuit terminated on a Section, Local Switch, 50 or 80 Line. On combined Trunk and Local Switch Sections, the N.T. Co.'s Circuit is terminated on a 5-point Switchspring with an Indicator, N.P.C., for the receipt of calls in the same way as an ordinary Junction circuit.

APPARATUS SCHEDULE.*Counter.*

Wallboard to Diagram C.B.S. 147. The description includes the Wallboard, 24" × 16", wired, and fitted with the following apparatus:—

Telephone No. 21.

Bell, Magneto, 100 ohms.

Bell, Trembler, Circular, 25 ohms.

Switch, 6-terminal, 2-position.

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

Cabinet.

Telephone No. 21.

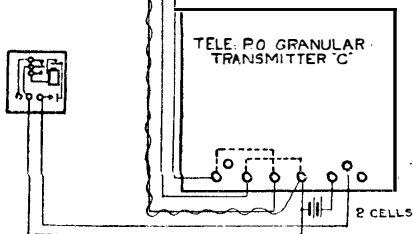
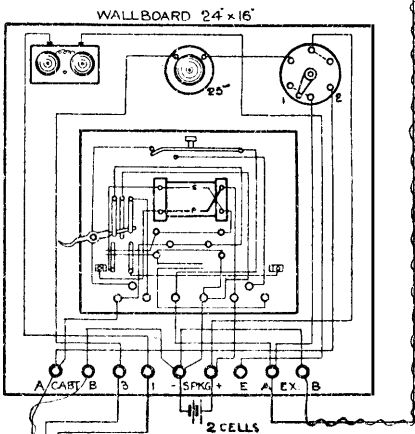
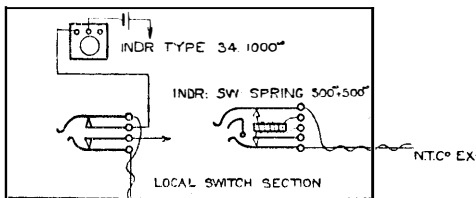


Plate 75.

Arm, Bell Receiver
 Receiver, Bell
 Cord, Flexible, No. 222 } for Second Receiver.
 Battery, Leclanché, Agglomerate, 6-block,
 2-cell.
 Box, Coin Collecting, Complete (when required).

When a Coin Collecting Box is fitted, the additional internal connection of the Telephone should be made by means of a piece of covered wire. *See* page 201.

With the Switch in position 2, the Counter clerk is enabled to "listen-in," and to assist the caller to secure connection if necessary. In this position also, the Trembler Bell will ring when the caller has replaced the Receiver on the rest; at the same time a Clearing Signal is sent to the Exchange.

Plate 76.

Diagram C.B.S. No. 148.

CALL OFFICE SWITCHBOARD FOR ONE
CIRCUIT TO POST OFFICE EXCHANGE
AND ONE CIRCUIT TO NATIONAL TELE-
PHONE COMPANY'S EXCHANGE.

APPARATUS SCHEDULE.

Wallboard to Diagram C.B.S. 148. The description includes the Wallboard, 16'' × 10'', wired, and fitted with the following apparatus:--

Case, Switch and Indicator, $3\frac{1}{2}$ ''.

Indicator, N.P., 1,000 ohms, $\frac{5}{5}$.

Coil, Bridging, 120 ohms.

Switchspring, 8-point, $\frac{5}{5}$.

Coil, Induction, $\frac{150}{1}$.

Bell, Trembler, Circular, 25 ohms.

Suspender for Micro Telephone.

4 Plates, Connection, Trembler Bell.

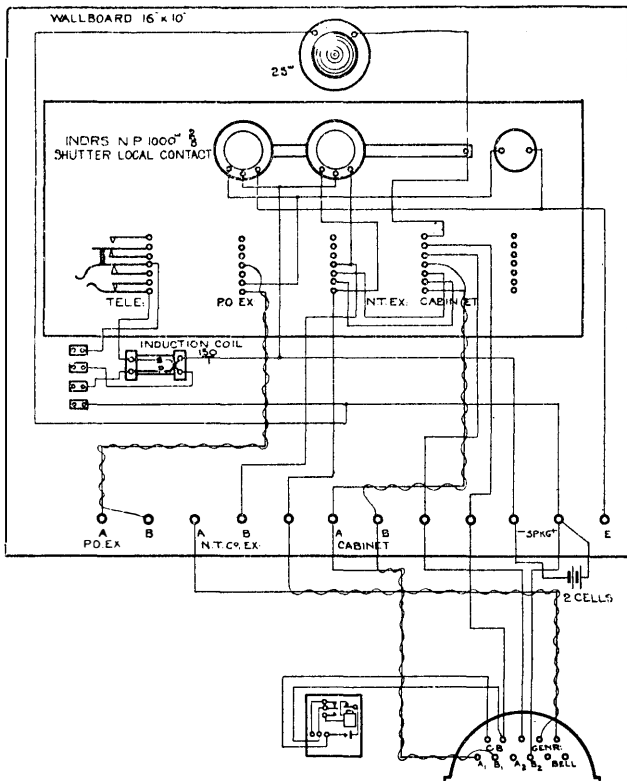
Telephone No. 28 (with hook).

2 Pairs, Pegs, No. 201 (Black or Red), with Cord 16''.

Battery, Leclanché, Agglomerate, 6-block, 2-cell.

Cabinet.

Telephone No. 13. See Plate 92.



TELE. WALL
 INTERMEDIATE
 WITH MAGNETO
 BELL AND
 GENERATOR
 COMPLETE.

Receiver, Watch, "D," Complete.
2 Cells, 2-block, Agglomerate, Complete.

The Coin Collecting Box will be supplied and maintained by the Company.

Communication with the N. T. Co.'s Exchange is normally obtained direct from the Cabinet, without necessitating switching at the Counter Switchboard, by means of the Generator fitted in the Telephone. When it is desired to use the Cabinet Set for communication with the Post Office Exchange, the Call Office attendant connects the Switchsprings marked "P.O. Ex." and "Cabinet" respectively by means of a pair of pegs and cords. When this latter condition obtains, and the Cabinet Telephone Receiver is restored to the rest on conclusion of a conversation, an independent Clearing Signal is given at the Counter by the ringing of the Trembler Bell. The withdrawal of the pegs from the Switchspring causes the bell to stop ringing automatically and sends a Clearing Signal to the Post Office Exchange.

The Post Office Exchange is called automatically when one peg of a pair is inserted in the Exchange Switchspring, the other peg being inserted in the operator's Telephone or Cabinet Switchspring so as to give the necessary "loop." The connections of the circuit at the Exchange are similar to those shown in Plate 75.

Plate 77.

Diagram T.L. 336.

SWITCHBOARD, MAGNETO (CALL OFFICE) :
 FOR OMNIBUS CIRCUIT CALL OFFICE
 WITH FROM ONE TO EIGHT SUB-
 SCRIBERS (MAGNETO WORKING).

APPARATUS SCHEDULE.

Switchboard, Magneto, Call Offices, $\frac{5}{10}$. The
 title includes the following items:—

- 1 Indicator, N.P.C., 500 + 500 ohms, $\frac{5}{5}$, 6".
- 1 Cover for Bell, Magneto, 1,000 ohms, for Wall Telephones.
- 1 Bell, Magneto, 1,000 ohms, for Wall Telephones.
- 2 Bell Domes $2\frac{1}{2}$ ".
- 2 Pillars, with Heads for Bell, Magneto, 1,000 ohms, for Wall Telephones.
- 1 Switchspring, 5-point, $\frac{5}{5}$, 6".
- 1 Key, Type H 3, Oval, $\frac{5}{5}$, 6".
- 1 Generator, Bracket, Unmounted.
- 1 Switchspring, 5-point, with brass socket.
- 1 Coil, Induction, $\frac{150}{1}$.
- 1 Bell, Trembler, Circular, 25 ohms.
- 1 Switch, Tumbler, 3 ampères (bronzed).
- 1 Suspender for Micro Telephone.

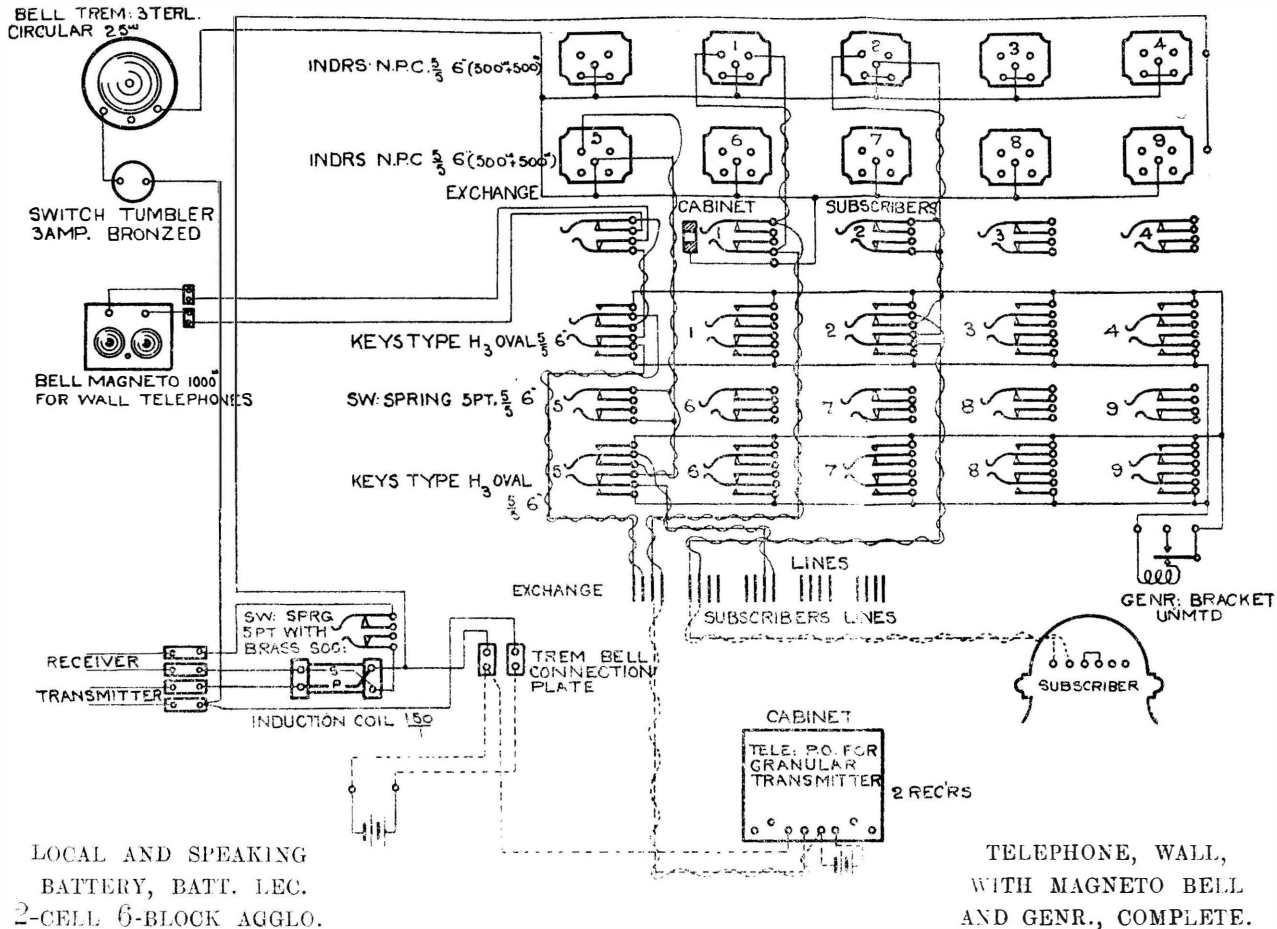


Plate 77.

- 4 Plates, Cord Connection.
- 1 Strip, Cross Connection, 5×4 .
- 4 Plates, Connection, Trembler Bell.
- 1 Card Holder.
- 2 Pegs, Circular, Triple with Cords 16''.

Separate Items.

- 1 Telephone, No. 28 (with hook).
- Battery, Leclanché, Agglomerate. 6-block, 2-cell.

These fittings provide the necessary apparatus for working on 1 Head Office, 1 Cabinet, and 3 Subscribers. When accommodation is required for 1 to 5 additional subscribers' circuits, the following apparatus should be requisitioned separately and fitted locally :—

- 1 Indicator, N.P.C., 500 + 500 ohms, $\frac{5}{5}$, 6''.
- 1 Switchspring, 5-point, $\frac{5}{5}$, 6''.
- 1 Key, Type H 3, Oval, $\frac{5}{5}$, 6''.

The board is wired for 10 lines when issued. The Exchange Circuit is joined up at the Head Office for Open Circuit Magneto working.

SECTION 3.

RECORD CALL JUNCTION AND
TRANSFER CIRCUITS.

Plate 78.

T.L. Diagram No. 268.

EXPLANATORY DIAGRAM OF RECORD CALL
 JUNCTION CIRCUITS, AND TRANSFER
 CIRCUITS BETWEEN TRUNK SECTIONS
 AND RECORD TABLE TRANSFER SWITCH
 SECTION.

For full wiring and fittings of "Section, Record
 Table Transfer, ⁵10," see Diagram T.L. 267.

Fig. 1.—Arrangement for terminating Record Call Junction Circuits on "Record Table Transfer Switch Sections" and "Junction Transfer Sections."

Normally, the batteries at the P.O. and the National Telephone Company's Exchange oppose each other, and there is no current on the lines. A call is given at both ends when either the peg is raised at the P.O., or the peg inserted in the Switchspring at the Company's end; the operation at either end cuts off the home battery and allows the distant battery to send a current through both Indicators, and along the lines in parallel. Clearing is also performed automatically, but in that case the home battery sends the clearing current.

Fig. 2.—Arrangements for terminating R.C.J. Circuits on Trunk Switch Sections.

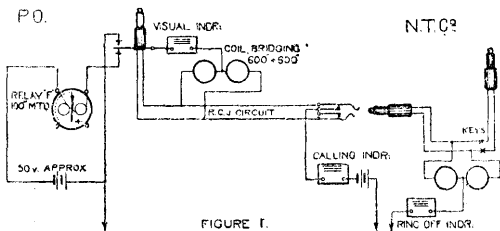


FIGURE 1.

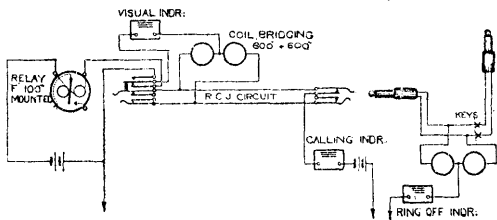


FIGURE 2

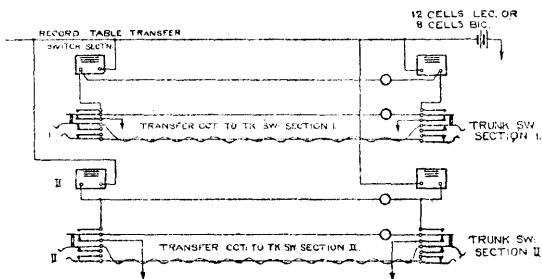


FIGURE 3.

Plate 78—*cont.*

The arrangement and methods of calling and clearing are similar to those shown in Fig. 1; S-point Switchsprings on the Trunk Switch Sections, however, taking the place of the Pegs and Contact Sockets on the Record Table Transfer and Junction Transfer Sections.

The Relay F, 100 ohms, Mounted, in both cases is utilised for Night Calls, and should have a Trembler Bell and Local Battery fitted in its local circuit for that purpose.

In the earlier boards two Coils, Bridging, 100 ohms, were fitted in the position occupied by the 1 Coil, Bridging, 600 + 600 ohms, in this diagram.

Fig. 3.—Transfer Circuits between Trunk Sections and Record Table Transfer Switch Section.

Normally, the Indicators are not actuated. The insertion of a peg at either end causes a current to flow through both Indicators in parallel. A peg inserted in the Switchspring at each end, breaks the battery circuit and the signal disappears.

Calling and Clearing Signals are thus sent automatically by the insertion and the withdrawal of the peg.

PART IV.—HOUSE TELEPHONES.

SECTION 1.

TWO TO TEN STATIONS;
INTERCOMMUNICATION,
NON-SECRET.

Plate 79.

T.L. Diagram No. 230.

HOUSE TELEPHONE SYSTEM.

For a full description of the Post Office System of House Telephones in Post Offices and Government Buildings, *see* Circular, Telephones (106), Monthly List, 1st January 1906.

Fig. 1.—Telephones in Pairs—in lieu of a speaking tube between two rooms only. For this service in Post Offices a stock of Telephones, G.B., Incomplete, House, for Single Receiver (in conjunction with 2 Receivers, Bell (Telephone No. 27) ; 2 Bells, Trembler, House, $2\frac{1}{2}$ '' ; and 1 Battery, 2-cell Leclanché, No. 1, C.Z.), is available, and should be joined up on the principle shown in Diagram T.L. 154. On the stock becoming exhausted, the apparatus shown in the Plate (Fig. 1) will be used for this class of service.

APPARATUS SCHEDULE.

2 Telephones, No. 29. The description includes Hook for Micro Telephone ; Bell, Trembler, Press Button (all mounted on base) ; and Telephone No. 30 ; *or*

2 Telephones, No. 46. The description includes Cradle for Micro Telephone ; Bell, Trembler ; Press Button (all mounted on base) ; Rose, Wall, and 6-foot Cord, Flexible ; and Telephone No. 30.

FIGURE 1.

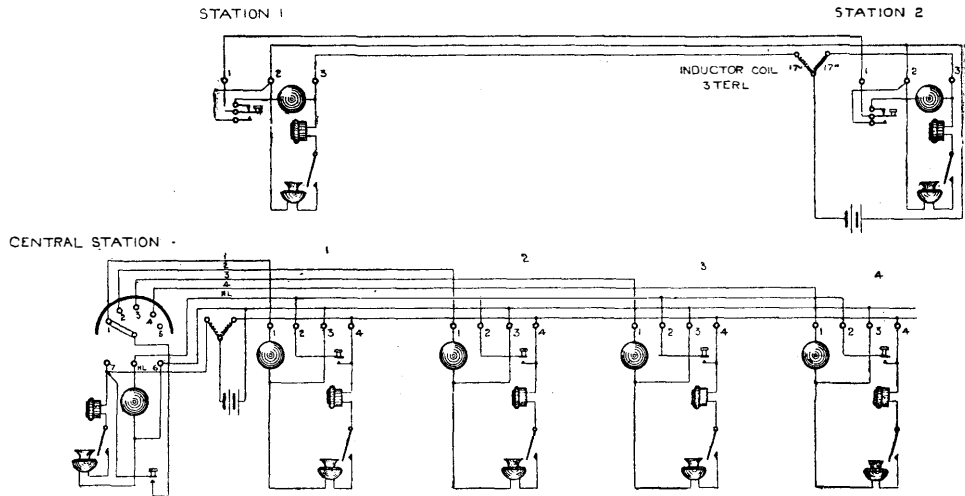


FIGURE 2.

Plate 79—*cont.*

1 Coil, Inductor, 3-terminal.

Battery, Leclanché, No. 1, C.Z., 3-cell.

The diagram provides for a simple Telephone Circuit connecting two stations. To call, the operator at Station 1 depresses the Press Button, thus causing the Bell at the distant station to ring. The operator there repeats the signal by the same process, and both operators complete the speaking circuit by depressing the Keys on the Micro Telephones.

Fig. 2.—Telephones between Central and Sub-Stations—in lieu of a number of speaking tubes radiating from a central point.

APPARATUS SCHEDULE.

1 Telephone, No. 33 or No. 35. The description includes Hook for Micro Telephone; Selector Switch; Bell, Trembler; Press Button (all mounted on base); and Telephone, No. 30; •

1 Telephone, No. 50 or No. 52. The description includes Cradle for Micro Telephone; Selector Switch; Bell, Trembler; Press Button (all mounted on base); Rose, Wall, Circular, and 6-foot Cord, Flexible; and Telephone No. 30.

n Telephones, No. 31 or No. 48; similar to 3-terminal instruments shown in Fig. 1.

1 Coil, Inductor, 3-terminal.

Battery, Leclanché, No. 1, C.Z., 4-cell.

n Boxes, Junction, House, 7 or 12-wire. A Junction Box is used at each intermediate point; 7-wire for 5-way sets, and 12-wire for 10-way sets.

To gain the attention of any particular station, the Selector Switch is turned to the number required, and the Ringing Key is operated; the reply is given by the depression of the Ringing Key at the station called, and the operators at both

stations are placed in speaking communication immediately the contacts on the Micro Telephone Press Keys are made.

The Signalling and Speaking Circuits are similar to those shown on Fig. 1, with the exception that an additional signalling line is provided for outward ringing from Station No. 1. All ringing inwards from the out stations is on the common line H.L. (Home Line).

Plate 80.

T.L. Diagram No. 231.

HOUSE TELEPHONE SYSTEM ;
INTERCOMMUNICATION, NON-SECRET.

FIG. 1.—APPARATUS SCHEDULE.

- n Telephones, No. 33 or No. 35 ; or
- n Telephones, No. 50 or No. 52.
- 1 Coil, Inductor, 3-terminal.
- Battery, Leclanché, No. 1, C.Z., 4-cell.
- n Boxes, Junction, House, 7 or 12-wire. A Junction Box is used at each intermediate point.

The diagram provides for full intercommunication between all stations on the system, and it is possible for all stations to come in circuit for listening and speaking.

To gain the attention of any station, the operator turns the Selector Switch to the number of the station required, depresses the Press Button, lifts the Micro Telephone from the hook, makes the contact of the Press Key, and listens for a reply. The distant station operator lifts the Micro Telephone, depresses the Press Button, and is in immediate speaking communication. The selective signalling lines are in the ringing circuits only, the speaking being on the common leads.

Figs. 2 and 3.—These figures illustrate the current circulation in the ringing and speaking circuits. Fig. 2 represents the circuit conditions when Station 1 is ringing Station 2; Fig. 3, Station 1 speaking to Station 2.

The conditions in these circuits are similar to those shown in Fig. 1, Plate 79.

FIGURE 1

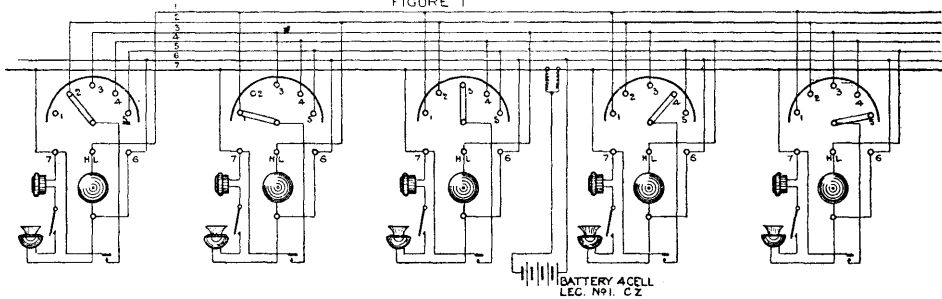


FIGURE 2

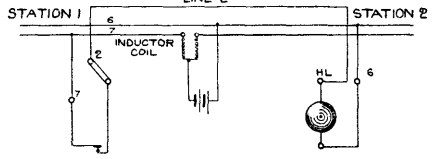
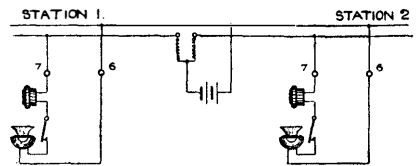


FIGURE 3



SECTION 2.

FIVE TO TWENTY STATIONS;
INTERCOMMUNICATION,
SECRET.

Plate 81.

T.L. Diagram No. 232.

HOUSE TELEPHONE SYSTEM. DIRECT CALL, INTERCOMMUNICATION (SECRET).

FIG. 1.—APPARATUS SCHEDULE.

n Telephones, No. 39, No. 41, No. 43, or No. 45. The description includes Hook for Micro Telephone; Selector Switch; Bell, Trembler; Press Button; Vibrator; Induction Coil; and Cut-in Relay (all mounted on base); Telephone No. 32; *or*

n Telephones, No. 56, No. 58, No. 60, or No. 62. The description includes Auto-Cradle for Micro Telephone; Selector Switch; Bell, Trembler; Press Button; Vibrator; Induction Coil; and Cut-in Relay (all mounted on base); Rose, Wall, and 6-foot Cord, Flexible; and Telephone No. 32.

n Boxes, Junction, House, 7, 12, 17, or 22-wire.

n Batteries, Leclanché, No. 1, C.Z., 3-cell.
● One used at each point for speaking.

Battery, Leclanché, No. 1, C.Z., 3-cell. Ringing battery for whole system.

The diagram provides for full intercommunication between any two stations on the system without interference by any other station. Also any two stations up to the full number on the system can be speaking independently of any other two stations; for instance, if 15 instruments are installed, seven different conversations can be carried on simultaneously.

FIGURE 1

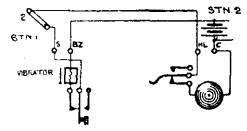
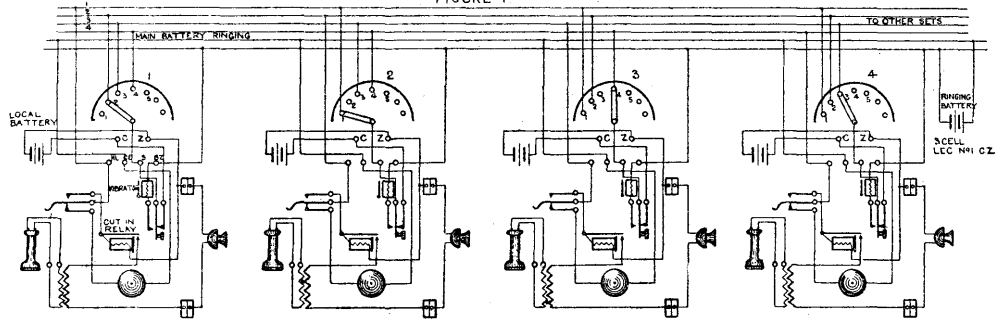


FIGURE 2

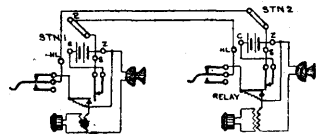


FIGURE 3

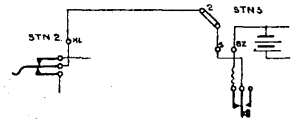


FIGURE 4

Plate 81—*cont.*

The operator at the calling station turns the Selector Switch to the number of the station required and depresses the Ringing Key, at the same time lifting the Receiver from the Auto-Switch Hook; if the Telephone at the station called is in use, the Vibrator at the calling station will not be actuated, thus indicating that attention cannot be obtained. On the ring being received, the operator at the called station will lift the Receiver from the Auto-Switch Hook, turn the Switch Arm until the mechanical click of the Cut-in Relay is heard inside the Telephone case, when the two operators will find themselves in speaking communication.

The arrangement is such as to render it essential that the speaking batteries must be joined up so that they are in series in the circuits before the communication between any two stations can be established. After a conversation is completed, the Receiver must be placed on the rests or hooks, but it is not essential to replace the Selector Switch to any particular position.

Fig. 2.—Station 1 ringing Station 2. Switch at 1 turned to Position 2 and Button pressed; if circuit engaged, Vibrator silent.

Fig. 3.—Station 1 speaking to Station 2. Station 2 lifts Receiver and turns Switch until the Relay is heard making the Primary circuit.

Fig. 4.—Station 3 attempting to ring Station 2 while the latter is engaged. The ringing battery is disconnected owing to the Receiver at Station 2 being off the hook.

Plate 82.

T.L. Diagram No. 233.

HOUSE TELEPHONE SYSTEM. DIRECT
CALL AND DELTA INTERCOMMUNICATION
(SECRET).

APPARATUS SCHEDULE.

n Telephones, No. 39, No. 41, No. 43, No. 45, or No. 56, No. 58, No. 60, No. 62.

n Telephones, No. 37 or No. 54; similar to the first item, but with no Selector Switch or Switch arm provided.

n Boxes, Junction, House, 7, 12, 17, or 22-wire.

n Batteries, Leclanché No. 1, C.Z., 3-cell (Speaking, one for each point).

Battery, Leclanché, No. 1, C.Z., 3-cell (Ringing, one for whole system).

The arrangement is a modification of the system shown in Plate 81, and provides, in addition to the general arrangement, sub-stations that cannot communicate with the main system, but can be called and conversed with from a Central Station. In the diagram, A and B are sub-stations; No. 1 is the Central Station able to communicate with A and B; and No. 2 is a typical station on the general system. A special set of apparatus is provided at the sub-stations, identical in all respects to the Intercommunication apparatus, with the exception that no Selector Switch or Switch arm is provided. Circuits joined up in this manner are referred to as "Delta."

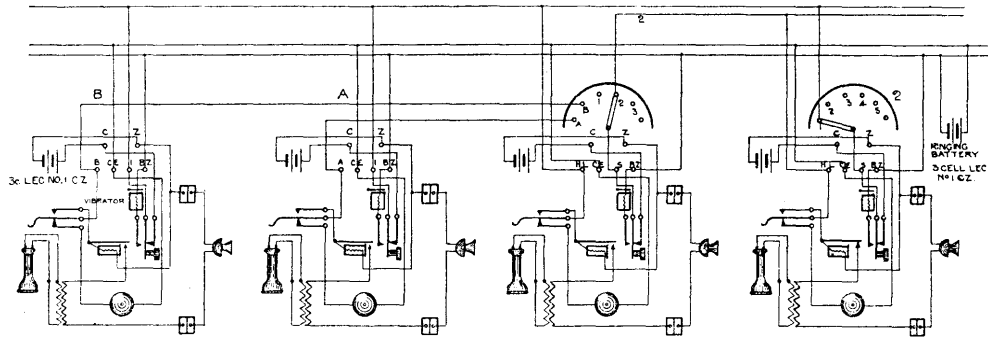


Plate 82.

PART V.—MISCELLANEOUS
TELEPHONES AND CIRCUITS.

SECTION 1.

MISCELLANEOUS TELEPHONES.

Plate 83.

MICRO TELEPHONE.

APPARATUS SCHEDULE.

Telephone No. 28.

This description covers the complete instrument, including Cord, Flexible, No. 403.

The two Microphone conductors are distinguished by white strands bound over the tinsel, while the Receiver conductors are similarly bound with copper strands.

If facility for hanging up is required, Telephone No. 28 (with loop) or Telephone No. 28 (with hook) should be requisitioned.

MICRO TELEPHONE.

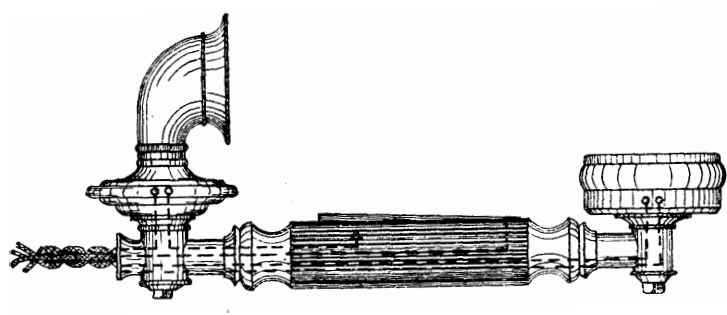


Plate 83.

Plate 84.TABLE TELEPHONE, WITH TREMBLER
BELL "A."

APPARATUS SCHEDULE.

Telephone No. 20.

The item includes Cord, Flexible, No. 602 ;
Strip, Flexible Cord Connection, 6-terminal ; and
Telephone No. 28.

A working current of 25 milliampères should
be allowed for the Bell.

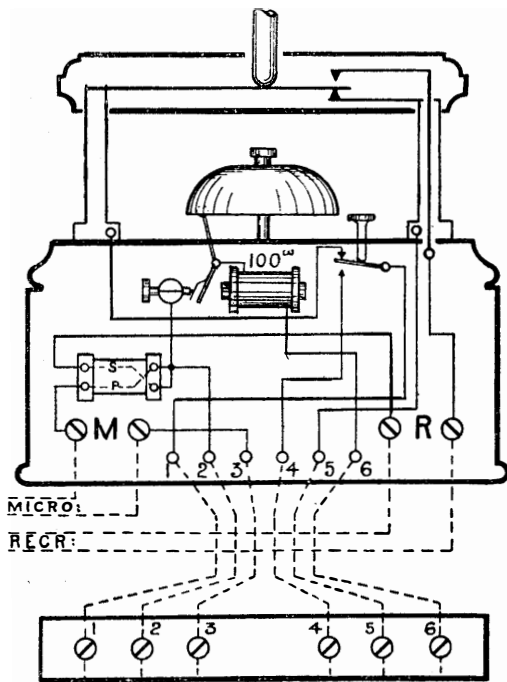


Plate 84.

Plate 85.

TABLE TELEPHONE, WITH MAGNETO BELL.

APPARATUS SCHEDULE.

Telephone No. 26.

The item includes Cord, Flexible, No. 402; Strip, Flexible Cord Connection, 4-terminal; and Telephone No. 28.

This instrument was intended for use on Telephone Exchange systems where the subscriber is called by Generator and calls the Exchange on the permanent current system. It is now used on C.B.S. Exchanges. See Plates 42 and 47.

The Bell is removable by taking off the dome and removing the two connection screws. Adjustment of the bell hammers is effected by means of two screws in the armature, against which the hammer springs are set.

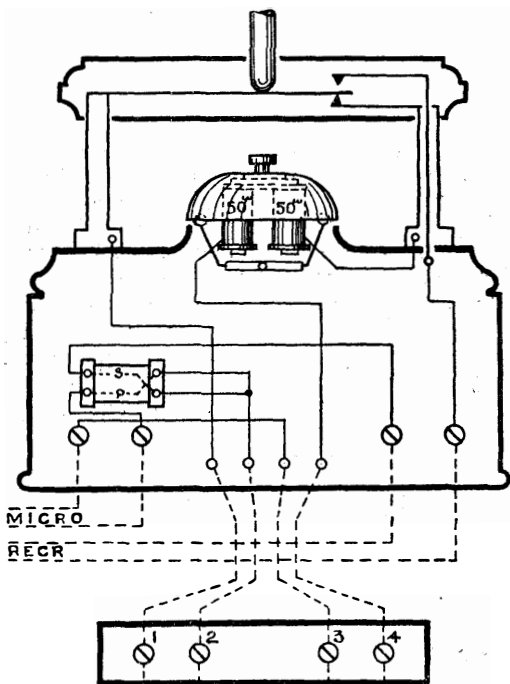


Plate 85.

Plate 86.**TABLE TELEPHONE, WITHOUT BELL "A."****APPARATUS SCHEDULE.**

Telephone No. 24.

The item includes Cord, Flexible, No. 702; Strip, Flexible Cord Connection, 7-terminal; and Telephone No. 28.

This Telephone is used on Extension Circuits, C.B.S. The connections shown are equivalent to those which are obtainable with the P.O. Telephone for Granular Transmitter, "C," *i.e.*, the signalling apparatus joined to Terminals 1 and 5 is entirely disconnected from the line leads when the Micro Telephone is lifted. See Plates 47 and 49.

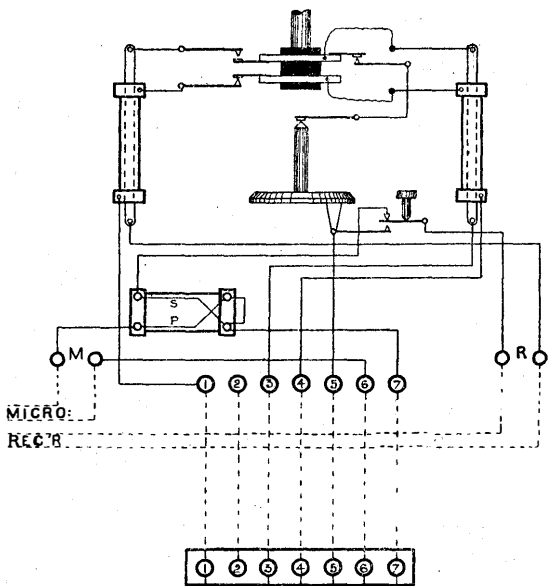


Plate 86.

Plate 87.

TABLE TELEPHONE, WITH GENERATOR.

APPARATUS SCHEDULE.

Telephone No. 18.

The item includes Cord, Flexible, No. 604; Strip, Flexible Cord Connection, 6-terminal; and Telephone No. 28.

As only a speaking battery is required where Generator ringing is provided, arrangements have been made to supply a

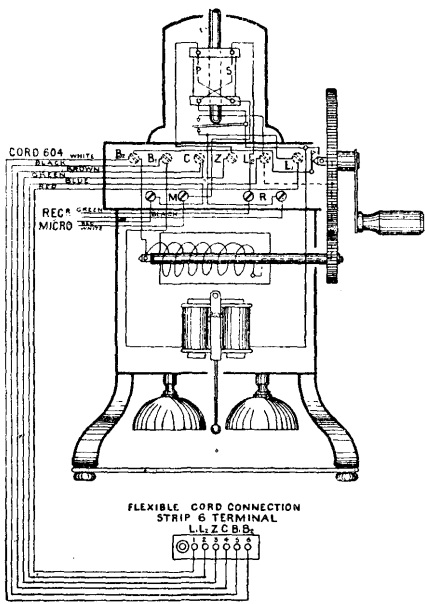
“Battery Box, Bracket, 2-cell,”
upon which, by means of a

“Baseboard, Table Telephone”
and two clamping screws, a Table Telephone, with Generator, can be converted into a complete Wall Telephone, including Battery Box. The Bracket Battery Box will contain two Dry Cells “Y” size, which are, of course, a separate item.

An earlier type of Table Telephone, with Generator, is fitted with a Flexible Cord Connection Block and Cord, Flexible, No. 603. As these Telephones are liable to be issued in execution of requisitions it will be necessary to specify “with Flexible Cord Connection Strips, 6-terminal” when they are to be used on Bracket Battery Boxes.

The spare Flexible Cord can be disposed of in the recess behind the Box, and the Battery leads taken through a hole provided below the Battery Case. The door of the Battery Box is fastened by means of a lock similar to those used for Magneto Bells.

This set is similar to Telephone, Table, with Generator, “B,” the latter being modified for C.B.S. working. See Plate 56.



NOTE.—The connection shown by dotted line is made through the base of the instrument.

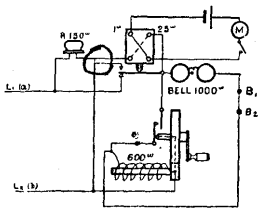


Plate 88.

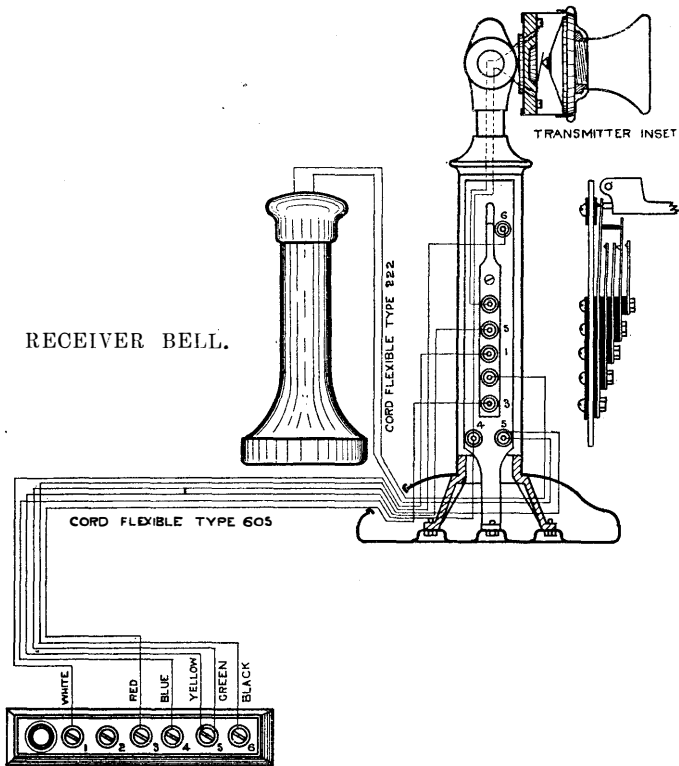
Diagram T.L. No. 337.

CONNECTIONS OF TELEPHONE, TABLE,
P.B., TRANSMITTER TYPE.

APPARATUS SCHEDULE.

Telephone No. 4. The description includes Cords, Flexible, Nos. 202 or 222 (Receiver cord), 223 (Transmitter cord), and 605 (for connecting the Telephone to Strip); Strip, Flexible, Cord Connection, 6-terminal, mounted; Transmitter; Inset; Receiver, Bell; and Label No. 78.

The combination of this Telephone with a Bell Set No. 5 forms the primary battery equivalent of the C.B. Table Set and Bell Set No. 1. The arrangement is suitable for working into C.B.S. Exchanges, *see* Plates 43, 44, and 48, and may also be used on long private wire circuits, in conjunction with a Generator, Table, for calling purposes. *See* Diagram T.L. No. 338.



STRIP, CORD CONNECTION, 6-FERMINAL.

Plate 89.

POST OFFICE TELEPHONE FOR GRANULAR
TRANSMITTER, "C."

APPARATUS SCHEDULE.

Telephone No. 21.

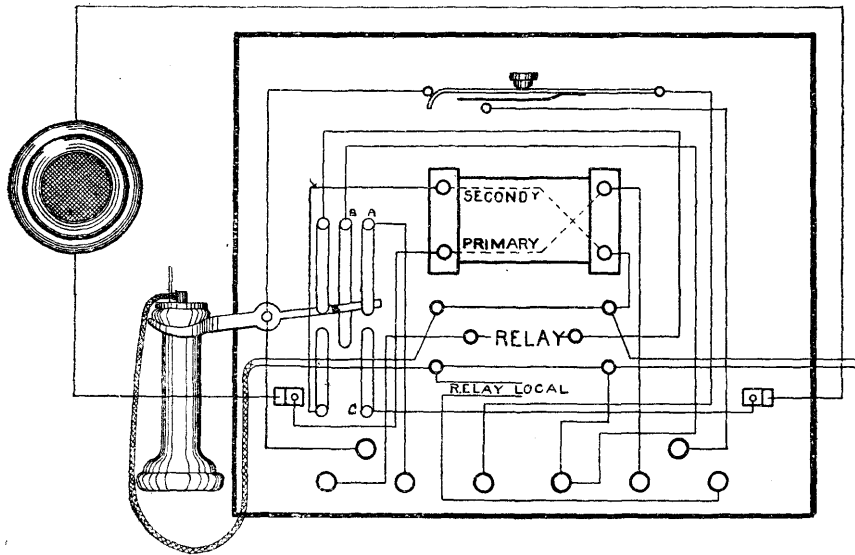
The item includes Cord, Flexible, No. 222 (for Bell Receivers) ; Receiver, Bell ; and Transmitter, Deckert, or Inset, ebonite, complete.

This form of Telephone provides all the connections made by the two-lever form of P.O. Telephone, and superseded the "Telephone, P.O., for Granular Transmitter" and "Telephone, P.O., for Granular Transmitter, "A."

The Switch lever is divided into two parts, the inner part being insulated from the outer. When the Receiver is in its rest, spring B is in electrical contact with spring A through the lever, in the speaking position B and C are electrically connected.

A fixed Rest will be provided for the right-hand Receiver under the description "Arm, Bell Receiver." This item, together with the Receiver and Cord, Flexible, No. 222, should be requisitioned separately when required. *See also* Plates 55 and 59.

It has been found advantageous on certain heavily-worked long distance circuits to equip P.O. Telephones with "Transmitters, Inset," and for that purpose ebonite cases are available under the stock title of "Case, Inset, Ebonite." The Case and the Transmitter will be supplied under the inclusive title of "Transmitter, Inset, Ebonite, Complete.'



TO SECOND
RECEIVER
WHEN
REQUIRED.

Plate 89.

Plate 90.

POST OFFICE TELEPHONE
FOR GRANULAR TRANSMITTER, "A"
(TELEPHONE No. 17).

The diagram shows the internal connections of the P.O. pattern Telephone as originally arranged with one movable Switch arm and a Deckert Transmitter. A second fixed arm was provided under the conditions detailed on page 242.

TEL. N° 17.

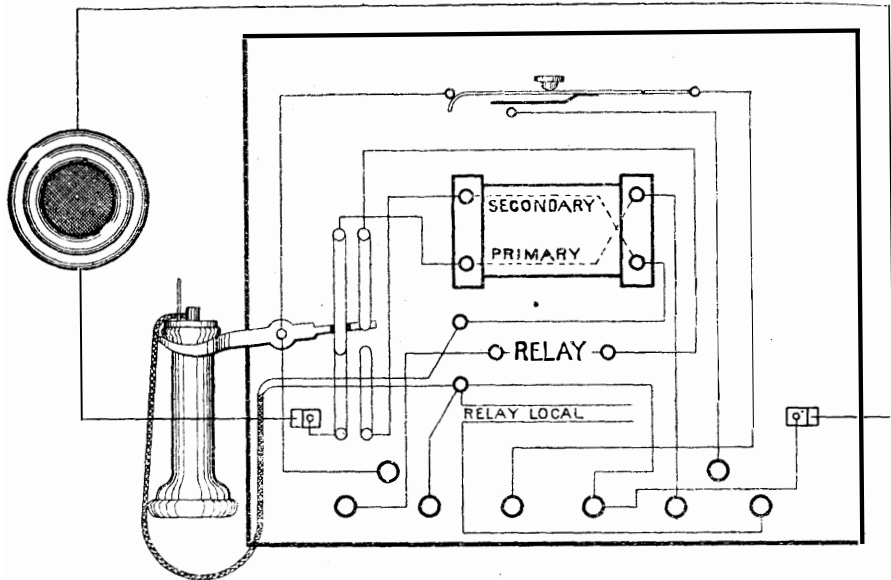


Plate 91.**POST OFFICE TELEPHONE FOR GRANULAR
TRANSMITTER (WITH TWO LEVERS).**

The diagram shows the internal connections of the P.O. pattern Telephone with two movable Switch arms and a Deckert Transmitter. The primary circuit is closed by the right-hand Switch lever coming in contact with the lower spring, the secondary being closed in a similar manner on the left side.

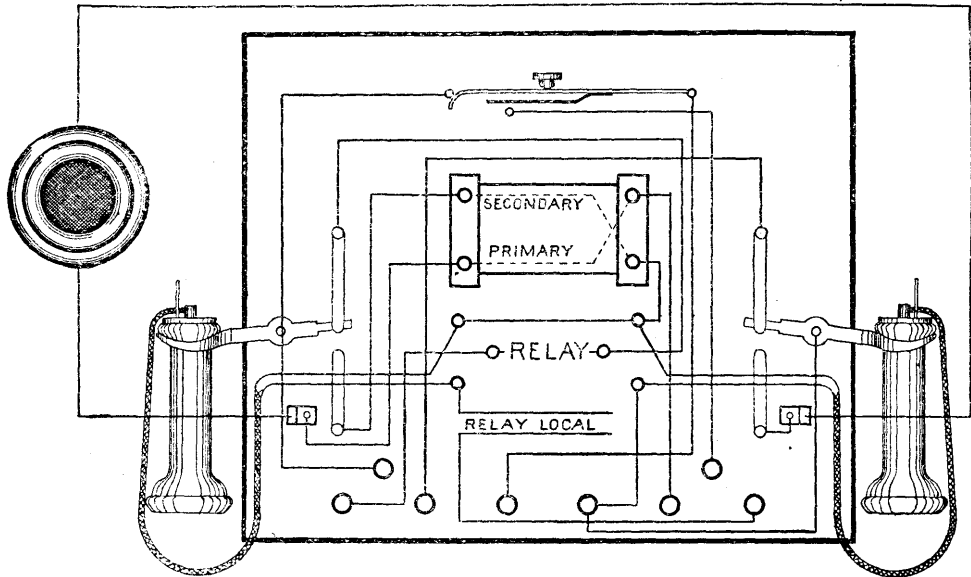


Plate 91.

Plate 92.

C.B.S. Diagram No. 123.

**CONNECTIONS OF TELEPHONE, WALL,
INTERMEDIATE, WITH MAGNETO BELL AND
GENERATOR.****APPARATUS SCHEDULE.**

Telephone No. 13. The description includes Bell, Magneto, 1,000 ohms; Generator Bracket, 3-terminal, unmounted; Coil, Induction, $\frac{25}{1}$; Transmitter; Cord, Flexible, No. 222; Receiver, Bell; and 3 fixing screws and washers.

2 Cells, 2-block, Agglomerate, Complete.

This Set, which is similar to Telephone, No. 3, but with a Generator and five extra Terminals fitted and wiring re-arranged, is suitable for Intermediate working, and is capable of performing the same functions as a P.O. Telephone with Granular Transmitter, "C," with the advantage of having a Generator, Magneto Bell, and accommodation for a Speaking Battery within the case. See Plate 76.

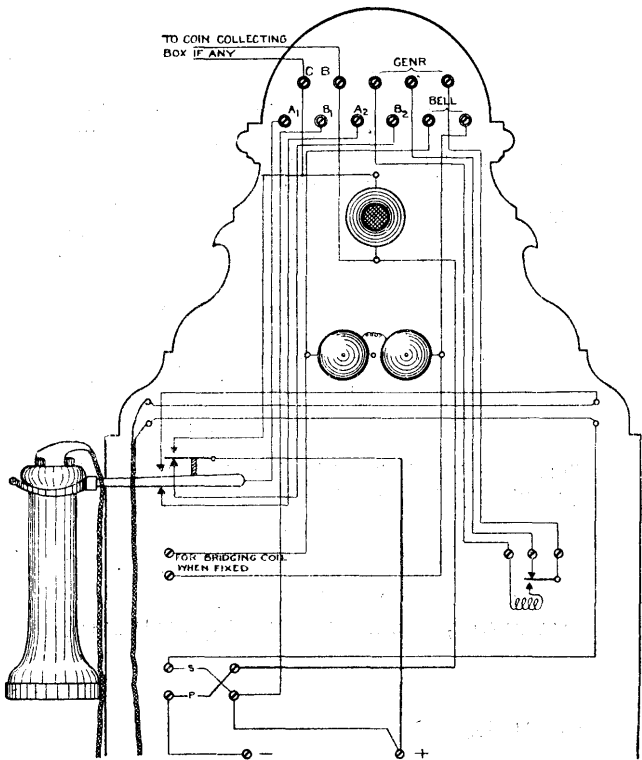


Plate 92.

Plate 93.**PORTABLE TELEPHONE WITH GENERATOR
AND VIBRATOR.****APPARATUS SCHEDULE.**

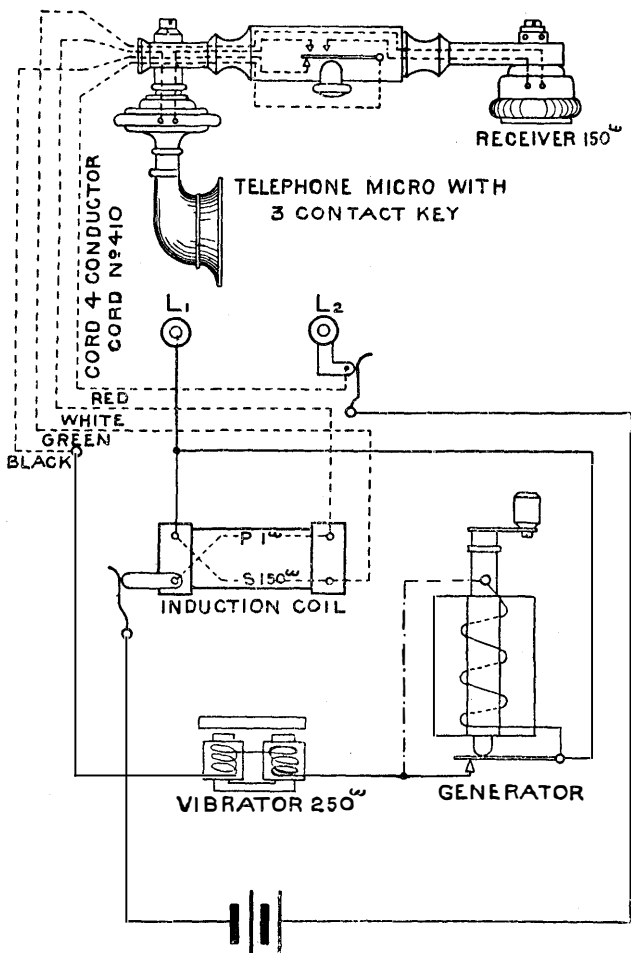
Telephone No. 42. The description includes a Telephone, No. 34 ; Vibrator (250 ohms) ; Generator ; and Induction Coil, ^{150.}
1

The description Telephone No. 34 includes the Cord, Flexible, No. 410.

Two "Clamps, connecting, for Watch Receiver " and 1 "Cord, Flexible, No. 205," may be used for making the line connections, but they are separate items, as are also the 2 Cells, Dry (X), used in connection with the set.

The 3-contact Key on the Micro Telephone must be depressed for both speaking and listening.

Calls are received on the Vibrator, or "Buzzer," which is in circuit when the 3-contact Key is in the normal position.



SPEAKING BATTERY, 2 DRY CELLS.

Plate 93.

Plate 93A.

T.L. Diagram No. 445.

**PORTABLE TELEPHONE, TYPE 2,
COMPLETE.****APPARATUS SCHEDULE.**

Telephone No. 44. The description includes a Telephone, No. 36 (Micro Telephone, with 3-contact key), Induction Coil $\frac{75}{1.7}$, Magneto Bell, 500 ohms; Generator, 500 ohms; Condenser, 1 m.f., and 2 dry cells, all of which are special to the instrument.

The connections of this telephone are so arranged that it can be used either on primary battery or C.B. circuits. The circuit is open, with the Magneto Bell and Condenser across the lines, until the press keys on the Micro-Telephone is operated. The battery is so placed that a conversation can be carried on between a lineman and a C.B. subscriber when the exchange battery is disconnected.

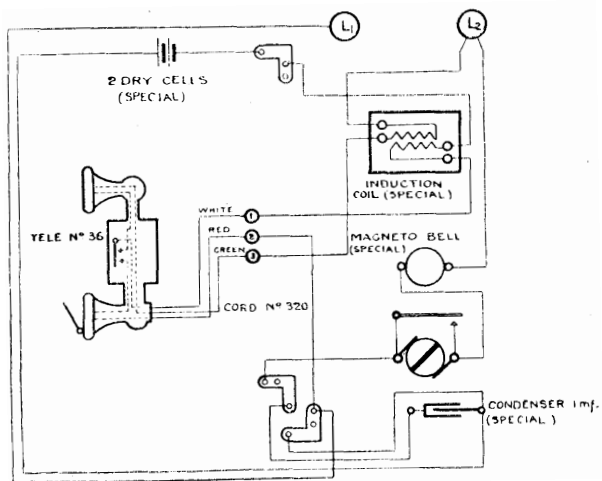
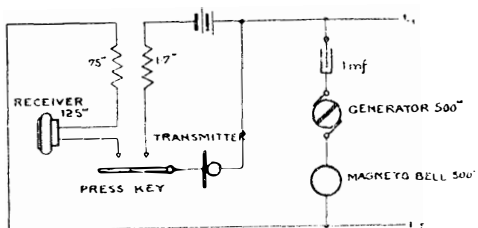


Plate 93A.

SECTION 2.

P.O. TELEPHONE WITH
MAGNETO BELL AND GENERATOR;
T.B.I. SWITCH.

Plate 94.

P.O. TELEPHONE, WITH MAGNETO BELL AND GENERATOR.

APPARATUS SCHEDULE.

Telephone No. 21.

Arm, Bell Receiver	} for Second Receiver,
Receiver, Bell, " D "	
Cord, Flexible, No. 222	

Bell, Magneto, 1,000 ohms.

Generator, Bracket, 3-terminal.

Magneto calling apparatus is sometimes used upon Coastguard and Public Office (Message) Circuits. The apparatus may also be used on other Telephone circuits (except Exchange Circuits) where Battery ringing is not specially required.

Not more than six Offices may be placed upon a circuit without special authority.

To ring, depress the Telephone Press Button, and turn the crank handle of the Generator continuously. If intermittent signals be required, turn the handle continuously and regulate signals by the Press Button. Jerking the handle of the Generator is liable to damage the gearing.

See also page 152.

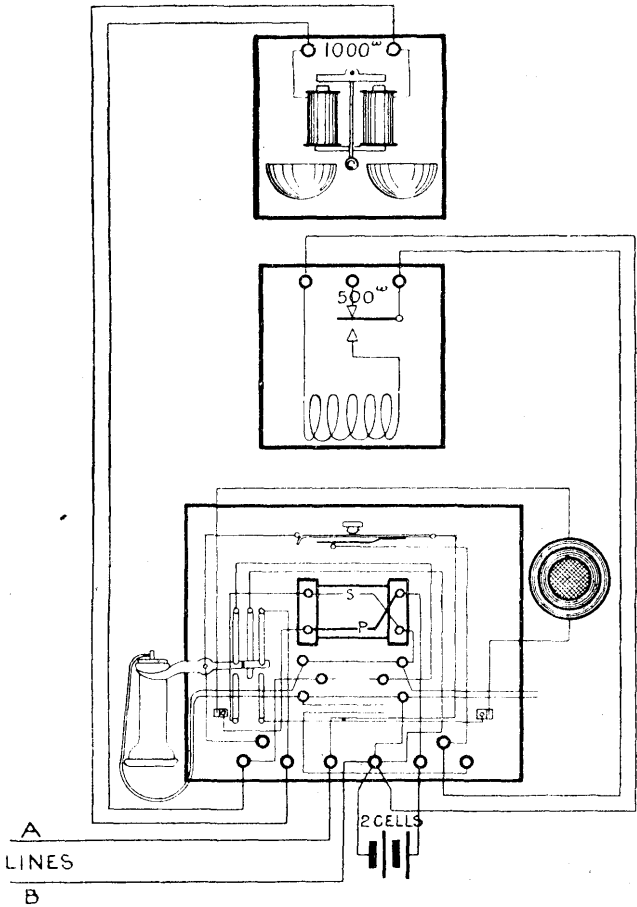


Plate 94.

Plate 95.

TELEPHONE BRIDGE INTERMEDIATE
SWITCH.

APPARATUS SCHEDULE.

Telephone No. 21.

Arm, Bell Receiver
Receiver, Bell, "D" } for Second Receiver,
Cord, Flexible, No. 222 } if required.

Relay, F, 100 ohms or 1,000 ohms, unmounted.

Switch, Bridge, Intermediate.

2 Bells, Trembler, with Indicators.

Coil, Resistance, Various (R).

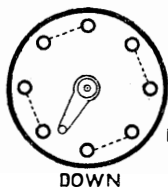
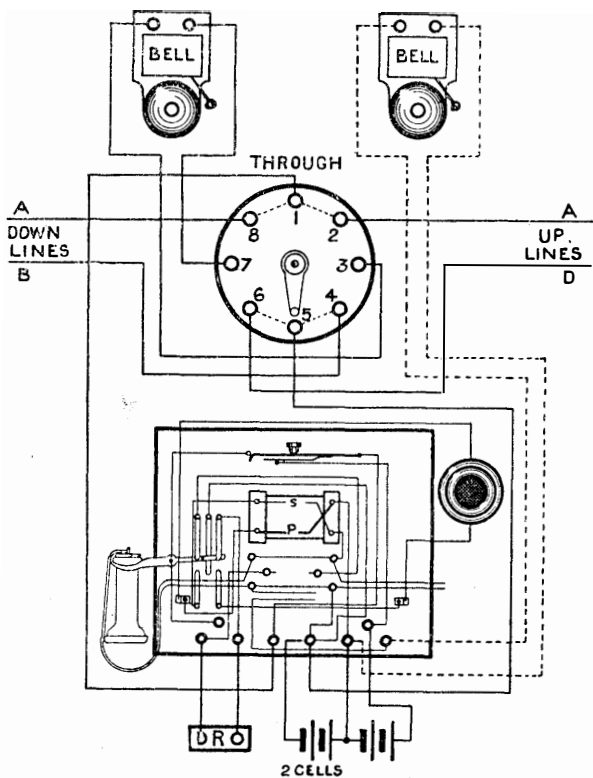
If a Balancing Resistance R is not required, the two Terminals of the Telephone to which it is usually connected should be joined direct.

When a Switch is used, if the Intermediate Office is off the Main Line, and has to be reached by a Branch, the Branch Line must consist of two wires for a single-wire circuit, and of four wires for a double-wire circuit.

In the through position the Telephone is placed in the circuit in "Bridge."

The same formation of Switch is used for single-wire circuits.

It is sometimes desired that the Intermediate Office Telephone may, for purposes of privacy, not be in circuit when the line is "through." In such case the *Telephone* and left-hand *Bell* connection on the Switch may be interchanged, so that the



SWITCH
POSITIONS FOR

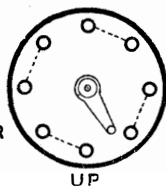


Plate 95.

Plate 95—cont.

Bell may be in circuit when the Switch is at "through"; in this case the Relay (mounted) should be used in the Bell instead of in the Telephone Circuit. The Balancing Resistance R (if any) must also be placed in the Bell Relay Circuit, instead of in the position shown.

The foregoing arrangements provide for Battery ringing, but Magneto working can be arranged on similar lines. On a Magneto system the Relay Terminals would be strapped across, and a Bell, Magneto, connected to Terminals 1 and 3 in place of R. A Bell, Magneto, would also take the place of the left-hand Bell, Trembler, whilst the Generator would be connected to Terminals 5 and 7 of the P.O. Telephone, as in the preceding Plate.

SECTION 3.

TELEGRAM CONCENTRATION●
SWITCH; SWITCHES AND KEYS

Plate 96.

T.L. Diagram No. 190.

SWITCHBOARD, MAGNETO (CONCENTRATION), $\frac{2 + 5}{7}$. FOR TELEGRAPH CIRCUITS
WORKED BY TELEPHONE.

APPARATUS SCHEDULE.

Switchboard, Magneto, (Concentration), $\frac{2 + 5}{7}$.

The description includes the Board, wired, and fitted with the following items:—

- 1 Indicator, N.P.C., 500 + 500 ohms, $\frac{5}{5}$, 6''.
- 1 Switchspring, 5-point, $\frac{5}{5}$, 6''.
- 1 Key, Type H 3 (oval), $\frac{5}{5}$, 6''.
- 2 Switchsprings, 5-point, with brass socket.
- 1 Strip, Cross Connection, 5 × 4.
- 1 Generator, Bracket, 3 terminals, unmounted.
- 1 Bell, Trembler, 3 terminals, Circular, 25 ohms.
- 1 Switch, Tumbler, 3 ampères (bronzed).
- 4 Plates, Cord Connection.
- 1 Coil, Induction, $\frac{150}{1}$.
- 1 Suspender for Micro Telephone.
- 3 Plates, Trembler Bell Connection.

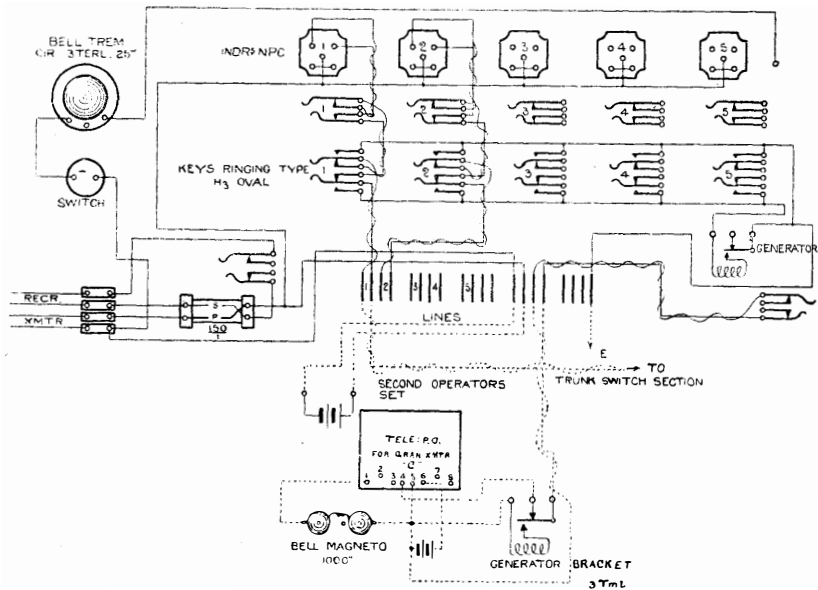


Plate 96.

Plate 96—cont.

SEPARATE ITEMS.

1 Telephone No. 28 (with hook).

1 Battery, Leclanché, Agglomerate, 6-block, 2-cell, No. 1, and the second operator's Complete Telephone Set as shown.

The dotted connections show the wiring that must be done locally.

If a circuit is associated with a local Switch Section, 50 Line, it should be terminated as an ordinary subscriber's line, and in this case the "B" side of the corresponding N.P.C. Indicator on the Magneto Switchboard should be earthed, and the inner "B" spring left disconnected. Terminal 3 of the P.O. Telephone (second operator's Set) should also be earthed.

These boards are made in three sizes, viz. : $\frac{2+5}{7}$, $\frac{4+7}{11}$, and $\frac{7+14}{21}$, the dimensions being similar to those of Switchboards, Magneto, (C.B.S.), shown in Plate 53. The sizes indicate wiring for 2 Telephone Sets and 5 line circuits, 4 Telephone Sets and 7 line circuits, and 7 Telephone Sets and 14-line circuits respectively, including in each case the Switchboard Telephone as a Telephone Set. The term "line circuits" includes the Switch Section circuit. On the larger boards a Switch Telephone Connector is fitted, and a Breastplate Transmitter and Headgear Receiver, associated with Cords, Flexible, No. 206, and a Peg, Circular, Double, take the place of the Micro Telephone shown in this Plate.

In all cases the operator's and Telephone Sets are separate items, as are also the pairs of Pegs, No. 201, with Cords 16'', by means of which the connections between the sets and line circuits are made.

For a full description of the various arrangements and methods of operating, *see* Circular Telephones (100), Monthly List, September, 1905.

Plate 97.**MISCELLANEOUS SWITCHES.**

The diagram shows the connections of the Switches in the various positions of the switch lever.

NAME OR TITLE	USE	E-IN-C DRAWING No	CONNECTIONS IN POSITIONS				SIZE
			1	2	3	4	
SWITCH 5 TERMINAL 4 POSITION	TESTING STATIONS ON PARIS TELEPHONE LINE	II 26					5 1/2
" 7 " 2 " A	CALL OFFICE TELEPHONES	IV 66					4
" 8 " 3	BRIDGE INTER:	II 29					5 3/4
" 8 " 3	BRIDGE INTER (OLD PATTERN)						5 3/4

NAME OR TITLE	USE	E-IN-C DRAWING No	CONNECTIONS IN POSITIONS				SIZE
			1	2	3	4	
SWITCH 9 TERMINAL 2 POSITION		810					4
" 10 " 2	EXCHANGE INTER (OLD PATTERN)	II 16					5 3/4
" 11 " 2 "	EXCHANGE INTER	II 29					5 3/4
" 4 " 3 "	DAY AND NIGHT						4 7/8 x 4 5/8

Plate 97.

Plate 98.

T.L. Diagram No. 53B.

TYPES OF UNION KEYS.

The Ebonite Barrel moves forward and presses against the Contact Springs when the key-handle is pushed back, and *vice versâ*. The diagrams provide for the Keys being pushed back to complete the "Speaking" connections, but the position of the Keys can be reversed, if required.

Column 1 shows the springs as viewed from the Key Plates.

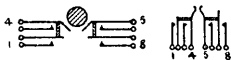
Column 2 shows the theoretical connections as represented on diagrams.

The numbers show the corresponding Springs in the two cases.

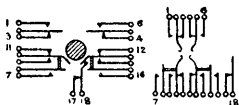
COLUMN 1 COLUMN 2



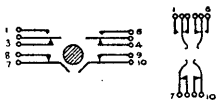
KEY TYPE U₁
(BLACK RED OR GREEN)



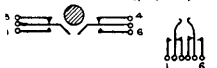
KEY TYPE U₂
(BLACK OR GREY.)



KEY TYPE U₃
(BLACK)

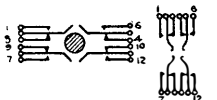


KEY TYPE U₄ (RED)

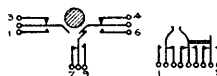


KEY TYPE U₅ (BLACK)

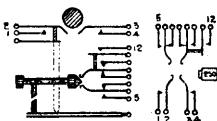
COLUMN 1 COLUMN 2



KEY TYPE U₁₁
(BLACK)

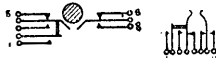


KEY TYPE U₁₂
(BLACK)



KEY TYPE U₁₃

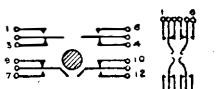
COLUMN 1 COLUMN 2



KEY TYPE U₆ (BLACK)



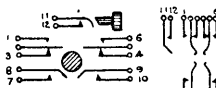
KEY TYPE U₇ (BLACK)



KEY TYPE U₈ (RED)

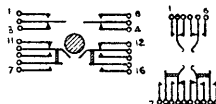


KEY TYPE U₉ (BLACK OR RED)

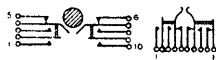


KEY TYPE U₁₀ (BLACK)

COLUMN 1 COLUMN 2



KEY TYPE U₁₄



KEY TYPE U₁₅



KEY TYPE U₁₆

PART VI.—TABLES.

SECTION 1.

OPERATING CURRENTS
OF INDICATORS, RELAYS, &c.

OPERATING PARTICULARS OF SOME OF THE TELEPHONE
INDICATORS, RELAYS, &C., IN COMMON USE.

Title.	Resistance.	Figures of Merit in Milliampères.
Indicators :—		
Type 34 - - -	$1,000\omega$	7·5
" 34D - - -	500ω	9
" 34B - - -	300ω	12
" 39 - - -	$1,000\omega + 1,000\omega$	10 (through 1 coil).
" 41B - - -	$100\omega + 100\omega$	15 (coils in series).
" 6A - - -	33ω (50 ω with 500ω shunt).	20
" 22A - - -	$600\omega + 45\omega$	7·5 (line coil). 40 (restoring coil).
Self-restoring - - -	$1,000\omega + 450\omega$	5 (line coil), 20 (restoring coil).
Switchspring, Type H 1.	$1,000\omega$	8
Switchspring, Type H 2.	$500\omega + 500\omega$	8 (coils in series).
Polarised No. 2 - - -	$1,000\omega$	3 (holds shutter up).
Non-polarised - - -	100ω	11·5
" - - -	$1,000\omega$	5
" C. - - -	$500\omega + 500\omega$	6 (coils in series).
Galvanometer, Tele- phone Exchange.	$500\omega + 500\omega$	3 " "
Relays :—		
E 1 - - -	$50\omega + 50\omega$	12 " "
" - - -	$100\omega + 100\omega$	9 " "
" - - -	$200\omega + 200\omega$	6 " "
" - - -	$500\omega + 500\omega$	4 " "
" - - -	$1,000\omega + 1,000\omega$	3 " "
" - - -	$4,000\omega$	1·5
E 2 - - -	$500\omega + 500\omega$	3 (coils in series).
F - - -	100ω	6
.. - - -	$1,000\omega$	2

H 1	-	-	-	$5\omega + 5\omega$	30 (coils in series).
"	-	-	-	$100\omega + 100\omega$	9 " "
"	-	-	-	$500\omega + 500\omega$	4 " "
"	-	-	-	$1,000\omega + 1,000\omega$	2.5 " "
"	-	-	-	$1,800\omega + 3,000\omega$	2.5 " "
					3 (1,800 ω coil),
					20 (3,000 ω coil
					platinoid wind-
					ing).
H 3	-	-	-	60ω	12
H 4	-	-	-	30ω	38
I polarised	-	-	-	$500\omega + 500\omega$	2 (coils in series).
I non-polarised	-	-	-	$500\omega + 500\omega$	2 " "

OPERATING PARTICULARS OF SOME OF THE TELEPHONE INDICATORS, &c.—*cont.*

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Title.	Resistance.	Operating Current in Milliampères.	Releasing Current in Milliampères.	Remarks.
Relay:—				
Type 101J -	60 ω	20	2	Line Relay C.B.
.. 111C -	30 ω	73	63	Cut-off Relay C.B.
.. 118AG -	0.45 ω	80	23	Pilot " "
.. 118AE -	12.5 ω	15	3	Cord circuits, C.B. Ex.
.. 107G -	200 ω + 200 ω	22 (Inner winding). 20 (Outer winding).	19.5 18	Tripping Relay machine ringing.
.. 108D -	12,000 ω + 27 ω	1.5 (12,000 ω coil). 27 (27 ω coil)	0.4 7	
.. 122AB -	350 ω	26	9	" "
.. 122E -	83.5 ω	57	50	" "
.. 2001B -	200 ω + 200 ω	12	—	Private Branch Ex. Swbds., C.B.
Meters:—				
Type 5A -	500 ω + 40 ω	40	37	Subscribers.
.. 5B -	0.25 ω	1.1 ampère	1 ampère (will not operate).	Effective Meter.
.. 5C -	500 ω	40 milliampères	37 milli-amps. (will not operate).	Ineffective Meter.
Relays G 100A and G 101A.	200 ω + 200 ω	18 milliampères	3.5	General Electric Coy.'s Line and Supervisory Relays.

OPERATING PARTICULARS OF SOME OF THE TELEPHONE INDICATORS, &c.—*cont.*

Title.	Resistance.	Operating Current in Milliampères.	Time.	Remarks.
Heat Coils A (green)	4·5 ω to 5·5 ω	500	15 to 60 secs.	{ Standard type for all telephone circuits, and all telegraph circuits except C.B. and A.B.C.
„ B (red) -	3·5 ω to 4·1 ω	500	Less than 210 secs.	
„ A (blue) -	13 ω to 16 ω	250	15 to 60 secs.	{ Standard type for C.B. and A.B.C. telegraph circuits.
„ B (black)	28·5 ω to 31·5 ω	170	Less than 210 secs.	
„ A (black)	25 ω	250	30 secs.	
„ A (red) -	7·5 ω to 8·5 ω	500	15 to 60 secs.	

It is important that the same type of Heat Coil should be fitted on both wires of telephone circuits.

SECTION 2.
SWITCHBOARD CABLES.

SWITCHBOARD CABLES, $\frac{N}{W}$.

Two insulated conductors of the particular colours indicated to be symmetrically twisted together with a 3-inch right-hand lay except where otherwise required.

The cables are to be of the section and dimensions hereinafter indicated, and to be formed of cores laid up as described. The paired conductors to be laid up in the cores with an 8-inch left-handed lay.

A 21-wire round cable to consist of 21 singles, the differently coloured conductors as shown in column 1, or the differently coloured conductors as shown in column 3, as may be demanded, laid up in one core.

A 42-wire oval cable to consist of 21 pairs; the differently coloured conductors as shown in column 1 paired with white.

The cable to consist of three cores laid side by side, each core formed of seven pairs as follows:—pairs 1 to 7 inclusive laid up in one core, pairs 8 to 14 inclusive in the second core, and pairs 15 to 21 inclusive in the third core.

A 63-wire oval cable to consist of 21 pairs, the differently coloured conductors as shown in column 1 paired with white, and 21 singles, the differently coloured conductors threaded with red as shown in column 3.

The cable to consist of three cores laid side by side, arranged as follows:—pairs 1 to 11 inclusive laid up in one core, and pairs 12 to 21 inclusive in another core, and between these is to be placed a core made up of the 21 singles.

An 84-wire oval cable to consist of 42 pairs, as follows:—the 21 differently coloured conductors,

as shown in column 1, paired with white, and the 21 differently coloured conductors threaded with red, as shown in column 3, paired with red.

The cable to consist of all the pairs laid up in one core in such a manner that the red conductors come in the centre of the cable.

A 63-wire flat cable, to consist of 21 triplets, the coloured conductors, as shown in column 1, and the correspondingly coloured conductors, threaded with red, as shown in column 3, to be twisted together with a white conductor so as to form the triplets. The triplets so formed to be laid up round a press board tape 1 inch by $\cdot 02$ inch, so as to form a single flat core.

Table I.

DIAMETER AND RESISTANCE OF CONDUCTORS.

Weight per Mile of Conductor.	Diameter.		Maximum Resistance per Statute Mile of Cable at 60° F.
	Minimum.	Maximum.	
Lbs.	Mils.	Mils.	Standard ohms.
9 $\frac{1}{4}$	23 $\frac{1}{2}$	24 $\frac{1}{2}$	95·87
12 $\frac{1}{2}$	27 $\frac{1}{2}$	28 $\frac{1}{2}$	70·96

NOTE.—To allow for variation of gauge and the tinning, the maximum resistance here specified is 3 per cent. higher than that of a pure copper wire of the standard weight.

Table II.

EXTERNAL DIMENSIONS OF CABLES.

Type of Cable.	For Cables containing $9\frac{1}{4}$ lb. Conductors. (S.W.G. No. 23.)			For Cables containing $12\frac{1}{2}$ lb. Conductors.		
	Maximum Width.	Maximum Thickness.	Maximum Girth.	Maximum Width.	Maximum Thickness.	Maximum Girth.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42-wire oval	·750	·350	1·900	·800	·400	2·150
63-wire oval	·820	·420	2·250	·900	·500	2·500
84-wire oval	·900	·550	2·500	1·000	·600	2·850
63-wire flat	1·250	·320	3·000	—	—	—
21-wire round	—	Diameter. ·400	—	—	—	—

Table III.

COLOUR SCHEME OF SWITCHBOARD CABLES.

Pairs.		Pairs.	
Col. 1.	Col. 2.	Col. 3.	Col. 4.
1 Blue - -	White.	22 Red Blue - -	Red.
2 Orange - -	..	23 Red Orange - -	..
3 Green - -	..	24 Red Green - -	..
4 Brown - -	..	25 Red Brown - -	..
5 Slate - -	..	26 Red Slate - -	..
6 Blue White - -	..	27 Red Blue White - -	..
7 Blue Orange - -	..	28 Red Blue Orange - -	..
8 Blue Green - -	..	29 Red Blue Green - -	..
9 Blue Brown - -	..	30 Red Blue Brown - -	..
10 Blue Slate - -	..	31 Red Blue Slate - -	..
11 Orange White - -	..	32 Red Orange White - -	..
12 Orange Green - -	..	33 Red Orange Green - -	..
13 Orange Brown - -	..	34 Red Orange Brown - -	..
14 Orange Slate - -	..	35 Red Orange Slate - -	..
15 Green White - -	..	36 Red Green White - -	..
16 Green Brown - -	..	37 Red Green Brown - -	..
17 Green Slate - -	..	38 Red Green Slate - -	..
18 Brown White - -	..	39 Red Brown White - -	..
19 Brown Slate - -	..	40 Red Brown Slate - -	..
20 Slate White - -	..	41 Red Slate White - -	..
21 Red - -	..	42 Red White - -	..

Columns 1, 2, 3, and 4 make an 84-wire cable.

Columns 1, 2, and 3 make a 63-wire cable.

Columns 1 and 2 make a 42-wire cable.

Column 1 or column 3 makes a 21-wire cable.

LIST OF TELEPHONES.

The following list gives the designations of all Telephones stocked by the Department, and includes also the titles under which the sets were previously known. In addition each Instrument has a "Mark" Number which designates the exact details of its construction, and which does not form part of the stock title.

Odd numbers have been allocated to Wall Telephones and even numbers to Table Telephones. The original titles have been retained on the plates, but the new designations are quoted in the letterpress for the purpose of identification.

Wall Telephones.

Title.	Previous Title.
Telephone—	
No. 1 - -	Telephone, Wall, C.B., complete.
No. 1 incomplete	Telephone, Wall, C.B.
No. 3 - -	Telephone, Wall, with Magneto Bell, complete.
No. 3 incomplete	Telephone, Wall, with Magneto Bell.
No. 3 - -	Telephone, Wall, with Magneto Bell, Type 2, complete.
No. 3 incomplete	Telephone, Wall, with Magnetic Bell Type 2.
No. 5 - -	Telephone, Wall, C.B., intermediate with Generator, complete.
No. 5 incomplete	Telephone, Wall, C.B. intermediate with Generator.
No. 7 incomplete	Telephone, Wall, C.B., with Rotary Key.
No. 7 - -	Telephone, Wall, C.B., with Rotary Key, complete.
No. 9 incomplete	Telephone, Wall, C.B., party line.
No. 9 - -	Telephone, Wall, C.B., party line, complete.
No. 11 incomplete	Telephone, Wall, with Magneto Bell and Generator.

Title.	Previous Title.
Telephone— <i>cont.</i>	
No. 11 - -	Telephone, Wall, with Magneto Bell and Generator, complete.
No. 11 incomplete	Telephone, Wall, with Magneto Bell and Generator, Type 2.
No. 11 - -	Telephone, Wall, with Magneto Bell and Generator, Type 2, complete.
No. 13 incomplete	Telephone, Wall, Intermediate, with Magneto Bell and Generator.
No. 13 - -	Telephone, Wall, Intermediate, with Magneto Bell and Generator, complete.
No. 13 incomplete	Telephone, Wall, Intermediate, with Magneto Bell and Generator, Type 2.
No. 13 - -	Telephone, Wall, Intermediate, with Magneto Bell and Generator, Type 2, complete.
No. 15 incomplete	Telephone, Wall, Intermediate, with Magneto and Trembler Bells and Generator.
No. 15 - -	Telephone, Wall, Intermediate, with Magneto and Trembler Bells and Generator, complete.
No. 15 incomplete	Telephone, Wall, Intermediate, with Magneto and Trembler Bells and Generator, Type 2.
No. 15 - -	Telephone, Wall, Intermediate, with Magneto and Trembler Bells and Generator, Type 2, complete.
No. 17 incomplete	Telephone, P.O., G.T.A.
No. 17 - -	Telephone, P.O., G.T.A., complete.
No. 19 incomplete	Telephone, P.O., G.T.B.
No. 19 - -	Telephone, P.O., G.T.B., complete.
No. 21 incomplete	Telephone, P.O., G.T.C.
No. 21 - -	Telephone, P.O., G.T.C., complete.
No. 21 incomplete	Telephone, P.O., with Inset Transmitter.
No. 21 - -	Telephone, P.O., with Inset Transmitter, complete.
No. 23 - -	Telephone, P.O., with Magneto Bell.
No. 25 - -	Telephone, P.O., with Magneto Bell and Generator.

Title.	Previous Title.
Telephone— <i>cont.</i>	
No. 27 - -	Telephone, G.B., incomplete, House for S.R.
No. 29 - -	Telephone, House, Wall, 3-terminal.
No. 31 - -	Telephone, House, Wall, 4-terminal.
No. 33 - -	Telephone, House, Wall, Intercommunication, 5-way.
No. 35 - -	Telephone, House, Wall, Intercommunication, 10-way.
No. 37 - -	Telephone, House, Wall, Intercommunication, Secret 1-way.
No. 39 - -	Telephone, House, Wall, Intercommunication, Secret 5-way.
No. 41 - -	Telephone, House, Wall, Intercommunication, Secret 10-way.
No. 43 - -	Telephone, House, Wall, Intercommunication, Secret 15-way.
No. 45 - -	Telephone, House, Wall, Intercommunication, Secret 20-way.
No. 47 - -	Telephone, Fire, P.O.

Table Telephones.

Telephone—	
No. 2 incomplete	Telephone, Table, C.B., Transmitter type, Types 20 and 2602.
No. 2 - -	Telephone, Table, C.B., Transmitter type, Types 20 and 2602, complete.
No. 4 incomplete	Telephone, Table, P.B., Transmitter type.
No. 4 - -	Telephone, Table, P.B., Transmitter type, complete.
No. 6 incomplete	Telephone, Table, C.B., Transmitter type, Intermediate with Generator.
No. 6 - -	Telephone, Table, C.B., Transmitter type, intermediate with Generator, complete.
No. 8 incomplete	Telephone, Table, C.B., Intermediate with Generator.
No. 8 - -	Telephone, Table, C.B., Intermediate with Generator, complete.

Title.	Previous Title.
Telephone— <i>cont.</i>	
No. 10 incomplete	Telephone, Table, C.B., Transmitter type, with Press Button.
No. 10 - - -	Telephone, Table, C.B., Transmitter type, with Press Button, complete.
No. 12 incomplete	Telephone, Table, C.B., Micro type.
No. 12 - - -	Telephone, Table, C.B., Micro type, complete.
No. 14 incomplete	Telephone, Table, Transmitter type, with Generator.
No. 14 - - -	Telephone, Table, Transmitter type, with Generator, complete.
No. 16 incomplete	Telephone, Table, with Generator B.
No. 16 - - -	Telephone, Table, with Generator B, complete.
No. 18 incomplete	Telephone, Table, with Generator.
No. 18 - - -	Telephone, Table, with Generator, complete.
No. 20 incomplete	Telephone, Table, with Tumbler Bell A.
No. 20 - - -	Telephone, Table, with Tumbler Bell A, complete.
No. 22 incomplete	Telephone, Table, with Tumbler Bell B.
No. 22 - - -	Telephone, Table, with Tumbler Bell B, complete.
No. 24 incomplete	Telephone, Table, without Bell.
No. 24 - - -	Telephone, Table, without Bell, complete.
No. 26 incomplete	Telephone, Table, with Magneto Bell.
No. 26 - - -	Telephone, Table, with Magneto Bell, complete.
No. 28 - - -	Telephone, Micro.
No. 28 (with loop)	Telephone, Micro, with loop suspension.
No. 28 (with hook)	Telephone, Micro, with hook suspension.
No. 30 - - -	Telephone, Micro, House, with Press Key.
No. 32 - - -	Telephone, Micro, House, without Press Key.
No. 34 - - -	Telephone, Micro, with 3-contact Key (for Telephone No. 42).

Title.	Previous Title.
Telephone-- <i>cont.</i>	
No. 36 - -	Telephone, Micro, with 3-contact Key (for Telephone No. 44).
No. 38 - -	Telephone, Micro, C.B.
No. 38 (with hook)	Telephone, Micro, C.B., with hook.
No. 40 incomplete	Telephone, Micro, P.O., incomplete.
No. 42 - -	Telephone, Portable, complete.
No. 44 - -	Telephone, Portable, complete, Type 2.
No. 46 - -	Telephone, House, Table, 3-terminal.
No. 48 - -	Telephone, House, Table, 4-terminal.
No. 50 - -	Telephone, House, Table, Intercommunication, 5-way.
No. 52 - -	Telephone, House, Table, Intercommunication, 10-way.
No. 54 - -	Telephone, House, Table, Intercommunication, Secret 1-way.
No. 56 - -	Telephone, House, Table, Intercommunication, Secret 5-way.
No. 58 - -	Telephone, House, Table, Intercommunication, Secret 10-way.
No. 60 - -	Telephone, House, Table, Intercommunication, Secret 15-way.
No. 62 - -	Telephone, House, Table, Intercommunication, Secret 20-way.
No. 64 - -	Adjustaphone, C.B., complete.
No. 66 - -	Telephone, Micro, Portable, complete.