

**Some Auxiliary Apparatus.**

A 27-B condenser with a capacity of 1 microfarad and built to stand a potential of 1,000 volts is bridged across each telegraph instrument on the composite system. This condenser acts as a path for telephone talking and signalling currents, instead of having to pass through the impedance of the relays and be interrupted whenever a telegraph message is being sent.

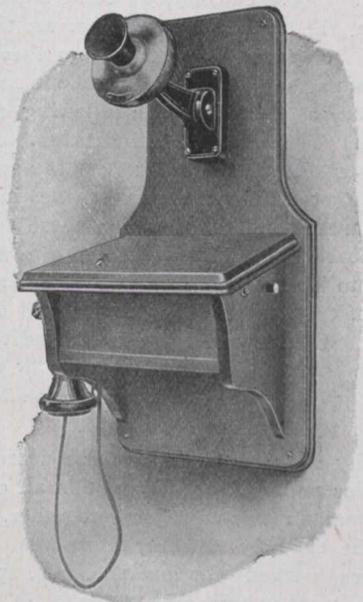
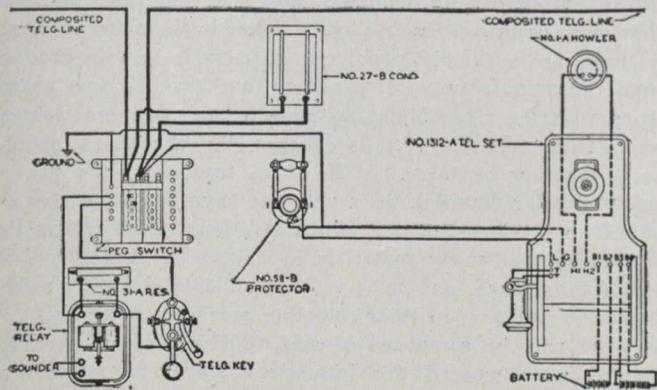


Fig. 2.—Telephone Set Closed.

The 31-A resistance across the relay is of high resistance but low inductance and so any currents from the telephones that happen to pass around the condensers go through these resistance and prevent any disturbance in the relay.

**Signalling.**

Different methods have been used for signalling purposes in connection with the telephones. Bells and hand generators are not used, but in their place, there is with every set what is commonly called a howler. It is just a special type of telephone receiver with an adjustable diaphragm, and shown in Fig. 4. The call given by the howler



INTERMEDIATE TELEGRAPH AND TELEPHONE STATION RAILWAY COMPOSITE SYSTEM.

Fig. 3.

is a whistle or shriek, whose tone can be adjusted to any pitch by the adjustment of the diaphragm. In each composite set an interrupter on the induction coil is used to furnish a high frequency signalling current from a small battery of dry cells. A push button on the side of the 1312-A wall

set allows the person calling to ring any code with the greatest ease.

This covers in a very general way the main features of the system.

**Special Conditions.**

Since every telegraph line has its own peculiar conditions, the manufacturers of composite apparatus should always be consulted as to the best arrangement possible for each case. Of course, conditions such as length of line, kind of wire, etc., are all fundamental points in the question. Many roads using composite systems are experiencing the



Fig. 4.—Howler.

greatest satisfaction on lines 100 miles in length. On lines using duplex or quadruplex circuits, or where machine sending is used, the composite system is not ordinarily recommended.

**Simplex System.**

The Simplex is the circuit that was contrasted with the Composite in the first of this article. Its operation is more commonly understood than is the composite, and effects the same result, viz., simultaneous telegraphy and telephony. However, it uses two wires as on the ordinary metallic telephone circuit. Hence, the telephone line may be transposed in this arrangement for the prevention of disturbances due to neighboring telephone, telegraph or high tension lines. A diagram of connections is shown in Fig. 5, and illustrates the "Repeating Coil Simplex" which is the type commonly in use.

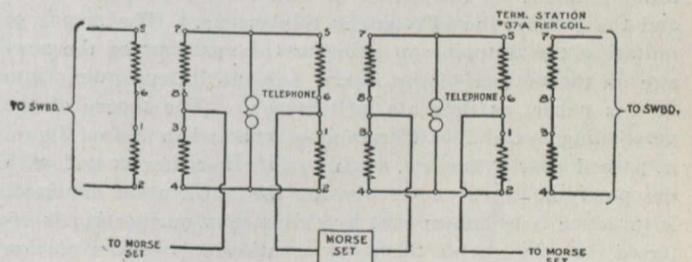


Fig. 5.—Simplex Circuits.

In its operation, the telegraph currents traverse the two wires and two winding of each coil as parallel branches of the one circuit. The telephone currents are repeated through the different repeating coils just as the currents of a lighting transformer are. Upon the efficiency of this repeating coil for voice currents depends the transmission of the conversation.

The telephones used with this circuit are the ordinary bridging instruments, and ringing is done as in the ordinary magneto instrument. This circuit may be connected directly to a telephone switchboard. With Composite systems the use of the howler prevents this arrangement.

**General Application.**

Summarizing, Composite circuits are used on lines designed primarily for telegraph work and afterwards adapted to the telephone. Simplex circuits are the converse where telephone lines are adapted to purposes of telegraphy. This is not a rigid classification, as the use of either system depends on the conditions found in each particular case, but it will aid in a general understanding of the use of each.