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SIGNALING SYSTEM

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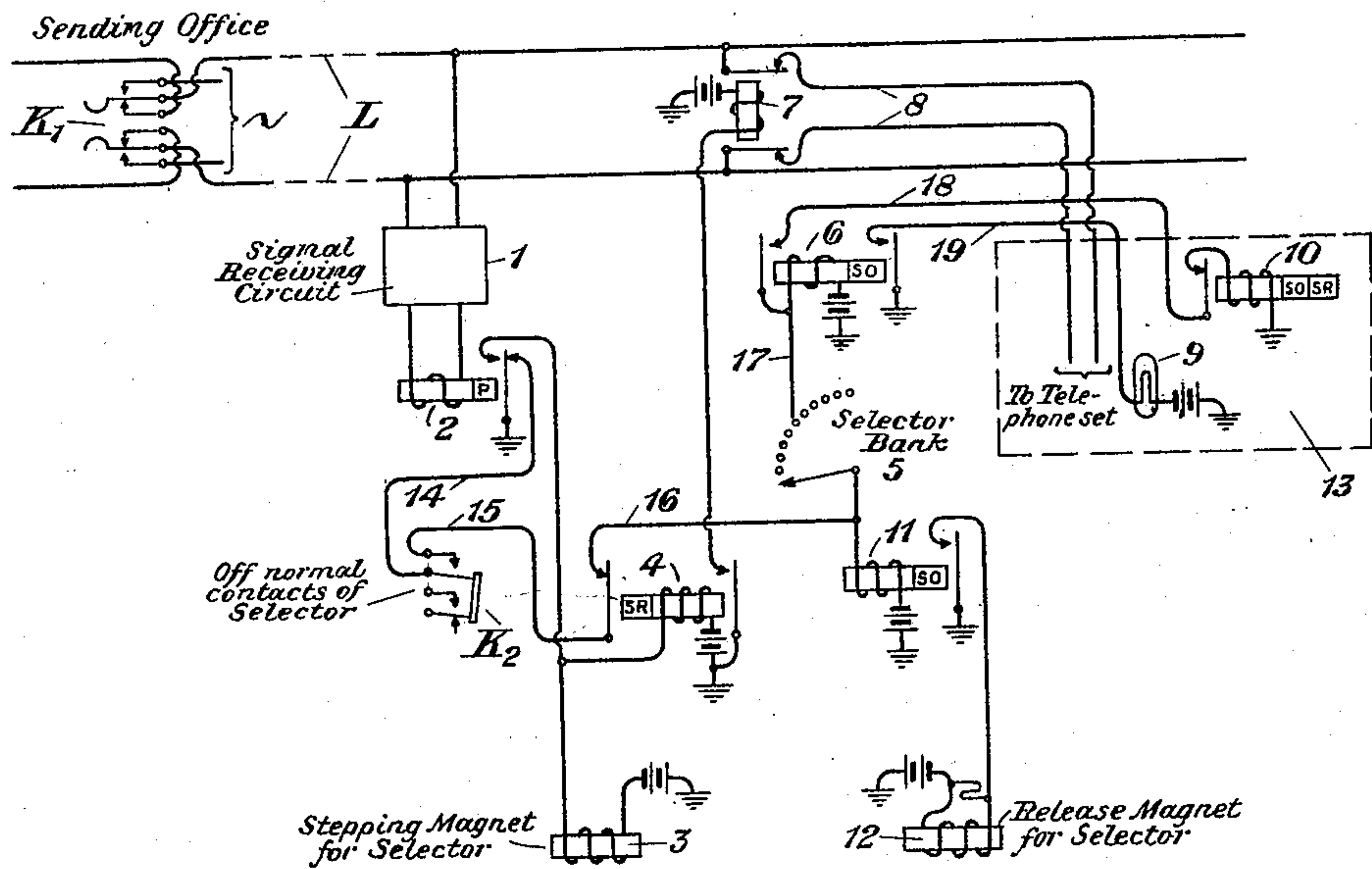


Fig. 1

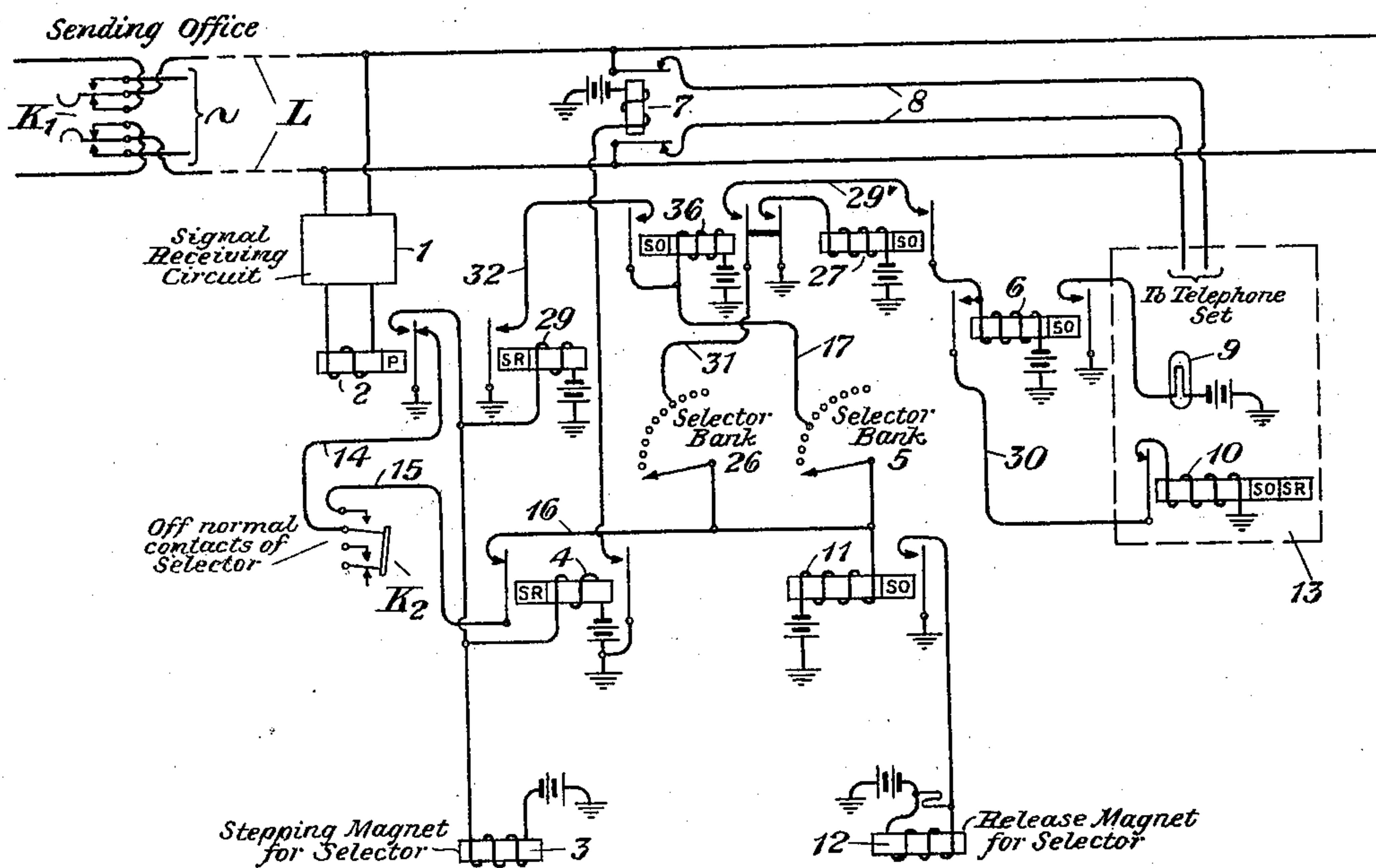


Fig. 2

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SIGNALING SYSTEM

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This invention relates to telephone systems, and more particularly to improved arrangements for selectively signaling any desired one of a number of stations connected across a single line in such systems.

One form of telephone service consists in the leasing of telephone circuits to subscribers who wish to have the exclusive use of the facilities. Such cases frequently involve the bridging of a number of stations on a single circuit and it then becomes necessary to provide means for calling in the various points when they are wanted. One method for accomplishing such signaling has been by the use of code ringing, or by transmitting code impulses over the line to actuate the signal responsive devices at each station. As heretofore used code ringing is open to several objections, among which are the fact that all stations are disturbed whenever any one is called, and the fact that it is necessary for the attendants to count the number of rings or signals received. The latter difficulty is particularly troublesome at stations having switchboards, since in these cases lamps are used instead of bells. It is the primary object of the arrangements of the invention to provide automatic counting devices in connection with each line, whereby the code impulses will be counted automatically and the proper station signaled without disturbing other stations on the line and without making it necessary for the attendants to count the signals. In the arrangements of the invention this is accomplished by utilizing selector switch mechanism together with relays controlled by the code signal impulses and having a timed relationship in their operation with respect to each other. Other objects and features of invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing, in the Figures 1 and 2 of which the invention is illustrated. In Fig. 1 is a circuit diagram illustrating the signaling arrangements of the invention adapted for a one-digit code; Fig. 2 is a circuit diagram illustrating the

signaling arrangements of the invention adapted for a two-digit code. Similar reference characters have been used to denote like parts in both figures.

In Fig. 1 is shown a transmission line L with which may be associated a number of telephone stations, such as the telephone set and its attendant apparatus 13. The line L would be connected to a sending office at which would be provided a key K₁ the operation of which would connect to the line L a source of signaling current. To signal the station 13 the key K₁ would be operated a number of times, such, for example, as five times, to send a code signal for that station over the line L. These code ringing impulses would be transmitted over the line L to the signal receiving circuit 1, and each impulse would operate the relay 2. The operation of relay 2 would put ground on a circuit for the stepping magnet 3. Accordingly, each impulse transmitted over the line L would operate the stepping magnet 3 which in turn would move the switch-arm of the selector ahead one step on selector bank 5. When the selector starts to move ahead, the off normal contacts K₂ will also be closed. The first impulse transmitted over the line will, upon the operation of relay 2, close a circuit for the relay 4 and operate it. Relay 4 is sufficiently slow in releasing so that it will hold over the breaks between the impulses making up the number being called and over the time required for the signal receiving circuit to operate. The operation of relay 4 will close the circuit for the relay 7 which will disconnect conductors 8 leading to the telephone set from the line L, to prevent any interference with the signaling due to someone talking on the circuit during the signaling period. When the correct number of signal impulses, such as 5, is received, the selector arm will stop on the proper contact of the bank. After a certain interval relay 4 will release and the following circuit will be completed: Ground, off-normal contacts K₂, conductor 15, armature and contact of relay 4, conductor 16, contacts of selector 5, conductor 17, winding of relay 6 to battery. This will operate the relay 6 which is some-

what slow-operate to prevent its operation on momentary grounds on the bank contact, which may occur when the selector is returning to normal from some higher point. The operation of relay 6 will close a circuit over its armature and contact, and conductor 19 for an indicating device, such as a lamp 9, at the station 13. The relay 6 will also lock up over its left-hand armature and contact, conductor 18, armature and contact of relay 10 to ground. The relay 10 is a slow-operate, slow-release relay and will not operate for a certain interval of time, so that the indicating device 9 will remain operated long enough to obtain the attention of the attendant at station 13. Relay 10 is slow-release to give relay 6 time to release before relay 10 releases. When the relay 10 finally operates, the locking circuit for relay 6 will be broken. If desired the locking circuit for relay 6 might also be broken when the subscriber answers the telephone. These means are provided to prevent the signal from operating indefinitely. When the relay 4 releases, in addition to the operations just indicated ground will be applied from conductor 16 to the winding of relay 11, which is a slow-operate relay and will eventually operate this relay. The operation of relay 11 will close a circuit for the release magnet 12, which will return the selector to its original condition. This will also open the off-normal contacts K_2 . Relay 11 is slow-operate to give relay 6 time to function before the release magnet is energized. Apparatus similar to that heretofore described and shown associated with station 13 would be provided for each of the other stations connected to the line. The selectors at other stations on the circuit will, of course, step at the same time as the selector associated with station 13. However, the relays similar to relay 6 associated with such selectors will not be operated when the selectors stop on the fifth contact as they will be connected to other contacts at other stations, and no signal will be given except at station 13. The release of relay 4 at each station will cause the operation of relay 11 and the release magnet at each point and hence cause all the selectors to return to normal after the last ringing impulse is received.

In Fig. 2 the arrangements of the invention are shown for use with a two-digit code. Similar reference characters have been utilized to denote like parts with respect to Fig. 1. The arrangements are substantially similar to those of Fig. 1 except that an additional bank 26 of the selector is used and the relays 36, 27 and 29 are added.

The operation of the arrangements of Fig. 2 is as follows: The code signal for the station 13 in the arrangements shown would be a digit of four impulses followed by one of seven impulses. This would be transmitted over the line L by the actuation of key K_1 .

The impulses of the first digit would operate relay 2 and the stepping magnet 3 and would cause the arms of the selector to move over the selector banks 5 and 26. The slow-release relays 4 and 29 would also be operated and would remain operated during transmission of the first code digit. The operation of the selector would also close the off-normal contacts K_2 . When the transmission of the first digit was completed an arm of the selector switch would remain on the fourth contact of selector bank 5 and ground would be applied to conductor 17 and relay 36 as soon as relay 4 released. This would operate relay 36 which would operate relay 27 and lock up over its left-hand contact and the armature and contact of the previously operated slow-release relay 29. Relay 29 is sufficiently slow in releasing to hold over the break between the two groups of pulses making up the two digits and over the operating time of the signal receiving circuit. The release of relay 4 will in a manner similar to that heretofore described cause the operation of relay 11 and the release magnet 12 for the selector. This will now return the selector switch to its normal position and open contacts K_2 . The key K_1 will now be operated to transmit over the line the second group of pulses making up the second digit of the code. This will in a manner similar to that already described reoperate relay 4 and causes the arms of the selector switch to step around to the proper position on the selector banks, which in this case will be the seventh position. When the relay 4 now releases due to the cessation of the signaling impulses, ground will be applied over conductors 16, arm and contact of selector bank 26, conductor 31, to the inner right-hand contact of relay 36. The relay 36, as has been previously pointed out, has been operated and in turn has caused the operation of relay 27. Ground will accordingly be applied over conductor 29, contact and armature of relay 27, to winding of relay 6 to battery, thereby operating relay 6. Relay 27 is made slow-operating to prevent the operation of relay 6 which would occur if the two digits of the code were the same and relay 6 were connected to selector bank 26 before the selector releases between the digits. The operation of relay 6 will close a circuit for the indicating device, such as lamp 9, as in the preceding case. Relay 6 will lock up over the armature and contact of slow-operate, slow-release relay 10, similar in function to relay 10 of Fig. 1. In addition to the above operation on the release of relay 4 after the transmission of the second group of impulses, relay 11 would also operate and cause the release magnet 12 to restore the selector to normal again. The subsequent release of slow-release relay 29 and slow-operate slow-release relay 10 would restore

the remainder of the apparatus to normal.

Similar apparatus would be provided for the other stations on the line, and conductors similar to 17 and 31 would be connected to the contacts on the selector banks thereat corresponding to the proper digits of the particular code for each of said stations.

The arrangements shown in Figs. 1 and 2 might, if desired, both be connected to the same line for use at different stations thereon. If this is done, the only limitation is that codes involving the same digits may not be used on both types of selectors, that is, if "4" is used on the one-digit selectors, no code using "4" may be used on the two-digit selectors, and vice versa.

While the arrangements of the invention have been shown as embodied in certain specific arrangements which are deemed desirable, it is pointed out that they are capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising a selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, and a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay.

2. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said signaling circuit comprising a relay with locking means therefor, and a circuit including an indicating device controlled by said last mentioned relay.

3. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a

switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said circuit including a relay with locking means therefor, a circuit including an indicating device at said station controlled by said last mentioned relay, and means operating at an interval after the energization of said last mentioned relay for releasing the locking means therefor.

4. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said circuit including a relay with locking means therefor, a circuit including an indicating device at said station controlled by said last mentioned relay, and means operating at an interval after the release of said first mentioned relay for restoring said selector mechanism to normal.

5. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, and a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay means, the signaling circuits at each of said stations being connected to one of the selector contacts thereat different from those having signaling circuits connected thereto at other stations.

6. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, the code signals for each station comprising two-digits each having one or more signal impulses, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism includ-

ing two switch arms each cooperating with a separate bank of contacts, a stepping magnet operated by said two-digit code impulses for stepping said two selector switch arms ahead, a slow-release relay held operated by said code signals and released at an interval after the transmission of each digit of said code signals, a circuit connected to one of said selector banks and completed upon the first release of said slow-release relay for preparing a signaling circuit for said station, and means associated with the other of said selector banks and operative upon the second release of said slow-release relay for completing said prepared signaling circuit.

7. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, the code signals for each station comprising two-digits each having one or more signal impulses, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including two switch arms each cooperating with a separate bank of contacts, a stepping magnet operated by said two-digit code impulses for stepping said two selector switch arms ahead, a slow-release relay held operated by said code signals and released at an interval after the transmission of each digit of said code signals, a circuit connected to one of said selector banks and completed upon the first release of said slow-release relay for operating relay mechanism for preparing a signaling circuit for said station, a locking device for said relay mechanism, means associated with the other of said selector banks and operative upon the second release of said slow-release relay for completing said prepared signaling circuit, means operative upon each release of said slow-release relay for restoring said selector switch to normal, and means operative at an interval after the final cessation of said signals for releasing said locking device for said relay mechanism.

8. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, the code signals for each station comprising two-digits each having one or more signal impulses, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including two switch arms each cooperating with a separate bank of contacts, a stepping magnet operated by said two-digit code impulses for stepping said two selector switch arms ahead, a slow-release relay held operated by said code signals and released at an interval after the transmission of each digit of said code signals, a circuit connected to one of said selector banks and completed upon the first release of said second mentioned slow-release relay for operating relay mechanism for preparing a signaling circuit for said

station, a locking device for said relay mechanism, means associated with the other of said selector banks and operative upon the second release of said second mentioned slow-release relay for completing said prepared signaling circuit, means operative upon each release of said second mentioned slow-release relay for restoring said selector switch to normal, means operative at an interval after the final cessation of said signals for releasing said locking device for said relay mechanism, and means operative at an interval after the completion of said prepared signaling circuit for releasing said signaling circuit.

In testimony whereof, we have signed our names to this specification this 16th day of March, 1932.

MILTON L. ALMQUIST.
ALBERT C. THOMPSON.

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DISCLAIMER

1,885,214.—*Milton L. Almquist*, Maplewood, and *Albert C. Thompson*, Mountain Lakes, N. J. SIGNALING SYSTEM. Patent dated November 1, 1932. Disclaimer filed August 29, 1933, by the assignee, *American Telephone and Telegraph Company*.

Hereby enters this disclaimer to claims 1 to 6 of said Letters Patent, to wit:

"1. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising a selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, and a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay.

"2. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said signaling circuit comprising a relay with locking means therefor, and a circuit including an indicating device controlled by said last mentioned relay.

"3. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said circuit including a relay with locking means therefor, a circuit including an indicating device at said station controlled by said last mentioned relay, and means operating at an interval after the energization of said last mentioned relay for releasing the locking means therefor.

"4. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay, said circuit including a relay with locking means therefor, a circuit including an indicating device at said station controlled by said last mentioned relay, and means operating at an interval after the release of said first mentioned relay for restoring said selector mechanism to normal.

"5. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including a switch arm cooperating with a bank of contacts, a stepping magnet operated by said code signals for stepping said selector switch arm ahead, relay means operated by said code signals and released at an interval after said code signals cease, and a signaling circuit for said station connected to one of the contacts of said selector bank and completed by the release of said relay means, the signaling circuits at each of said stations being connected to one of the selector contacts thereof different from those having signaling circuits connected thereto at other stations.

"6. A transmission line having a plurality of stations connected thereto, means for applying code signals to said line, the code signals for each station comprising two digits each having one or more signal impulses, and means at each of said stations responsive to said code signals, each of said responsive means comprising selector mechanism including two switch arms each cooperating with a separate bank of con-

tacts, a stepping magnet operated by said two-digit code impulses for stepping said two selector switch arms ahead, a slow-release relay held operated by said code signals and released at an interval after the transmission of each digit of said code signals, a circuit connected to one of said selector banks and completed upon the first release of said slow-release relay for preparing a signaling circuit for said station, and means associated with the other of said selector banks and operative upon the second release of said slow-release relay for completing said prepared signaling circuit."

[Official Gazette September 26, 1933.]