

H. A. AFFEL.
CARRIER TELEGRAPH CIRCUIT.
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1,402,991.

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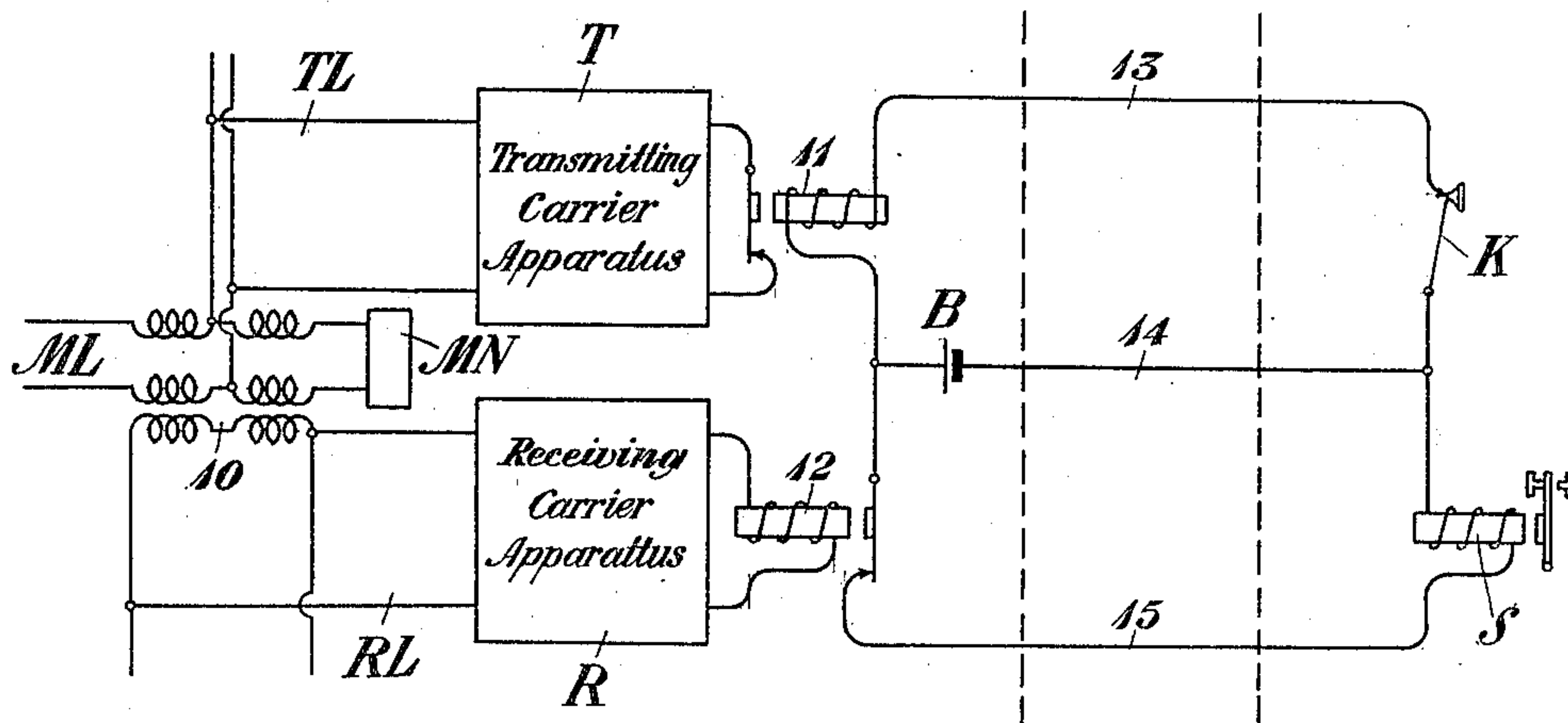


Fig. 1

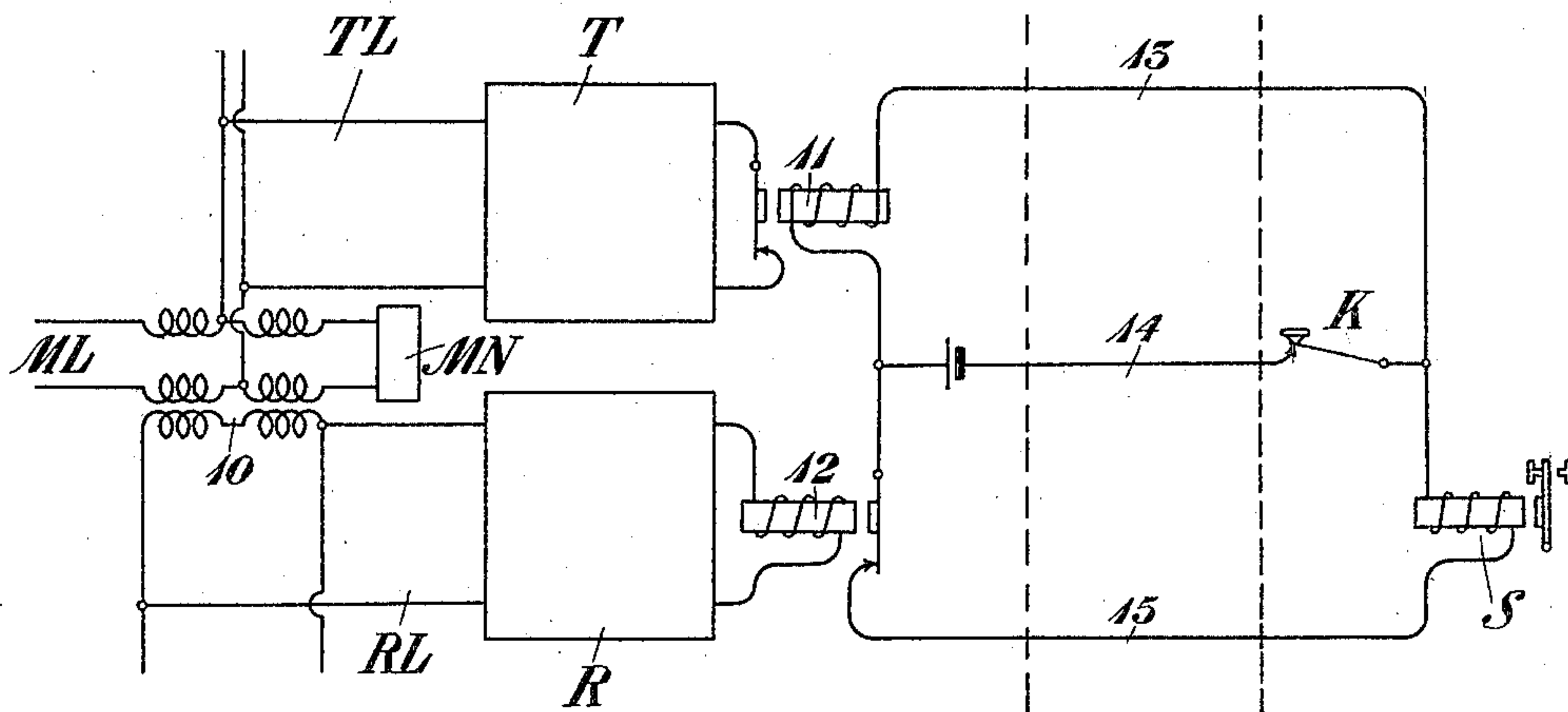


Fig. 2

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CARRIER TELEGRAPH CIRCUIT.

1,402,991.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HERMAN A. AFFEL, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Carrier Telegraph Circuits, of which the following is a specification.

This invention relates to signaling systems and, more particularly, to signaling systems in which telegraph signals are transmitted by means of carrier currents.

One of the objects of this invention is to provide an arrangement whereby carrier signals may be translated into carrier frequencies for transmission and whereby received carrier frequencies may be translated into low frequency telegraph signals. A further object of the invention is to provide a system of the character above described, in which the telegraph apparatus shall be as simple as possible, and the number of relays shall be reduced to a minimum.

Other and further objects of the invention will be clear from the following description, when read in connection with the accompanying drawing, Figures 1 and 2 of which are simplified circuit diagrams of two forms of the invention.

Referring to Figure 1, ML designates a main transmission line over which carrier currents may be transmitted. A transmitting channel TL and a receiving channel RL are associated with said main line ML. In order that the channels may be substantially conjugate, the receiving channel RL is associated with the main line ML through a balanced transformer arrangement of well-known construction and the line ML is balanced by means of the line MN. The transmitting channel TL includes carrier transmitting apparatus conventionally indicated at T. This transmitting apparatus may assume various forms but, if the system is a multiplex system, should include some selecting means, such as a tuned circuit, a source of carrier frequency, and means for interrupting or modulating the carrier frequency, in accordance with the telegraph signals. As illustrated, a transmitting relay 11 is provided for, for interrupting the carrier frequency directly by means of its contact, or for modulating the carrier frequency in any well-known manner, by means of the circuit controlled by its contact.

The receiving channel RL includes re-

ceiving carrier apparatus conventionally indicated at R. This apparatus may likewise assume a number of different forms, but if the system is to be multiplex, it should include some selecting arrangement, such as a tuned circuit and a detector or other arrangement for detecting the telegraph signals from the carrier current. A receiving relay 12 may be controlled by the detector in any such a manner that it will respond to the detected signal impulses. In order that the carrier apparatus may be associated with a telegraph station at some distance, a three-wire circuit is provided, including conductors 13, 14 and 15. The transmitting telegraph station includes a transmitting key K and a sounder S. In the circuit arrangement illustrated in Figure 1, the system is arranged for full duplex operation, so that the transmitting and receiving operation may take place simultaneously and independently. For this purpose, the transmitting relay 11 and a sending key K are included in the wire 13, and a battery B is included in the wire 14. A contact of the receiving relay 12 and the sounder S are likewise included in the wire 15.

The operation is as follows: The circuit of the transmitting relay 12 passes over the wire 13 and over the key K and thence over the wire 14 to battery B, independently of the receiving relay 12 and the sounder S. By opening and closing the key K, the transmitting relay may be energized and deenergized to interrupt or modulate the transmission of the carrier frequency by means of the carrier apparatus, to the main line ML. The received carrier currents from the line ML are detected by means of the carrier apparatus R, thereby energizing the receiving relay 12 which, in turn, opens and closes the circuit extending over the wire 15 through the sounder S and back over the wire 14 to the battery B. The sounder S, therefore, responds to the signals received by the relay 12.

Figure 2 illustrates the apparatus as arranged for half-duplex operation, in which sending and receiving cannot take place separately. The only change required, in order to convert the apparatus from a full-duplex to a half-duplex, is to include the key K in the wire 14, instead of in the wire 13.

The operation is as follows: Normally, the carrier is transmitted so that the car-

rier current received from the distant station holds the receiving relay 12 energized. With the key K closed, the circuit of the sounder S is completed and the sounder is held energized. The circuit of the transmitting relay 11 is also completed and the relay 11, by maintaining its contact in closed condition, causes the continuous transmission of the carrier frequency by means of the transmitting apparatus T. If the operator at the station illustrated desires to transmit by interrupting the key K, each time the key is interrupted, the local sounder S will respond and, at the same time, the transmitting relay will be de-energized to interrupt or modulate the carrier frequency.

If the distant station is transmitting, the key K must be maintained closed and receiving relay 12, in response to the signals detected from the carrier frequency transmitted from the distant station, will interrupt the circuit of the sounder S, so that it will respond to the received signal.

Should the operator, while a signal is being received, desire to "break in" or interrupt, for the purpose of sending to the distant station, the key K will be held open for an interval. This opens the circuit of the sounder S, so that it no longer responds to the receiving relay 12 and, at the same time, de-energizes the transmitting relay 11, so that the carrier frequency is either not transmitted or is changed in amplitude, depending whether the system operates by interrupting or by modulating the carrier.

The effect of the break signal at the distant station may be understood by a consideration of the effect produced at the illustrated station by a break signal transmitted from a distant station. If the operator at the illustrated station is sending and the distant operator should "break in," thereby interrupting or changing the amplitude of the carrier, the carrier apparatus R would operate to de-energize the receiving relay 12 during the continuance of the break sig-

nal. As long as the relay 12 is de-energized, the circuit of the sounder S will be held open, and the operator who is sending by manipulating the key 12 will understand that a break signal is being received, by observing that the sounder S no longer responds to the actuation of the key.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated, without departing from the spirit of the invention, as defined in the following claims.

What is claimed is:

1. In a signaling system, a carrier transmitting channel, a carrier receiving channel, a receiving relay associated with said carrier receiving channel, a three-wire low frequency telegraph circuit extending to a subscriber's station, a key, a transmitting relay for controlling said carrier transmitting channel in one wire, a subscriber's sounder included in a second wire, and the continuity of said wire being controlled by the receiving relay, and a common source of current for the transmitting relay and the receiving sounder in the third wire.

2. In a signaling system, a carrier transmitting channel, a carrier receiving channel, a receiving relay associated with said carrier receiving channel, a three-wire low frequency telegraph circuit extending to a subscriber's station, a transmitting relay for controlling said carrier transmitting channel in one wire, a subscriber's sounder included in a second wire, and the continuity of said wire being controlled by the receiving relay, and a common source of current for the transmitting relay and the receiving sounder in the third wire, and a transmitting key included in said first wire.

In testimony whereof, I have signed my name to this specification this 19th day of October, 1920.

HERMAN A. AFFEL.