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J. F. TOOMEY

SIGNALING SYSTEM

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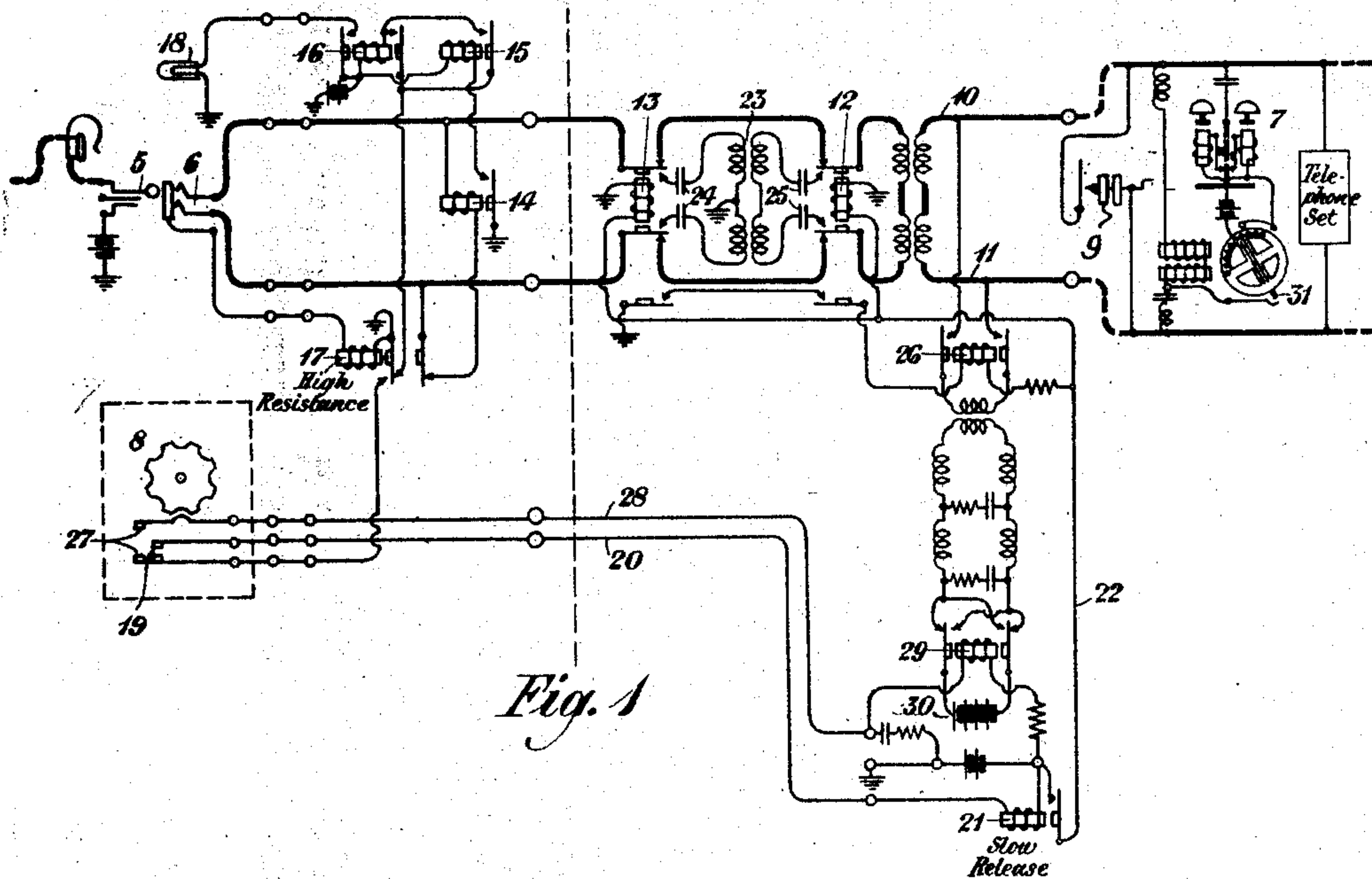


Fig. 1

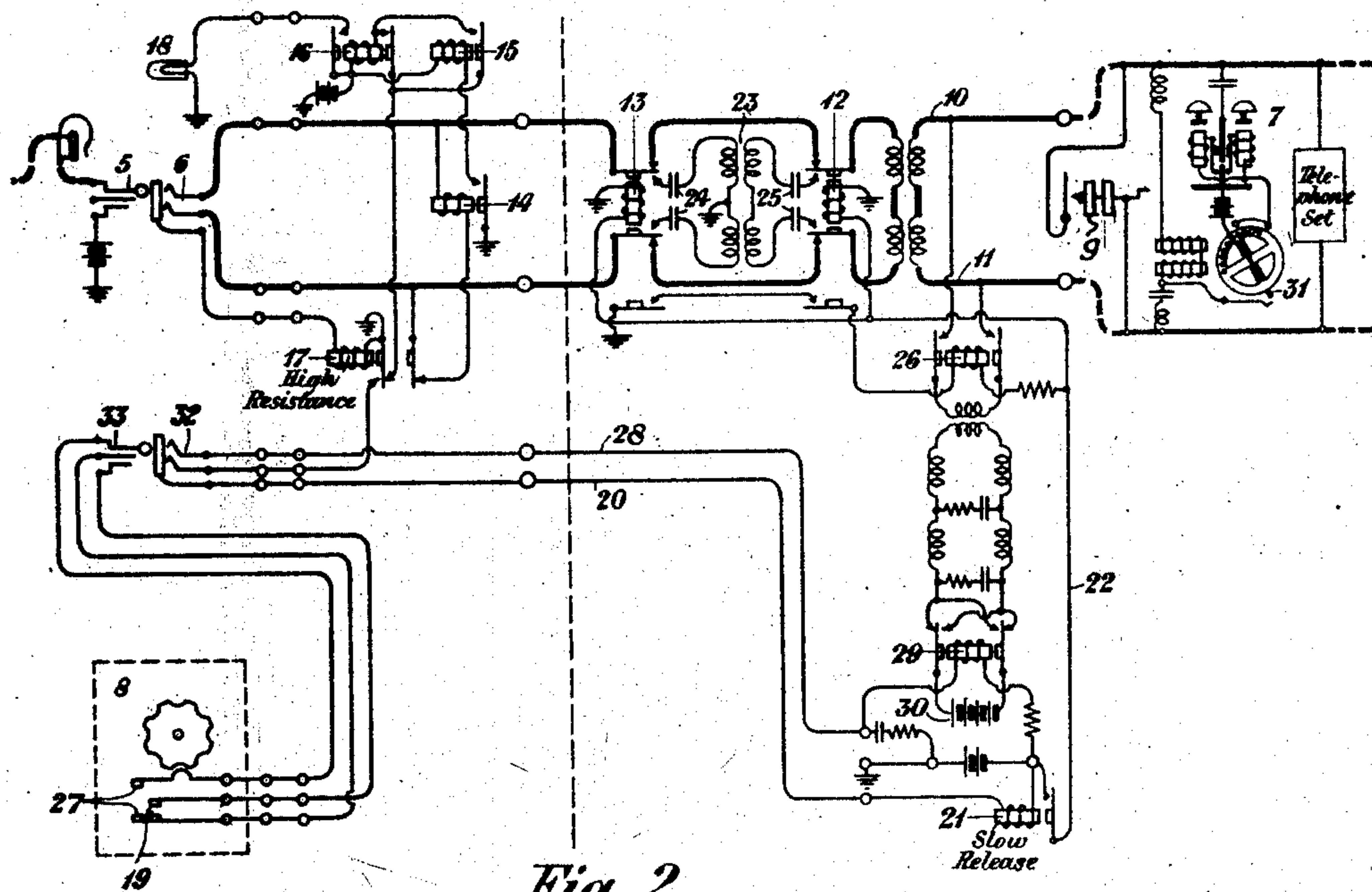


Fig. 2

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UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

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To all whom it may concern:

Be it known that I, JOHN F. TOOMEY, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Signaling Systems, of which the following is a specification.

This invention relates to signaling systems, and more particularly to signaling systems adapted to be used in connection with railroad private branch exchange telephone circuits and railroad message and despatch circuits.

In railroad message and despatch systems, a plurality of way stations are connected at intervals with the lines and each station is provided with the customary selector and other apparatus. A comparatively high voltage is required for the operation of this apparatus, and heretofore it has been inexpedient to directly associate telephone private branch exchanges with railroad message and despatch systems because of the detrimental effect such high voltage might have upon the equipment at the private branch exchange. Accordingly, it is an object of this invention to associate a telephone private branch exchange with a railroad message and despatch system in such manner as to eliminate any detrimental effect upon the private branch equipment by the high voltage required for the operation of the signaling apparatus. Another object consists in providing an audible signal at the private branch exchange as an indication that the selective apparatus at the called way station is being operated. Other and further objects of the invention will be apparent from the following description, when read in connection with the accompanying drawing, in which appear certain embodiments thereof.

Referring to the drawing, Figure 1 represents a single railroad despatch or message circuit terminating at a telephone private branch exchange; Fig. 2 indicates a circuit similar to Fig. 1 which is adapted to be used with a plurality of despatch or message circuits.

The equipment shown at the right of the vertical dotted line in each of the figures in the drawing is located at a terminal room from which a line extends to a plurality of way stations. The equipment indicated at the left of said dotted line terminates at the private branch exchange.

In the drawing, in which like numerals designate like equipment throughout, 5 represents a plug of an operator's cord circuit which has the usual operator's head set associated therewith. This plug is adapted to be inserted in a jack 6, the tip and ring conductors of which extend to an outgoing line that may have a plurality of way stations connected therewith, one of which is shown at 7. A connection may be completed from any of the way stations to a subscriber's station over said line and the connected cord circuit in a well understood manner. A selector key 8 is positioned at the private branch exchange which is adapted to selectively signal any desired station connected with the outgoing line.

In the operation of this system, it will be assumed that a station connected with the line, for instance station 7, desires to call the private branch exchange operator. To do this, a hand generator 9, which is shown as bridged across the line, is operated and causes current to be transmitted over the conductors 10 and 11, through back contacts of relays 12 and 13 and winding of relay 14. The relay 14 is normally bridged across the line conductors at the private branch exchange, and the closing of this circuit causes its operation. The operation of relay 14 closes a circuit through its make contact, from ground, winding of relay 15 to battery, thus causing the energization of relay 15, which in turn closes a circuit from the battery, winding and right make contact of relay 16, make contacts of relay 15 to ground, thereby operating relay 16. The operation of relay 16 closes a locking circuit through its winding and right make contact, from battery, inner back contact of relay 17 to ground. The operation of relay 16 also closes a circuit through its left contact from battery, through filament of lamp 18 to ground, which causes the illumination of this line lamp. The lighting of lamp 18 indicates to the attendant at the private branch exchange the presence of an incoming call, and in response thereto, the attendant will insert the plug of one of the toll cords associated with the private branch exchange, such as 5, in the jack 6, thereby closing a circuit from battery, sleeve contacts of said plug and jack, winding of relay 17 to ground. The closing of this circuit operates relay 17, which in turn deenergizes relay 16

by opening its locking circuit, and extinguishes the line lamp 18.

When the above connection is established between the calling way station 7 and the private branch exchange, conversation may be carried on between the two points, and the attendant at the exchange may complete over the cord circuit associated with jack 6 any telephone connection desired by the way station.

If the private branch exchange operator wishes to call a way station on the message circuit, a plug of one of the toll cords is inserted in the jack associated with the line. For instance, plug 5 of the toll cord is inserted in the jack 6, thereby operating relay 17 as formerly indicated. At this time the attendant proceeds to set the selector key 8 for the code corresponding to the code which will operate the selector apparatus at the way station desired. The operation of the key 8 will send the proper code signals over the circuit comprising the conductors 10 and 11 in the usual manner. When the key 8 is set, a circuit is intermittently closed from grounded contact of relay 17 through make contact 19 of the selector spring, conductor 20, winding of relay 21 to battery, thus causing the operation of this relay. The operation of relay 21 closes a circuit through its make contact from grounded battery, conductor 22, through the windings of relays 12 and 13 in parallel to ground. The closure of this circuit causes the operation of relays 12 and 13, which connect the incoming line through repeating coil 23 and condensers 24 and 25 with the private branch exchange. The condensers 24 and 25 are of such type that they will not break down or short circuit when high voltage is impressed on the circuit, and these with the repeating coil 23 act as a filter to prevent current of comparatively high voltage being transmitted to the private branch exchange during the period said current is connected to the line, as will be presently described. The operation of relays 12 and 13 causes the energization of relay 26 over a circuit from battery, make contact of relay 21, conductor 22, winding of relay 26, make contacts of relays 12 and 13 to ground. The operation of relay 26 connects the signaling apparatus to the line over conductors 10 and 11, which extend to the way stations. It will be noted that relay 26 cannot operate until both relays 12 and 13 have operated. This arrangement insures that high voltage current cannot be connected to the line until the filter comprising the repeater and condensers previously referred to are connected to the line.

The operation of the selector key 8 through its make contacts 27 intermittently closes a circuit from grounded contact of relay 17, conductor 28, winding of relay 29

to battery, which intermittently energizes relay 29. Thus the relay 29, under control of the selector key 8, closes a circuit from main battery 30 through its make contacts through the usual transformers and condensers, make contacts of relay 26, over the line conductors 10 and 11. Pulses of negative and positive current will be transmitted over this circuit in accordance with the code setting of the selector key 8, and a ringing signal at the called station corresponding to such setting, such as station 7, will operate when the selector apparatus thereat responds in a well understood manner.

The selector apparatus, upon operating, is bridged across the line conductors 10 and 11 through its closed code pin 31, and a circuit which includes battery is closed over said conductors, make contacts of relay 12, condensers 25 and 24, coil 23, make contacts of relay 13, tip and ring conductors of jack 6 and plug 5 of the cord circuit and associated operator's telephone set. When key 8 is returning to normal a final impulse is connected to the line which causes the selectors to be restored to their normal condition. After this impulse has been transmitted the circuit of relay 21 is opened, thereby causing this relay to release.

During the period the comparatively high voltage current is connected from the main battery 30 through the contacts of relay 26 to operate the selector apparatus at the way station 7, the line extending to the private branch exchange will be connected through the make contacts of relays 12 and 13 with the high breakdown condensers 24, 25 and the repeating coil 23. The connection of the line through these condensers and repeating coil protects the equipment at the private branch exchange from any detrimental effects due to high voltage required for the operation of the selector apparatus connected with the line extending to the way stations.

In the modification shown in Fig. 2, in which more than one message circuit is involved, the selector key 8, instead of being permanently associated with a particular circuit, is arranged so that it can, by means of a cord and plug, be connected to any desired message circuit. In order to accomplish this, an additional jack 32 is provided so that when the plug 33, which is connected with the selector key 8, is inserted in the jack 32, it connects the terminals of said key with the signaling equipment in a manner similar to that outlined in connection with Fig. 1.

In Fig. 2 the private branch exchange is signaled and the selector apparatus at the way stations is operated as outlined in the description of Fig. 1. In like manner to Fig. 1, the circuit extending to the private branch exchange is opened at the con-

tacts of relays 12 and 13 during the interval of operation of the selector apparatus to protect the equipment at said exchange from comparatively high voltage current.

5 What is claimed is:

1. A signaling system comprising a private branch exchange, a line circuit terminating thereat, a plurality of way stations associated with the line circuit, signaling means at each way station, means at the private branch exchange for selectively operating the signaling means at the way stations, and means associated with the line circuit and responsive to the operation of said signaling means for permitting the transmission of an audible signal to the private branch exchange.

2. A signaling system comprising a private branch exchange, a line circuit terminating thereat, a plurality of way stations associated with the line circuit, signaling means at the way stations, switching means at the private branch exchange for selectively operating the signaling means at the way stations, and means associated with the line circuit upon the operation of the switching means for transmitting an audible signal to the private branch exchange as an indication of the operation of said signaling means.

3. A signaling system comprising a private branch exchange, a line circuit terminating thereat, a plurality of way stations associated with the line circuit, switching means at the private branch exchange, a battery of comparatively high voltage, means for connecting said battery to the line circuit for impressing thereon pulses of current predetermined by the switching means to selectively signal the way station, and means associated with the line circuit upon the operation of said switching means for so attenuating the high voltage current as to prevent any detrimental effect to the

private branch exchange therefrom during the application of current.

4. The combination of a telephone private branch exchange and railroad message circuits terminating thereat, a plurality of way stations associated with each message circuit, switching means at the private branch exchange, a battery of comparatively high voltage, means for connecting said battery to the message circuits for impressing thereon pulses of current predetermined by the switching means to selectively signal the way stations, and means associated with the message circuits for permitting an audible signal to be transmitted to the private branch exchange over said circuits as an indication of the operation of the selective signaling and for also attenuating the high voltage current to prevent any detrimental effect to the private branch exchange during the application of current to the message circuits.

5. The combination of a telephone private branch exchange and railroad message circuits terminating thereat, a plurality of way stations associated with each message circuit, a battery of comparatively high voltage, switching means at the private branch exchange for connecting said battery to the line to selectively signal the way stations, and means including condensers and a repeating coil associated with the message circuits upon the operation of the switching means for permitting an audible signal to be transmitted from the signaled way station to the private branch exchange and for attenuating the high voltage current to prevent detrimental effect to the private branch exchange therefrom during such period.

In testimony whereof, I have signed my name to this specification this 22nd day of September 1924.

JOHN F. TOOMEY.