

The utilization of existing telegraph lines as a part or the whole of a circuit for buzzer and telephone working, at the same time not interfering with the use of the wire for Morse working, may be effected by using condensers interposed between the line and the buzzer. (See fig. 3-29.)

The pulsations of the ordinary Morse sending are comparatively slow. The condensers, therefore, act as a very large resistance, and no appreciable effect will be noticed in the telegraph line.

The very rapid pulsations produced by the buzzer or transmitter, however, will permit of transmission from one buzzer to the other with little diminution of sound.

Figure 3-30 shows the circuits of the service buzzer. It will be noted that with the field buzzer if a line of low insulation resistance is utilized a heavy drain on the battery will ensue, due to battery being connected to the line, while with the service buzzer under like conditions a heavy drain will not exist, due to battery being connected in a local circuit which does not physically connect with line. It will also be noted that a condenser which can be cut out by means of a short-circuiting switch is contained in the instrument and connected in series with the line. This condenser is for use when it is desired to use an existing telegraph line. (See fig. 3-29.) Two units of tungsten type A dry battery are used with the service buzzer for furnishing the necessary primary current, both being in circuit when sending telegraphic signals, and one only being in transmitter circuit for telephone communication.

The circuits of the service buzzer may be classed as follows:

- Primary sending circuit—telegraph.
- Secondary sending circuit—telegraph.
- Receiving circuit—telegraph.
- Primary sending circuit—telephone.
- Secondary sending circuit—telephone.
- Receiving circuit—telephone.

These circuits may be traced as follows, reference being made to figure 3-30:

#### PRIMARY SENDING CIRCUIT—TELEGRAPH.

*S. P. D. T.* knife switch marked "*Sw*" must be closed on side marked "buzzer." Upon depressing key *K*, circuit is as follows: Positive end of battery, through primary of induction coil, to *A* to *B*, contact 1 of key, lever of key, contact 2, vibrator, to negative end of battery.

#### SECONDARY SENDING CIRCUIT—TELEGRAPH.

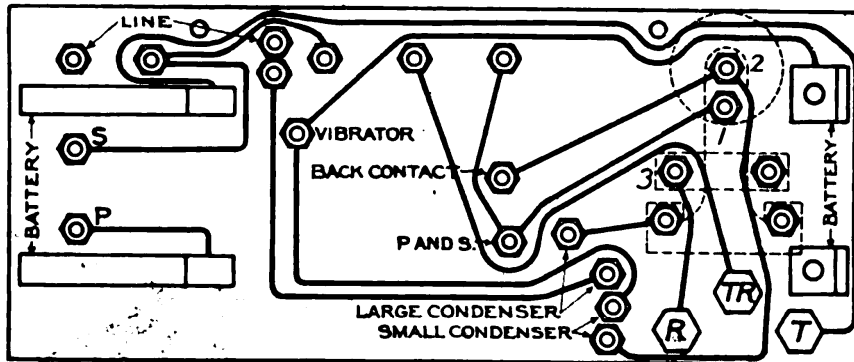
*S. P. D. T.* knife switch marked "*Sw*" is closed on side marked "buzzer." An A. C. current of high E. M. F. is induced in secondary winding of induction coil by interrupted current in primary and its path is as follows: *G*, earth or one side of line (if metallic circuit is used); "receiving circuit, telegraph" of distant buzzer, other side of line, *L*, contact 1 of key (key is depressed), *B*, *A*, other side of secondary winding of induction coil.

#### RECEIVING CIRCUIT—TELEGRAPH.

*S. P. D. T.* knife switch marked "*Sw*" is closed on side marked "buzzer." A. C. current of high E. M. F. reaches *L* from distant instrument by one side of line, contact 3 of key (key raised), receiver, *C*, switch marked "*Sw*," *G*, other side of line to distant instrument.

PRIMARY SENDING CIRCUIT—TELEPHONE.

*S. P. D. T.* knife switch marked "*Sw*" is closed on side marked "talk"; from positive end of battery through primary winding of induction coil, to *A*, to *B*, through blade of switch marked "*Sw*" to *C*, through push-button switch marked "*PB*," through transmitter to negative side of one unit of the tungsten type A battery.



BOTTOM VIEW OF BACKBOARD SHOWING WIRING

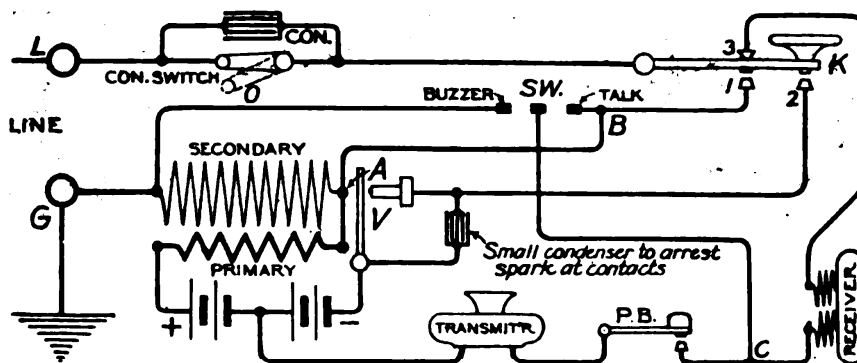


Fig. 3-30.—BUZZER, SERVICE, CIRCUITS.

SECONDARY SENDING CIRCUIT—TELEPHONE.

*S. P. D. T.* knife switch marked "*Sw*" is closed on side marked "talk." When sound waves fall upon diaphragm of transmitter, an alternating current of high E. M. F. is induced in secondary winding of induction coil. Starting with secondary of induction coil, to *G*, to earth or one side of line (if metallic circuit be used), through "receiving-circuit-telephone" of distant instrument, returning on other side of line, to *L*, through contact 3 of key marked "*K*" (key raised), to receiver, to *C*, to switch marked "*Sw*," through blade of this switch to *B*, to *A*, to other side of secondary winding of induction coil.

RECEIVING CIRCUIT—TELEPHONE.

*S. P. D. T.* knife switch marked "*Sw*" is closed on side marked "talk." An alternating current of high E. M. F. induced in the secondary winding of induction coil in distant instrument, reaches buzzer over outside line, to *L*, thence to contact 3 of key marked "*K*," to receiver, to *C*, to switch marked "*Sw*," through blade of this switch to *B*, to *A*, through secondary winding of induction coil to *G*, to earth or line (if metallic circuit be used), to distant buzzer.

When an existing telegraph line is utilized, the switch marked "*con sw*" should be thrown to the "O" position in order that the condenser "*Con*" will be placed in the circuit.

The service buzzer is shown in accompanying figures 3-31 and 3-32, it being shown dismantled in figure 3-32 to facilitate preparation of requisitions for renewal parts.

The instrument is contained in an aluminum case fitted with a hinged cover, both of which are covered externally with a russet-colored, smooth-finish leather which is neatly sewed and riveted in place. The overall outside dimensions of the case are approximately 3½ by 5½ by 7½ inches. The two units of Tungsten type A battery are contained in a chamber located in the bottom and are accessible without opening main cover, there being an additional small hinged cover in one end of case which is fastened securely, when closed, by a substantial spring clip, and by a flap of leather.



Fig. 3-31.—BUZZER, SERVICE.

The instrument may be operated with both covers closed, which is highly advantageous in inclement weather. To accomplish this there is a suitable opening for leading out the cords to receiver and transmitter, and in main cover, directly over the sending key, is a round aperture which is made moisture-proof by means of a covering of extremely flexible pigskin. The sending key can be readily operated through this flexible pigskin.

The sending key, induction coil, condensers, plug jack, transfer switch, vibrator, and binding posts for transmitter and receiver cords are mounted upon a common base of hard rubber. Wiring to the component parts is routed in the underside of this base, which is mounted in the front of the case above the battery chamber previously mentioned. In the rear of the instrument is a compartment of leather for containing the transmitter, receiver, and cord for connecting them. At one end of this chamber, neatly mounted on a hard rubber strip, is a socket wrench for adjusting the nuts which secure the transmitter and receiver terminals, also two screw drivers—one large and one small—which are so constructed that the shanks may be inserted in the end of socket wrench, thereby using socket wrench as a handle.

Invariably there is furnished with this instrument a two-conductor cord, approximately 5 feet long, one end of which is equipped with a substantial plug

similar to those used in connection with telephone switchboards. At other end one of the conductors is equipped with a Williams test clamp for connection to line, the other conductor being equipped with a Signal Corps type D ground rod. The Williams test clamp is so constructed that to attach to line, it is merely necessary to compress the two principal parts, releasing them when line has been inserted in space provided. One side of this clamp is equipped with an 11-point stud securely threaded to test clamp. These points make excellent contact on line, regardless of whether the line be insulated or not. By this means a quick connection can be made to buzzer wire or field wire which is insulated, and when the clamp is removed the abrasion to insulation is negligible. There is an opening in the case of buzzer through which the plug is inserted when connection is desired, and when plug is so inserted, it makes a positive connection by means of a substantial jack mounted on the base as previously indicated.

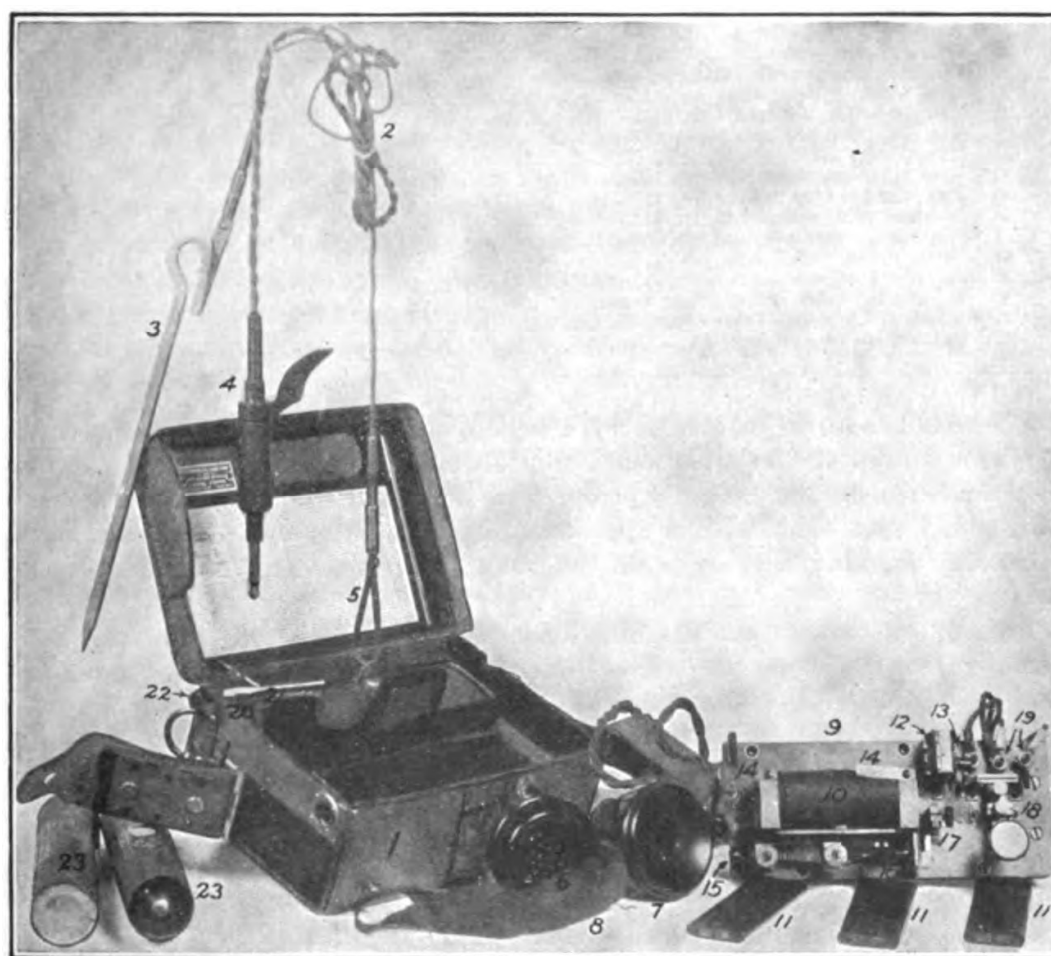


Fig. 3-32.—BUZZER, SERVICE, DISMANTLED.

Part No.	Name.	Reference No.
1	Case, complete.....	1
2	Cover for case, complete.....	
3	Door, battery, complete with hinges.....	
4	Case, leather, for transmitter and receiver.....	
5	Carrying strap.....	
6	Main cord with terminals.....	2
7	Ground rod, type D.....	3
8	Plug.....	4

(Continued on next page.)

## Parts list—Continued.

Part No.	Name.	Reference No.
9	Plug, fiber cups for.....	
10	Connector, type A.....	5
11	Transmitter.....	6
12	Transmitter, cap for.....	
13	Receiver.....	7
14	Receiver, cap for.....	
15	Head band, complete.....	8
16	Base.....	9
17	Base, holding screws for.....	
18	Induction coil, complete.....	10
19	Condensers (3 to a set).....	11
20	Condensers, connecting blocks for.....	12
21	Condensers, short-circuit switch, complete.....	13
22	Condensers, holding clip.....	14
23	Jack, plug, complete.....	15
24	Jack, spring for.....	
25	Switch, transfer, complete.....	16
26	Vibrator, complete (11 pieces).....	17
27	Vibrator screw, clamp.....	
28	Vibrator screw, contact.....	
29	Vibrator tongue with platinum contact.....	
30	Key, sending, complete.....	18
31	Key, lever for, without button.....	
32	Key, supports and screws.....	
33	Key, spring for.....	
34	Key, adjusting screw for.....	
35	Key, hard rubber button for.....	
36	Binding post, complete.....	19
37	Binding post, screws and washers for.....	
38	Screw driver, large.....	20
39	Screw driver, small.....	21
40	Handle for screw drivers, and wrench.....	22
41	Battery, Tungsten, type A (2 units to a set).....	23
42	Battery spring and support.....	

The case has an adjustable carrying strap, one end of which is equipped with a snap connection, the other end being sewed to hinged fitting on case. The instrument, including carrying strap, type D ground rod, Williams test clamp, plug and 5-foot cord, weighs approximately 5 pounds, and full directions for operation, together with a circuit diagram, are attached to the inside of main cover.

Figure 3-33 shows the circuits employed in sending and receiving Morse signals by means of service buzzers. It will be noted that a single conductor is used to connect the two instruments, and that the earth is used for other conductor of the circuit. This is the customary manner of connecting two or more service buzzers in the field.

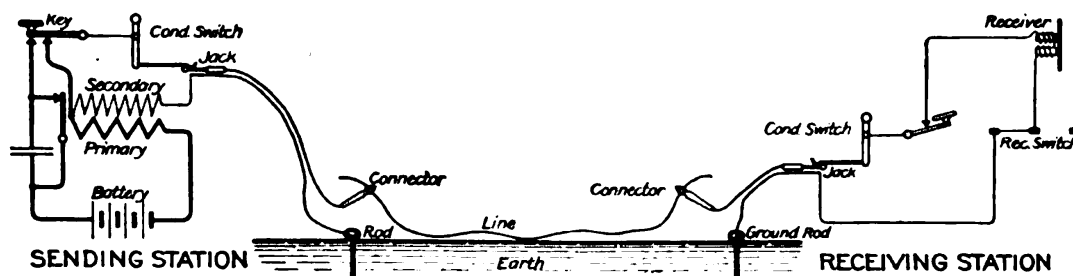


Fig. 3-33.—BUZZER, SERVICE, SENDING AND RECEIVING MORSE SIGNALS, CIRCUITS EMPLOYED.